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Number of Papers Included in these Proceedings per Country
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Country	# Papers	%
TOTAL	131	100.00
United States	40	30.53
Spain	12	9.16
Italy	7	5.34
Sweden	7	5.34
Australia	6	4.58
Japan	6	4.58
Czech Republic	4	3.05
Taiwan	4	3.05
United Kingdom	4	3.05
Romania	3	2.29
Belgium	2	1.53
China	2	1.53
Denmark	2	1.53
Norway	2	1.53
Pakistan	2	1.53
Russian Federation	2	1.53
Saudi Arabia	2	1.53
South Korea	2	1.53
Switzerland	2	1.53
Thailand	2	1.53
Trinidad and Tobago	2	1.53
Turkey	2	1.53
Austria	1	0.76
Bahrain	1	0.76
Botswana	1	0.76
Canada	1	0.76
Hong Kong	1	0.76
Jordan	1	0.76
Namibia	1	0.76
New Zealand	1	0.76
Oman	1	0.76
Portugal	1	0.76
Puerto Rico	1	0.76
Singapore	1	0.76
Slovenia	1	0.76
Tanzania	1	0.76

Foreword

Informatics and Cybernetics (communication and control) are having an increasing impact on societies and in the globalization process that is integrating them. Societies are trying to regulate this impact, and adapt it to their respective cultural infra-structures. Societies and cultures are in reciprocal co-adaptations with Information and Communication Technologies. Synergic relationships might emerge in this co-adaptation process by means of positive and negative feedback loops, as well as feedforward ones. This would make the whole larger than the sum of its parts, generating emergent properties in the parts involved as well as in the whole coming forth. The academic, private, and public sectors are integrating their activities; multi-disciplinary groups and inter-disciplinary teams are being formed, and collaborative research and development projects are being organized in order to facilitate and adequately orient the design and implementation of the feedback and the feedforward loops, so the synergic relationships are socially positive and personally human.

One of the main purposes of the 4th International Multi-Conference on Society, Cybernetics and Informatics (IMSCI 2010) is to bring together academics, professionals, and managers from the private and the public sectors, so they can share ideas, results of research, and innovative services or products, in a multi-disciplinary and multi-sector forum.

Educational technologies, socio-economic organizations, and socio-political processes are essential domains among those involved in the evolving co-adaptation and co-transformation between societies and cultures on the one hand, and between informatics and cybernetics (communication and control) on the other hand. Consequently, the main conferences in the context of the IMSCI 2010 Multi-Conference are the following:

- 8th International Conference on Education and Information Systems, Technologies and Applications: EISTA 2010
- 6th International Conference on Social and Organizational Informatics and Cybernetics: SOIC 2010
- 8th International Conference on Politics and Information Systems, Technologies and Applications: PISTA 2010

These three conferences are related to each other and, as a whole, are producing or might produce synergic relationships with Information and Communication Technologies. This is why the Organizing Committees of the three of them have the purpose of combining their efforts in a way that would lead to the organization of an adequate joint event, where academics, researchers, consultants, professionals, innovators, and practitioners from the three areas might relate and interact with each other in the same event. These types of interaction might generate possibilities of cross-fertilization and analogical thinking, as well as possibilities of new working hypothesis, ideas, and reflections on the impact, significance, and usefulness of Informatics and Cybernetics in important

dimensions of educational, socio-political, and socio-economical processes, services, and products.

The relationship between education/training and Information and Communication Technologies (ICT) is quickly intensifying and sometimes appears in unexpected forms and in combination with original ideas, innovative tools, methodologies, and synergies. Accordingly, the primary purpose of the 8th International Conference on Education and Information Systems, Technologies and Applications (EISTA 2010) has been to bring together researchers and practitioners from both areas together to support the emerging bridge between education/training and the ICT communities.

The 6th International Conference on Social and Organizational Informatics and Cybernetics (SOIC 2010) and The 8th International Conference on Politics and Information Systems, Technologies and Applications (PISTA 2010) have been organized and collocated with EISTA 2010 and the proceedings of the three conferences have been collected in the same volumes under the general title of Society, Cybernetics and Informatics because significant relationships were found among the three of them.

In the context of EISTA 2010, practitioners and consultants were invited to present case studies and innovative solutions. Corporations were invited to present education/training information systems and software-based solutions. Teachers and professors were invited to present case studies, specifically developed information systems, and innovative ideas and designs. Educational scientists and technologists were invited to present research or position papers on the impact and the future possibilities of ICT in educational systems, training processes, and methodologies. Managers of educational organizations and training consultants were invited to present problems that might be solved by ICT or solutions that might be improved by different approaches and designs in ICT.

EISTA 2010 provides a forum for the presentation of solutions and problems in the application of ICT in the fields of education/training. Authors of the papers included in the proceedings provided diverse answers to the following questions:

- What is the impact of ICT in education and training?
- How are ICTs affecting and improving education and training? What networks and models are emerging?
- How are universities, schools, corporations and other educational/training organizations making use of ICT?
- What electronic tools are there to facilitate e-learning, distance education and co-operative training?

In the context of PISTA 2010/SOIC 2010, Information and Communication Technologies (ICTs) are transforming our societies and our governments at a remarkable speed. Government departments are seeing the importance of delivering services electronically.

Political parties have begun using ICT in their processes. Yet, despite this increased need, we find, as John Harvey-Jones calls it, a Dialogue of the Deaf between politicians and the ICT community. Politicians need to understand the potential role of the Internet in politics and the ICT community needs a better understanding of politics if this Dialogue of the Deaf is to be transformed into a mutually comprehensive dialogue and a synergic relationship. The purpose of the International Conference on Politics and Information Systems, Technologies and Applications (PISTA 2010) is to contribute to this emerging dialogue and to aid in bridging the gap between the two communities.

In order to contribute to the creation of relationships between ICT and Sociopolitical communities, ICT researchers and professionals were invited to present their experience and research as it pertains to the application of ICT in politics, governmental action, and political science. Practitioners and consultants were invited to present case studies and innovative solutions. Corporations were invited to present political information systems and software-based solutions to political issues. Public servants were invited to present case studies requiring technology: information systems, innovative ideas, and designs that were developed with political purposes in mind. Political and social scientists were invited to present research or position papers on the impact and future possibilities of ICT in social systems and political processes. Politicians and political consultants were invited to present problems that might be solved by means of ICTs or solutions that might be improved by different approaches and designs in ICT.

The main objective of PISTA 2010 has been to provide a forum for the presentation of both the solutions and problems of ICT applications in politics and society. The following questions need answers from a variety of different perspectives:

- How do ICTs impact society?
- How are ICTs affecting democracy and the potential to make joint and collective decisions in government?
- What networks and models are emerging to provide support for political decision systems?
- How are political parties, governments, and campaign groups using IT systems and electronic communications in particular?
- What electronic tools already exist to facilitate democratic discussions and decision-making processes?
- What ethical and legal issues will be a part of the social transformation produced by the ICTs?

On behalf of the Organizing Committees, I extend our heartfelt thanks to:

1. the 135 members of the Program Committees (18 members of the IMSCI 2010's PC and 135 members of the PCs related to the conferences and symposia organized in the context of IMSCI 2010) from 36 countries;
2. the 431 additional reviewers, from 71 countries, for their **double-blind peer reviews**;
3. the 289 reviewers, from 57 countries, for their efforts in making the **non-blind peer reviews**. (Some reviewers supported both: non-blind and double-blind reviewing for different submissions)

A total of 1751 reviews made by 720 reviewers (who made at least one review) contributed to the quality achieved in IMSCI 2010. This means an average of 5.45 reviews per submission (321 submissions were received). Each registered author had access, via the conference web site, to the reviews that recommended the acceptance of their respective submissions. Each registered author could get information about: 1) the average of the reviewers evaluations according to 8 criteria, and the average of a global evaluation of his/her submission; and 2) the comments and the constructive feedback made by the reviewers, who recommended the acceptance of his/her submission, so the author would be able to improve the final version of the paper.

In the organizational process of IMSCI 2010, about 321 papers/abstracts were submitted. These pre-conference proceedings include about 131 papers, from 36 countries, that were accepted for presentation. I extend our thanks to the invited sessions' organizers for collecting, reviewing, and selecting the papers that will be presented in their respective sessions. The submissions were reviewed as carefully as time permitted; it is expected that most of them will appear in a more polished and complete form in scientific journals.

This information about IMSCI 2010 is summarized in the following table, along with the other collocated conferences:

Conference	# of submissions received	# of reviewers that made at least one review	# of reviews made	Average of reviews per reviewer	Average of reviews per submission	# of papers included in the proceedings	% of submissions included in the proceedings
WMSCI 2010	711	1841	3586	1.95	5.04	242	34.04%
IMETI 2010	425	1124	2480	2.21	5.84	134	31.53%
IMSCI 2010	321	720	1751	2.43	5.45	131	40.81%
CISCI 2010	622	1174	3321	2.83	5.34	224	36.01%
TOTAL	2079	4859	11138	2.29	5.36	731	35.16%

We also extend our gratitude to the co-editors of these proceedings, for the hard work, energy and eagerness they shown preparing their respective sessions. We express our intense gratitude to Professor William Lesso for his wise and opportune tutoring, for his eternal energy, integrity, and continuous support and advice, as the Program Committee Chair of past conferences, and as Honorary President of WMSCI 2010, as well as for being a very caring old friend and intellectual father to many of us. We also extend our gratitude to Professor Belkis Sanchez, who brilliantly managed the organizing process.

We also express our immense gratitude to Professor Freddy Malpica for distinguishing this conference by accepting the position of Honorary Chair of EISTA 2010 and the past conferences of PISTA and SOIC; to Professors Friedrich Welsch for serving as the Program Co-Chair of EISTA 2010 and SOIC 2010, to José Vicente Carrasquero for co-chairing the Program committee of EISTA 2010 and PISTA 2010, to Angel Oropeza for Co-Chairing the EISTA 2010 Organizing Committee, and to Andrés Tremante for serving as the General Chair of EISTA 2010. We also extend our gratitude to Professor Belkis Sánchez, for her relentless support in the organizing process.

We extend our gratitude to Drs. W. Curtiss Priest, Louis H. Kauffman, Leonid Perlovsky, Stuart A. Umpleby, Eric Dent, Thomas Marlowe, Ranulph Glanville, Karl H. Müller, and Shigehiro Hashimoto, for accepting to address the audience of the General Joint Plenary Sessions with keynote conferences, as well as to Drs. Ronald C. Thomas, Jr., Christopher Dreisbach and Roxanne Byrne for accepting our invitation as Keynote Speakers at the Plenary Session of IMSCI 2010.

We also extend our gratitude to Maria Sanchez, Juan Manuel Pineda, Leonisol Callaos, Dalia Sánchez, Keyla Guédez, Riad Callaos, Marcela Briceño and Mabel Escobar Ortiz for their knowledgeable effort in supporting the organizational process and for producing the hard copy and CD versions of the proceedings. We would also like to thank the support and the secretariat staff that helped in the troubleshooting activities.

Professors Andrés Tremante and Nagib Callaos
IMSCI 2010 General Co-Chairs

VOLUME II
(Post-Conference Edition)

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The young and digital technologies: defining spaces for leisure, participation and learning

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ABSTRACT

The present article is a descriptive summary of the data obtained through a survey addressed to the Spanish population between 12 and 18 years old about the effective use of Internet, social networks, mobile telephones and videogames. Specifically, the first data collected show that young people have learnt to use the Internet and connect mainly in informal spaces (private and/or related to family and friends), but not in formal educational spaces (such as classrooms or academies). For them, Internet is mainly a leisure space. Besides, the survey shows that a third does not use tools such as social networks, blogs or photologs, and that the majority does not play videogames on a regular basis, mainly because they are not interested. On the other hand, how they perceive the use of digital technologies illustrates characteristic ways of identity formation and privacy management by young people.

Key words: youth, leisure, digital technologies, communicative practices, cultural consumption

1. Introduction and methodology

The present paper is a descriptive summary of the data collected through a survey addressed to the Spanish population between 12 and 18 years old about the effective use of Internet, social networks, videogames and mobile telephones conducted between March the 16th and the 1st of April in 2009. This quantitative study is the first phase of a research funded by the Spanish Ministry Industry, Tourism and Commerce Ministry within the frame of Plan Avanza (grant reference: TSI-040400-2008-42), entitled “Transformemos el ocio digital: un proyecto de socialización del tiempo libre” [Let's transform digital leisure: a sociability project of leisure time].

The account of these results has been divided into four sections corresponding to the main sections of the survey: Internet use in general, use of online social networks, use of mobile telephones, and use of videogames.

The sample study is formed by the totality of Spanish teenagers between 12 and 18 years old (that is 3,044,131 inhabitants, without taking into account the population in the Canary Islands, Ceuta and Melilla). All in all, the final theoretical sample adds up to 2,054 consultations with a

margin of error of $\pm 2,16\%$ for $P=Q=50.0\%$ and on the supposition of maximum uncertainty. This is how a strongest sample in terms of statistical significance was obtained. The amount of consultations made follows a distribution proportional to the Spanish population in terms of both sex and age between 12 and 18 years of age (with the exception of the Canary Islands, Ceuta and Melilla). From this premise, 51.7 % of the consultations have been conducted to men and 48.3 % to women. A percentage of 53.9% has been conducted to people between 12 and 15 years old and of 46.1% to people between 16 and 18 years old. Additionally, these segmentations have been applied to be proportional to the size of each town (less than 2,000 people, between 2,001 y 5,000 people, between 5,001 and 10,000 people, between 10,001 and 50,000, between 50,001 and 100,000 people, between 100,001 and 500,000 people and more than 500,000 people) and by regions or *comunidades autónomas*.

2. The Internet

The first significant information this study reveals is the fact that almost all Spanish teenagers claim to have connected to the Internet some time in their lives (96.7%). Besides, the majority connects on a regular basis (53% connect at least an hour a day on average; it is also revealing that 13.6% of the total claim to be *almost always connected*).

In this context, and in relation to the place, frequency and intensity of Internet use by teenagers, as well as to the effective parental control over this use, it is important to highlight, in the first place, that the majority (94.5%) connect to the Internet mainly at home, with 59.2% claiming to have a connection in their own bedroom. Internet availability in private or personal spaces increases with age (it is more frequent among those between 16 and 18 years old than among those between 12 and 15 years old). In parallel, the same occurs with the time they devote to it, which is slightly superior between the older stretch of teenagers interviewed, despite diversity is commonly observed in this respect, and with the gradual migration of the main hours of use, from afternoons (majority option, but more common among those between 12 and 15 years) to nights or to connect at any time. All these data together suggest an established pattern of Internet use for teenagers in their households, which becomes more flexible and diverse as they grow up, at first as a natural development of the habitual generational

dynamics that, precisely in domestic environments, often translate into discussions and negotiations regarding the use and consumption of technology and media [1].

On the other hand, the data corresponding to the channel of introduction to Internet use are particularly interesting. From the totality of users, 53.6% claim to have learnt to use it by themselves, whereas 21.8% have learnt with the help of some relative (parents, uncles or aunts, brothers or sisters, cousins). It is noteworthy, on the lines of the previously highlighted age-related observations, that the weight of the family as a way of learning the use of Internet is specially significant among the younger interviewees (from 12 to 15 years old). Nevertheless, all in all, these data reveal that most teenagers (79.35%) learn to use Internet in informal contexts, either on their own, with the family or with friends (83.9%), and therefore unrelated to formal education (barely 19.9% of the interviewees claim to have learnt at school or in academies).

In this context, the comparison of the effective uses of the Internet with the perception young people have on the Internet reveals some fundamental characteristics related to how they introduce digital technologies into their daily lives. Although entertainment (*with the Internet I while away the time and entertain myself*) and information (*The Internet allows me to know what is going on around me, in the Internet I always find the information I need*) are still two of the main functions attributed to Internet, so is participation (*The Internet allows me to share the pictures I take, the videos I record*).

It is worth mentioning that 94.5% of teenagers that use the Internet have one or more email accounts, whereas 89.9% have one or more instant messaging accounts (Messenger, Skype, Jabber), which implies that only 4.6% use email as their main tool of online communication. In any case, it is worth noting that the use of email is more related, in principle, with entertainment (*activities related to entertainment and leisure*) than with merely practical issues (*activities related to studies or work*).

The principal uses (*a lot*) of these accounts are to *talk to friends* (89.3%) and *about what interests them or they like* (71.3%), high above the uses involving relationships with people not pertaining to their daily social circle, family or teachers (*talk to people they do not often see*, 48.5%; *talk to relatives*, 36.7%; *talk to teachers or monitors*, 3.1%), or, once again, of a more practical nature, such as *solving doubts regarding studies* (44.2%). Together, the contacts lists prioritize friends and schoolmates, whereas they relegate parents and teachers to the last places, or consider them their first choices not to add to those lists.

The correlations between the main socio-demographic variables (genre and age) and the answers obtained by a simple preliminary regression analysis (*Chi-square; p < 0,05*) have been explored more thoroughly. This first approach precisely reveals some of the characteristics of that negotiation dynamics regarding media and technology within the households between fathers and mothers and their sons and daughters, wherein as teenagers grow up, the use of

the available tools becomes more independent, personalized and versatile.

In fact, first of all, it is observed a quite clear relation between the increase in age and a higher level of integration and personalization of the use of the Internet. Thus, in general, and without forgetting that a wide distribution of answers among the different groups is usually observed, those between 16 and 18 years old are more significantly related to:

- more flexible hours of use (*at any hour*, compared to hours such as the *afternoon* and *weekend* for those between 12 and 15 years old);
- more time investment (*more than 10 hours per week*, compared to *8 or less hours* for those between 12 and 15 years old);
- the connection in private spaces within the family environment (*in the bedroom*, compared to *living room* –communal space- for those between 12 and 15 years old);
- a tendency to *learn by oneself* (compared to *with the help of relatives* in the case of those between 12 and 15 years old);
- a tendency towards a more frequent, intense, personalized and versatile use of online tools and applications as main/initial vehicle of communication.

In this respect, it is also necessary to note that girls are precisely those who perceive that the idea that *their parents do not like that they spend so much time surfing the Internet*, has a much more forceful effect on them, which at first might be indicative of a higher level of control of girls by their fathers and mothers. In fact, this information is confirmed by the significant relation of boys (specially in the higher age stretch, between 16 and 18 years old) with the *absence of rules in the household about what can be done with the Internet*. These norms, when applied, refer much more to the kind of pages they can visit and the people they can get in touch with in the case of the youngest ones (between 12 and 15 years old) and of girls in general, and to the time of connection with regard to the boys.

Nevertheless, girls are also the ones who relate in a more significant way as against boys to the *distribution of pictures, videos or personal opinions* (in the same way as in the specific case of Messenger). In a context wherein boys are more intense, frequent and independent users, besides perceiving higher versatility in the usefulness of the Internet, these results suggest that girls are more proactive when it comes to exploring/exploiting the technical characteristics, tools and applications of the Internet. These data might be interpreted as an indication of the tendency towards gradual decrease and eventual disappearance of inequalities in the use of the Internet among boys and girls of these ages.

In any case, all these preliminary conclusions with regard to the relations of teenagers to digital technologies according to their genre and age must be necessarily contrasted with the corresponding data and analysis regarding the use and

perception of online social networks, mobile telephones and videogames, which are described in the following sections.

4. Online social networks and photologs

The contrast of data related to the use and perception of the Internet in general on the one hand, and of social networks specifically (and mobile telephones, see below) on the other, offers the possibility to elaborate a first general approach to the patterns of appropriation of digital technologies by the Spanish youth. This appropriation means the application of different services, tools and platforms related to obtaining and developing social, cultural and educational competences. In this respect, regarding the level and type of contribution of the youth to the construction of ways of *participatory culture* [2], and the previously mentioned data about the relatively low level of activity related to content creation and distribution, it is specially remarkable the fact that 31.6% of Spanish teenagers do not use online social networks, blogs or photologs. This information is particularly significant insofar as this kind of tools and services on the Internet are applications precisely built around relations of friendship and/or interest, and whose technical characteristics have a direct relation to the social and or cultural competences on which new models of participatory and collaborative culture are founded [3]. In this respect, the most commonly used social networks are Tuenti (68.5% of the social networks users) and Fotolog (18.4%), in both cases above Facebook (10.1%), which, at first, offers more technical versatility in relation to participation. On the other hand, the use of blogs among teenagers in Spain is insignificant (only 0.4% of the totality of Internet users within this population group).

In this context, the reasons to use these tools and services among young people reveal the importance of these tools and services with respect to their social life. Thus, the main uses (*a lot*) of social networks in general are to *talk to friends* (79.5% of the users) and to *look at what the contacts in their friends list do or say* (66.6%), which suggests a main pattern of appropriation regarding friendship relations. Besides, these data corroborate the fact that teenagers integrate the Internet into their daily life, at least at the beginning, as an online extension of their offline environment. In fact, the friends and schoolmates are by far the people more frequently included in the “contacts” lists of the social networks (94.6% and 65.3%, respectively). In this respect, it is important to mention that the online extension of the teenagers offline life through the Internet does not include family, mainly fathers and mothers: on the one hand, *to talk/communicate with relatives* is not one of the main uses of social networks (or Fotolog); on the other hand, *fathers and mothers* are a minority group in contacts lists at the same time as they are one the main groups they would not include in such lists.

Beyond the importance of social networks, relations of interest and participation (although not necessarily separated from friendship relations) are also fundamental: other main reasons why the Spanish youth uses social networks on the Internet are *to talk about what interests me/I like* (63.8%), *to give an opinion* (61.2%), *to send pictures, videos or texts*

made by oneself (59.8%), and *to send/receive pictures, videos or funny stuff found on the Internet* (59.5%). In the case of Fotolog (figure 9), participation, which is clearly linked to friendship relationships, is revealed as the most significant function: thus, the personal reasons to use Fotolog are, by order of importance, *to write or comment on Fotologs of friends* (67.7%), *to publish pictures, videos or texts made by oneself* (59.8%), *to communicate with friends* (53.8%), *to write about what interests me/I like* (51.4%). Regarding “contacts” lists, the pattern is similar to that of the social networks in general, so that *friends* (85.7%) and *schoolmates* (63.3%) are also the most present groups. All in all, these data strongly suggest that the appropriation by young people of these tools and services becomes a development vector of a *participatory culture*, mediated by technology, and supported by friendship relationships in the first place and interest relations in the second place.

The analysis of preliminary regression undertaken reveals some significant differences regarding the use of online social networks and photologs, specially regarding genre. Thus, it is important to stress that girls are particularly more active in the use of these tools and services as a means of interpersonal communication (with *friends, relatives, people they know but they do not see often*) of participation (*to comment on what others do, for the distribution of pictures, videos or texts made by themselves*) and for solving practical problems (*to solve doubts related to the studies*). These data coincide with the fact that girls relate in a more significant way as against boys to the *distribution of pictures, videos or personal opinions* in the general use of the Internet (and in the same way in the specific case of Messenger). Thus, in a context wherein boys are more intense, frequent and independent users, besides perceiving more versatility in the usefulness of the Internet, these results suggest that girls are more proactive when it comes to exploring/exploiting the technical characteristics, tools and applications on the Internet. These data become an additional indication, insofar as speaking about teenagers, of the tendency towards a gradual decrease and eventual disappearance of gender inequalities in the use of Internet.

5. Mobile telephones

The data regarding the use and perception of mobile telephones by teenagers are essential to elaborate a general picture about the relation of the youth with digital technologies. Specifically, they complement the results obtained in relation to the use of the Internet in general and online social networks in particular, specially regarding sociability, but also participation, although, as previously seen, in clear conjunction with their friendships relationships. Thus, with respect to the context of use, 93.2% of teenagers in Spain have their own mobile telephone, a percentage which rises to 98.0% among those between 16 and 18 years old. It is also noteworthy that the majority (53.0%) have had their mobile telephone for 4 years or more, including a 30.7% percentage of the younger ones (between 12 and 15 years old), which indicates that mothers and fathers are willing to facilitate this technology to their children at an early age. In this context, it is interesting

mentioning that 17.1% of the users in this population group mention the possibility of *their fathers and mothers controlling them* as one of the main functions of their mobile telephone, and that 77.9% think that to have their mobile telephone on facilitates their [parents] *controlling them*. On the other hand, and in relation to parental control of the use of the mobile telephone by teenagers, 58.3% of the users claim to have a limited monthly budget, which is 14.81€ on average, whereas only 11.7% claim to have other kind of restrictions, mainly related to the moment and place where they can use it.

With regard to the specific uses teenagers make related to interpersonal communication, 55.5% of them use the mobile telephone mainly to make calls, whereas, considering that almost two thirds of the users have a budget limitation, it is not surprising that, in principle, 45.5% use it mainly to send text messages (SMS).

Besides these uses, the *most important activities the mobile telephone allows to do*, are, according the young people by order of importance, to *take pictures* (64.7%) and to *listen to music* (60.3%). The functions of the mobile telephone with digital camera and sound equipment are complemented by a 26.7% percentage that also mentions the possibility to make videos as an essential activity, and 6.7% of them that also use it to listen to the radio. In this respect, it seems evident that for teenagers the mobile telephone is, among other aspects and as with the Internet, a leisure space (in fact, 59.8% of them claim to *have fun with their mobile telephone*).

Another significant activity for teenagers in relation to the mobile telephone and which is clearly related to sociability is the possibility to *know what friends are doing* (45.9%). In this respect, the perceptions of teenagers regarding the use of mobile telephones (figure 12) reveal characteristic ways of identity and privacy management. On the one hand, there is no doubt about the fact that, as with online social networks, the mobile telephone is a tool of immediate contribution and participation (84.0% of the teenage users claim that with the mobile telephone *they can take pictures of everything they want, whenever they want and wherever they want*; whereas 88.0% also note that it allows them to *exchange pictures or videos with friends*) in a community defined by a close social circle, which, in general, is already built (only 25.1% of them claim that the mobile telephone *is useful to make friends*). On the other hand, it is an essential tool to keep in touch and updated in the environment they live in (69.0% of them *does not go out with the mobile telephone*; 62.0% confirm that the mobile telephone allows them to *know what their friends are doing*, and 44.2% claim that it allows them to *find out about what is going on around them*). But, besides, they are perfectly aware that all these possibilities concern them as recipients too (77.9% of them claim that having their mobile telephone on *facilitates being controlled*, beyond specifying whether it is about their parents and mothers or friends), and show their rejection to the invasion of their privacy (66.1% are *annoyed by the fact that with the mobile telephone anyone can take pictures of them, anytime and anywhere*). All in all, all these data illustrate that the mobile telephone is an essential tool in relation to the

sociability of teenagers, and at the same time it is a field test with regard to the identity and privacy management typical of their age, specially regarding the participatory functions that the technical characteristics of these devices offer.

6. Videogames

The use of videogames by teenagers is often one of the key points of debate regarding the relation of the youth with media and technology. Aspects such as access to adequate contents regarding the age of the players, as well as the frequent and intense use that might generate addiction in teenagers, besides the consequent alienation of their social life, are habitual arguments being discussed at all levels (academic, administrative, public). In general terms, and according to the data obtained in this survey, only 42.4% of Spanish teenagers play videogames usually (figure 13). In this respect, significant differences have been observed in relation to gender and age (differences which have been corroborated by the preliminary regression analysis): thus, boys (62.3% of the total) play more than girls (21.0%); on the other hand, the youngest ones, between 12 and 15 years old (47.9%) are also more frequent players than those between 16 and 18 years old (35.9%). In this respect, the survey establishes the average age at which they start playing at 9,3 years.

Regarding the majority of those not playing videogames (57.6%), the main argument they put forward when asked why is by far their lack of interest (*I am not interested*, 79.2%; the next argument being the *lack of time*, mentioned by only 12.2%).

Regarding the hours and place of the game (figures 14 and 15), the results are similar to the ones obtained with respect to the use of the Internet: the most habitual hours are the afternoons (44.1%) and nights (between 8 and 12 in the evening; 15.9%), although the weekend becomes particularly important (26.2%); and the more habitual place is their bedroom (49.0%) before the living room (40.8%). In both cases, it is observed a migration of age habits, which means that the youngest ones tend to play more in the afternoons and weekends, as well in common spaces at their households, whereas the oldest ones play more by night and in the private environment of their bedrooms.

Similar results are drawn by the intensity of the game (figure 16): the average time devoted to videogames is 5.2 hours per week. Despite the percentage of players among the youngest ones is superior compared to the oldest ones, these are the ones who devote more time to playing (6.3 hours on average per week for those between 16 and 18 years old, as against 4.4 hours for those between 12 and 15 years old). In this respect, genre differences have been also observed (5.9 hours for the boys as against 2.8 hours for the girls).

The main ways to acquire videogames are shopping (36.8% of players *buy* videogames and 12.8% *are bought* videogames) and Internet downloads (24.6% *download them*, mainly to have more, because it is an easy method, or to get something that others do not have or has not been released in Spain). On the other hand, a wide majority of players (72.6%) decide personally the kind of games they

acquire, whereas the fathers and mothers only intervene in this decision in 5.7% of the cases. In this context, and as with the Internet, it is not surprising that also a majority (51.3% of teenagers who play) claim *they do not have rules at home regarding the use of videogames*, besides of *knowing what they can and cannot do with them*. When rules apply, they refer mostly to time (investment, days of the week they can play) and only 14.4% mention restrictions regarding the *kind of games they can play*.

On the other hand, *friends and or schoolmates*, that is to say, again the closest social circle beyond immediate family, are the ones they mostly talk about videogames with (in 85.5% and 77.9% of the cases, respectively) whereas *fathers and mothers* are much less habitual interlocutors (in 36.2% of the cases). In this respect, it is also worth mentioning that the preliminary regression analysis confirms that girls in general, but mostly those between 12 and 15 years, keep a significantly closer relationship to their fathers and mothers when it comes to playing or talking about videogames. This information corroborates a higher parental control on girls and youngest kids, which was previously mentioned with respect to the Internet and to mobile telephones, regarding the use of digital technologies.

Regarding the social habits associated with the use of videogames, we start from the premise that 66.3% of Spanish teenagers *play usually on their own*. For their part, the minority that play fundamentally with other people are particularly prone to mention *friends* (52.2%) and *brothers and sisters* (43.3%). However, *fathers and mothers* barely appear as play mates (7.8%). Finally, taking into account that 66.3% of the players *use the Internet to play*, and regarding the risk of unwanted contact through the Internet, it is also noteworthy that the *people one has met online but not in person* are mentioned as play mates in 27.1% of the cases (which represents 11.5% of the total of Spanish teenagers), which decreases to 23.6% among players that specifically use the Internet to play (6.6% of the total).

Within this general context of teenage practices related to the use of videogames, their perceptions on that matter reveal patterns of adoption that oscillate between two extremes: on the one hand, the assimilation of preventive discourses that are public knowledge. Thus, a high percentage of players claim that *videogames can create addiction* (84.9%) or that *the majority of videogames are violent* (59.5%). On the other hand, the appropriation of these technologies, together with other technologies and available media (such as television) according, as expected, to the needs and interests of their daily lives. In this respect, a majority acknowledges, on the one hand, that *they prefer to go out with friends than to play videogames* (89.2%) which is indicative that videogames are not used or do not necessarily become substitutes for the daily social life of teenagers; on the other hand, they *prefer to play videogames than to watch television* (49.9%), an information that illustrates a strong competition between the different media and technologies available in the households. These patterns of appropriation also involve a certain degree of transgression, which is otherwise perfectly attributable to the interests concerning their age and the generational negotiation, specially in the households. Thus, taking into

account that the absence of rules regarding the use of videogames is habitual, and that a majority of players claim to know very well, as previously mentioned, what can and cannot be done with them, a significant amount of them also recognises that they *play videogames not recommended for their age* (72.1%).

On the other hand, a significant amount of players attribute openly positive characteristics to videogames related to sociability, personal well-being and, notably, learning. On the one hand, 31.6% of players claim that *after playing they feel more relaxed*; and on the other hand, 45.3% claim that *things can be learnt with videogames*. The attribution of learning functions is much superior in this case to what was detected on the Internet, the online social networks and mobile telephones, and probably has a directed relation with interactivity and the level of involvement that is demanded to the player concerning videogames. In this respect, it also should not be overlooked that, as with the rest of technologies analysed, teachers, as well as fathers and mothers (that is to say, adults in general), become interlocutors to talk about videogames or play mates in very few cases. Thus, all in all, these data reassert the priority that, through the use of digital technologies among other aspects, teenagers attribute to more intertwined and horizontal types of sociability and learning, compared to traditional educational schemes. Lastly, it is worth pointing out that the regression analysis reveals that boys, that is to say, those who play the most, and mostly older and therefore more experienced ones, significantly attribute to videogames the abilities to make [them make] friends, relax and learn. This information establishes a relation between the intensity of use and the experience of a wider, more versatile and personalized attribution of functions, abilities and possibilities related to digital technologies.

7. Conclusion

The generalized access to these technologies from a very early age has prompted a debate at very different levels (academic, administrative, public) about the use and the ways of appropriation of these technologies by young people. There is no doubt about that the life of teenagers is developing in contexts characterized by the growing presence of media and technology, wherein digital technologies play a fundamental role in relation to multiple aspects of their daily lives, such as sociability, consumption or learning. In this respect, the current youth is often referred to as the "digital generation", although this denomination tends to involve a double meaning according to the terms of the public knowledge socio-cultural debate: on the one hand, they are the vanguard that represents a better future supported by the experienced use of these technologies; on the other hand, due to their age, and therefore lack of experience, they are vulnerable to the risks attributed to these technologies, mainly in relation to the access to unwanted contents or contacts [4].

Considering these premises and the growing need to better know the dynamics of appropriation of digital technologies by the teenage population, this survey reveals some essential

aspects. In the first place, the study corroborates that the main way of introduction to the use of digital technologies is the family-domestic environment, so that learning is made in informal contexts (mainly self-taught or with the help of relatives). From this situation, teenagers use the technologies and media available according to their needs and daily interests, that is to say, mainly related to sociability, consumption and learning, but within a generational debate with fathers and mothers which develops in a perfectly logical and natural way according to age, and which, precisely, often revolves around the characteristics (frequency, intensity, use) of use of available technologies and media [5].

This debate is very much related to value judgements that counter the practical need for teenagers to learn to use these technologies, according to traditional professional and educational schemes, and the patterns of appropriation of these technologies by the fathers and mothers, to the “waste of time” represented by the idle consumption of media, which is an extension of the perception of fathers and mothers about the way teenagers (and themselves) use of television. There is no doubt, as the study reveals, that teenagers appropriate these technologies fundamentally as leisure spaces. Nevertheless, in this respect, the survey also reveals that it is very common that fathers and mothers do not impose any kind of restrictions whatsoever to their children regarding the use of technologies, with the precise exception of time [6], that is to say, to the hours teenagers devote to the Internet, the online social networks and videogames, and even to the mobile telephones, which translates into budget limits.

In the second place, the survey illustrates the characteristics of appropriation of these technologies around the needs and interests of teenagers. Thus, their use of the Internet, the social networks, mobile telephones and videogames revolves around their daily and closest social circles outside their families (their friends and schoolmates), which means that their high level of integration of these technologies into their daily life translates essentially into an online extension of their offline life. This is how the technical characteristics of these technologies turn them into essential tools in relation to the sociability of technologies, and at the same time become a test field regarding the identity and privacy management (within and beyond the family environment) typical of their age. In this respect, and considering the above mentioned absence of restrictions, teenagers show a certain level of assumption of the previous parental preventive discourses regarding the risks they are taking, as well as a high level of certainty regarding what they can and cannot do with technologies. In this respect, the study makes it clear that the contacts made strictly online are reduced to minimal percentages.

And lastly, in the third place, the study corroborates that the appropriation of technologies by the youth constitutes a development vector of a *participatory culture* mediated by technology, and, as mentioned before, firstly supported by friendship relationships as an extension of their life offline, as well as interest relations [7]. The results obtained show that teenagers articulate their activities with digital

technologies around a participation and contribution dynamics which is egalitarian in the community. At its turn, this circumstance brings about a generation of characteristic forms of obtaining and managing social, cultural and educational competences, that is to say, those related to the way they communicate, consume, study, collaborate and solve problems. Without forgetting the fact that teenagers mainly relate these technologies to leisure and not to learning, actually the study reveals that, through the use of these technologies, young people generate support, sociability and recognition spaces which are also collaborative learning spaces, undoubtedly informal and supported by their close social circle, wherein there are ample opportunities to develop very diverse abilities at a social, cultural, professional or technical level. As previously mentioned, this is how young people acquire an important *network capital* [8]. To share their experiences, worries and opinions through alternative leisure and participation spaces constitutes an important vector of learning, no matter how the people concerned do not perceive it as such. In any case, this perception probably stems from the informal nature of this learning, which is openly collaborative (horizontal and egalitarian, as opposed to a traditional transmission flow of vertical information, from expert adults to profane minors), and which is mainly supported by social relationships beyond their family, that is to say, those that are less focused in the practical function of the use of digital technologies.

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A project-based approach for a Multimedia Engineering Degree

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ABSTRACT

The authors wish to present a “work-in-progress” approximation to the training, teaching and learning frameworks within the Education (Teacher Education, Cybernetics of Education, Learning to Learn, On-Line Training, and Higher Education) in a Multimedia Engineering Degree.

We are immersed in the second year of this official degree, which is adapted to the European Bologna plan, and we’ve been through a polishing phase regarding some of its specific subjects. Those have been adapted while applying new methodologies.

We are introducing a project-based approach where the student has to solve a real problem with real environmental parameters. And there are other cases that we’d like to mention: applying Game and Simulation theory to our *Virtual Reality* classes, developing a fully online version of the *Design and Usability* course (part I) and creating a support tool for our *Multimedia Productions* course (part II) in order to give the students extra materials and content, among other approaches.

Keywords: Multimedia Engineering, Project-Based Approach, Game Theory, Simulation, On-line Learning.

1. INTRODUCTION

The needs of a society deeply based on the IT as well as the new demands that emerge from the expansion of the virtualization require new products and interactive services and, therefore, a new professional profile.

Several reports (as the Reflex study [1]) point out that there is a certain disconnection between the real thing and what is really necessary (for a company) and finally implemented (as output profile in our universities). For this reason, it is needed an analysis of the sector, of the needs of this one, of the fields of application and regarding the skills that the people to be contracted within it should have once finished their studies (in our case, we will refer to the Multimedia Engineering Degree). An important European report, the Career Space document [2] offered some key points in this matter arguing in a clear way the need that, “...of the professional of “The Multimedia field”, we would have during the next years.

Multimedia is a transversal and strategic field that agglutinates all kinds of disciplines while being fully applicable to all kinds of final sectors. Real innovation emerges from the mixing of knowledge and different perspectives, thanks to the new contents and effective solutions. For that, it is necessary to understand the functioning of the new organizational environments and learning to elaborate and apply methodologies that integrate Creation, Design and Engineering in any process.

The authors wish to present a “work-in-progress” approximation of the new methodologies that are going to be introduced in the first Official Degree in Multimedia Engineering of Spain, which is in the second year of implantation.

2. WHAT IS MULTIMEDIA?

The term “Multimedia” generates some confusion because of being used in all kinds of contexts and situations. This is the reason why we decided to outline

several examples next, innovative and concrete, regarding this type of knowledge. Among other final solutions:

- Recovering History and Cultural Heritage (Scripting, 3D Graphics, Animation & Modeling, User Experience and User-Designed Design). For instance by virtually reconstructing old historical sites and buildings, even if not existing nowadays, and allowing the user to visit and interact with their virtual assets.
- Multimedia in Medicine (Image Processing and Virtual Reality) when developing a complete and complex surgery simulator that might reconstruct any patient's organ from a set of medical imagery. The final 3D model might be fully touchable, in real-time, in order to increase the chances of a better diagnosis, from an expert, or the training of potential physicians.
- Helping to develop Cultural Networks (Design, User-Centered Design and Technology) by using a system of MP3 audio guides adapted to any mobile terminal. When the user gets close to an interesting place, she can download the guide from a set of Bluetooth kiosks distributed all over the city and ready to adapt the content.
- Marketing campaigns (Technologies for the Virtuality, Usability Engineering and Computer Vision) where an interactive installation offers relevant information and a set of experiences to the users visiting. Some "Serious Games" can provide with a natural interaction layer that allows everybody, any gender and age, to participate and enjoy the experience.
- Sports (Computer-generated Graphics, Animation & Modeling, Virtual Reality peripherals and Artificial Intelligence) simulations, where we have a squash simulator for the disabled. Several motion sensors track the users while filtering their movements to deliver the best affordable experience, in terms of being memorable.

All of these productions need a set of specific skills from our graduated students. These were defined by the Consortium for Multimedia Studies [3], integrated by 5 universities in Spain:

1. Creating the concepts and the scripts for interactive products.
2. Designing and developing interactive products.
3. Applying Accessibility and Usability principles through all the design phases.
4. Integrating digital content within a Multimedia application.
5. Creating and editing 2D and 3D content (for interactive applications).
6. Recording and editing audiovisual streams.
7. Directing the execution of a Multimedia project.

8. Managing the execution of a Multimedia project.
9. Knowing about the market and the implied synergies, regarding technologies, products and Multimedia projects.
10. Starting and implementing servers of content, interactive systems and Multimedia devices.

3. A UNIQUE MULTIMEDIA ENGINEERING DEGREE

La Salle – URL has been offering Multimedia formation at a university level since 1996. Those were the first studies of its kind in Spain. After several iterations during all those years, both the undergraduate and the master program have been fully adapted to the new European Framework Scheme. There are several implications to be followed. Note the *European Credit Transfer System* or ECTS Label [4]. The new system allows for a better and fair evaluation of the volume of work.

All our courses were adapted to the new framework and are being monitorized while still corrected. The new ECTS system delivers a better reference for both the professor and the student. One ECTS stands for 25-30 hours of personal work (onto the student side) taking everything into consideration: from lectures to the lab, the assignments, the research or the personal study. Everything is included.

It is not easy to find the correct dimension for a given subject. It was mandatory to start by asking the students regarding their personal perceptions and the amount of hours devoted to the different tasks in order to obtain a better estimation and performing the needed corrections.

ILLUSTRATION I
MULTIMEDIA ENGINEERING DEGREE

1st		2nd		3rd		4th	
semester 1	semester 2	semester 1	semester 2	semester 1	semester 2	semester 1	semester 2
Business and engineering (6) FB	Value chain and financial economics (6) FB	Project management (3)		Organizational management (3)		Entrepreneurship and innovation (3)	Corporate social responsibility (3)
Algebra (6) FB	Statistics and mathematical analysis (6) FB	Local Area Networks (6)		Audio and speech processing (4)		External training (4)	
Calculus (10) FB	Signals and transmission systems (6)	Digital Signal Processing (4)	Digital Image Processing (4)	Interactive resources (2)		Final Thesis (16)	
	3D Modeling_Animation I(5)	Audiovisual Dramaturgy (3)	Digital photography (5)	3D Modeling_Animation II (4)			
Programming Methodology and Technology (10) FB	Audiovisual Language (5)	Digital television I (4)	Audiovisual history (2)	Multimedia production II (6)		Musical edition (4)	
	Computer Graphics I (5)	Hypermedia programming (5)	Physics Simulation (4)	Virtual reality (6)			
Basic electronics (12) FB	Design and usability II (5)	Object Oriented Programming and design (6)	Computer Graphics II (5)	Web projects (5)		Computer games (6)	
Design and usability I (5)	Database systems (5)	Multimedia production I (4)		Optional Subject (4)		Optional Subject (4)	
Introduction to computers (9)	Optional Subject (4)	Optional Subject (4)		Optional Subject (4)		Technological tendencies (4)	

All the syllabus have been revised and included within the new thematic lines that we follow through this degree: Multimedia Productions, Hypermedia and the Internet, Scripting and User Experience, Virtual Worlds and Videogames, Processing Signals and Systems, Programming the low and the high level, among others.

5. PM SHOWCASE TOOL

4. GAME AND SIMULATION THEORY

We offer a VR (Virtual Reality) course during our third year. It consists of 6 ECTS that is an approximated dedication of 168 hours from the student side (if we take 28 hours of work per ECTS credit).

In there we define what the disciplines are, that integrate it, its applications and uses plus its need as a clear strategic field. Virtual Reality is a fully interdisciplinary field that requires a lot of different skills. Just to mention some: Imagination, Creativity, Aesthetical criteria, Drawing abilities, Capability of analysis, Good Communication skills, Compromise, Technical aspects and even Psychology, among others.

Virtual environments and synthetic experiences “...show physical and abstract principles to the user” thanks to the use of an effective human perception system.

How to deliver such a great amount of skills? How to practice those and moreover that, how to combine them in such a way that, correctly digested, satisfies the final user by providing the correct degree of immersion for the final experience? Videogames might be the answer. Those are quite complex productions, pure “Multimedia” artifacts where several disciplines are conjugated in a unique manner. Videogames imply virtual worlds and characters and are governed by rule sets and Game Design principles [5] that we might start using within the classes. In fact there’s a new current outlining what “Serious Games” [6] can do for our society, delivering different solutions to all kinds of well-known problems.

The VR course students learn about technology but also about other disciplines, aligned in orthogonal axes, such as Concept Creation, Aesthetics and Design or Storytelling, in order to face several challenges. Those challenges include the simulation of a set of real principles (plus their communication to the end-used while guaranteeing that the experience trains in a satisfactory way), the integration of several technologies (software and hardware, the latter regarding VR peripherals like Cybergloves, Head Mounted Displays, 3D Mouses. Console pads, sensors and so on) and the ability to create a Virtual World with a clear restriction: everything used should guarantee a low-cost approach.

Important concepts like “having fun while learning”, “learning by doing” or “practicing more than lecturing” are keywords within the VR course.

PM Showcase [7] (PM stands for “Produccions Multimedia”, that is Multimedia Productions) is an application that we have specifically developed for being a support tool for the *Multimedia Productions* course (part II) [8]. In this course the student has to develop a multimedia project including different technologies learned both in the course and in previous ones.

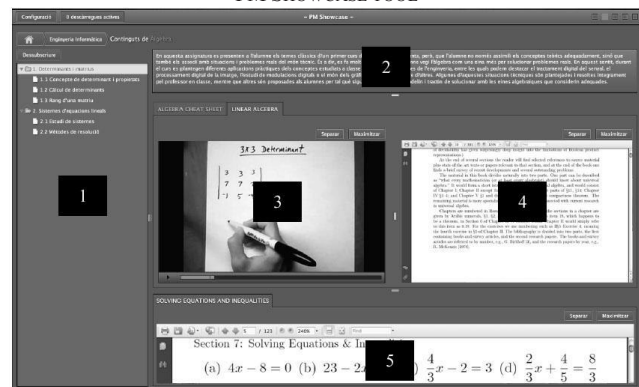
The main characteristic of the *Multimedia Productions* course is the amount of material provided to the student. Some of this material is composed by examples using technologies that the students already know. There are also examples with the technologies learned within the course plus some examples containing technologies unknown for them.

This characteristic has led us to the need of a system that would provide the students with different examples in an orderly manner. Those include either documentation or explanations of several case studies when appropriate.

In this context, the PM Showcase has been designed and implemented as a client – server system that fulfills the need for a content delivery tool to support educational tasks. It is mainly developed for the *Multimedia Productions* course (fourth year, first semester) but it is applicable to other courses with similar needs.

Moreover, the visual design of the tool has been taken into account in order to provide the students with an application that is an example itself. In fact it can be treated as a multimedia project developed with some of the technologies learned in the course.

ILLUSTRATION II
PM SHOWCASE TOOL



As shown in Illustration I, the interface of PM Showcase tool is divided into five main areas. Both the first and the second ones are static areas where the user will always find the menu of the application and a short description of

the course. On the other hand, in the third, fourth and fifth areas the student will find the resources of every lesson in the course including documents and audiovisual materials.

The application is now developed but not yet tested in a real environment. In the next academic year we are going to put the tool in operation with real material and for real students and we will evaluate the use that is made of the tool from the perspectives of the students but also of the teachers.

6. PROJECT-BASED METHODOLOGY

Roger Schank [9] is one of the world's leading visionaries in artificial intelligence, learning theory, cognitive science, and the building of virtual learning environments. His *learning by doing* theory reveals the importance of having real experiences for learning. And the Project – Based methodology permits the student working in a project with a simulated environment taken from reality.

In some courses of the Multimedia Engineering degree [8], we are introducing new educational methodologies in order to improve the quality of the students learning. This is the case of *Design and Usability* (part II but also part I) and *Hypermedia Programming* courses.

In the first semester of the *Design and Usability* (part II) course, the students have to develop an online game using flash [10] and taking into account the visual design and the usability of the interface. The evaluation of this semester is based almost entirely on this project but also with some exercises done during the semester; there are no exams.

At the beginning of the semester, the students have some knowledge of visual design and usability already (because they have previously studied the *Design and Usability* (part I) course), but they might not have any kind of knowledge regarding these tools (specifically speaking, *action script* programming for instance). At the same time, it is important to note that the students are told what they are expected to deliver at the end of the semester.

The students work in pairs and they have to go through all the different phases of the project: come up with an idea for the game they want to develop, design the interface and all the icons and elements, implement the game write down the documentation, and finally present it in front of the class.

In order for them to develop this project, the students attend some theoretical and practical classes to learn the

basics of *flash* and *action script* programming plus expanding their knowledge on visual design and usability.

Although we are now at the end of the semester, we are still processing their final results. We think that it has been a positive experience because of the clear motivation of the students which has been maintained in a high level during the entire semester.

We believe that this has been a memorable learning experience for the students, widely improved as stated. They have come up with an excellent project realization, far away from the initial objectives.

On the other hand, and regarding the *Hypermedia Programming* Course [8], we are going to introduce a project-based methodology in the practical classes in order to strengthen the learning from the theoretical classes.

The exams and the theoretical classes will be maintained as in previous academic years but we are going to change the dynamic of the practical classes.

The first change we introduce is the increment of practical classes having now more hours per week. This way we believe that students will have more time to practice at class but also to work in teams at the same time they have a teacher to ask questions. In the previous years, the student attended more theoretical classes than practical ones and the results in the final exams showed that most of the students did not have enough fluency solving the exercises.

The other change that we are going to put in practice this year is related to the project that the students are asked to realize during the semester. In the previous years, the students were asked to work in pairs to solve a programming problem; they had to develop a game with some specific requirements, and in most cases they did not work as a team and, if so, as a result they only learned how to solve a concrete problem. This year we are going to ask the students to work in groups of four and we won't give them specific requirements in order for them to come up with an idea, conduct it and finally present it, working altogether as a team.

We believe that in this way, the students will learn how to work in teams and will have to go through all the phases of the project learning the problems of each phase. But also, they will be developing a project in a realistic environment.

7. ON-LINE LEARNING

Combined with the project-based methodology exposed on the previous section, we are interested in introducing an on-line learning methodology in some courses. This is the case of the *Design and Usability* (part I) and *Hypermedia Programming* courses [8].

In both cases we need an on-line methodology for learning practical concepts and just a few theoretical ones. That is because in the *Design and Usability* (part I) course there are little theoretical contents and the evaluation lies on projects (project – based methodology).

And within the *Hypermedia Programming* course we want to start introducing the on-line learning methodology, although it will only be implemented in practical classes, which will also follow the project – based methodology.

We are working with the idea of doing some video tutorials in order to teach technological tools. This way, we are going to ask the students to work in a project (if it is possible in teams) from the beginning to the end, giving them the necessary resources including those video tutorials but also documentation, links and other types of extra materials.

Apart from the resources available, the students should be able to contact the other students and teachers easily. In order to facilitate this, some intranet forums will be available for asynchronous meetings. We are also thinking about the possibility of including some video conferencing classes for the sake of synchronous meetings.

In addition to this, the authors want to mention that the on-line learning methodology will soon be a reality in all the courses of the degree and not only in some of them. We are working to launch the first year of the On-line Multimedia Engineering Degree next September.

8. CONCLUSIONS

The authors have presented the “work-in-progress” which is being carried out in some courses from the Multimedia Engineering Degree. New methodologies as the project – based approach or the on-line learning are being launched in this degree in order to improve the students learning.

Because we are now in the middle of the academic year, we do not yet have final results about the introduction of the project – based methodology; but the high levels of motivation seen on the students let us think that it will be

a positive experience.

Finally, an educational support application has been presented. PM Showcase responds to the need for a content delivery tool to support educational tasks.

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THE MEDIA PROGRAM 2007-2013 AND ITS IMPACT ON THE DEVELOPMENT OF NEW TECHNOLOGIES: THE CALLS FOR PROPOSALS ON PILOT PROJECTS

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ABSTRACT

The fourth edition of the Media Program (MEDIA 2007-2013), with a budget of 755 million euros, supports the same areas as its previous editions such as Distribution, Production, Training, Promotion, Festivals and Exhibition, and incorporates one new area: New Technologies.

What interests us especially for the analysis in the context of this communication is that it focuses attention, and shows a special interest in supporting the use and development of new technologies in the audiovisual industry: supporting pilot projects; video on demand; and digital cinema distribution.

This new focus of attention is given to the consequences of the so-called digital revolution and the expansion of the European audiovisual market, which forces us to reconsider the structure and priorities of the New Media Program. Through this communication we analyze the projects subject to funding under the EACEA/08/2008 Call for proposals on Pilot Projects to show which are the main focuses of the efforts of technological investment in the audiovisual field for the European Union.

Keywords: Media Program / Digital distribution / VOD / Europe / New Technologies / EACEA

1. INTRODUCTION

The MEDIA program was born in 1991 as a Support Program for the European audiovisual industry. Among its main objectives we can list:

- The training of audiovisual professionals
- Promoting the production of European Projects, including feature films, television dramas, documentaries, animation and new media projects
- The promotion of the distribution of European films and programs
- The promotion of European films and programs
- Support for film festivals

The successive approved editions of the Media program have seen the inclusion of new targets answering new market needs. This is the case that will center our attention in the context of this communication, because through the latest edition of the Media Program 2007 - 2013, a new area of action has been created focusing on new technologies. This new area focuses on two key points: Pilot Projects and Video on Demand and Digital Cinema Distribution.

It must be said that the main factors that drove to think about the need for the MEDIA Program and ultimately led to its creation in the early 90s (as indicated by the European Commission itself) were, among others, the growth of competition in the television market, which led to an increased demand for programs, and was seen as an opportunity to establish a European audiovisual industry; increased competition in the most economic non-European programs; the drop in movie ticket sales that had been taking place in most member states of the European Union, mainly due to the rise of television and new options for consuming films at home via video, and later DVD.

These structural changes have had a greater effect on Europe's own productions than on the productions coming from outside Europe, mainly the U.S., which kept dominating the sector.

All these factors caused a significant and sustained loss of market share for European films and consequently met with worse conditions for production.

In this sense, the MEDIA program was born with the intention of providing good measures which might contribute to the reversal of this situation and to increase the competitiveness and the circulation of European audiovisual production in both film and television production. The focus on the promotion and development of new technologies in the audiovisual shares these very same goals.

2. THE MEDIA PROGRAM MEASURES IN THE FIELD OF NEW TECHNOLOGIES: THE PILOT PROJECTS

The main goal of the Media 2007 Program in the axis of Pilot Projects is to keep ensuring, the latest developments in the field of communication technologies and information are introduced to the market and used by the different actors that shape the European audiovisual market, through different calls.

Among the activities promoted we find:

- In the area of distribution, providing support for projects that intend to distribute and promote European content through nonlinear services.
- In order to improve the conservation of European audiovisual heritage, supporting the creation of linked databases that help to increase and consolidate access and exploitation of European catalogs.
- Finally, establishing continuity with respect to pilot projects approved by prior calls with the commitment to continue supporting projects which started earlier in the

MEDIA Plus Pilot Project Call for Proposals framework.

We can see how the essence of European audiovisual policy, and consequently the MEDIA Program, is still present in the axis of the Pilot Projects. Its calls include pursuing new technologies by reinforcing the European cultural and linguistic diversity, encouraging new ways to preserve the European audiovisual heritage and facilitating their public access; increasing the circulation and viewership of works both inside and outside the European Union and increasing the competitiveness of the European audiovisual sector in the framework of an open market. We can see, again the connection between the cultural and economic axis.

If we observe the criteria for participation in the latest edition of the Pilot Projects (EACEA/08/2008), we see, among the fundamental criteria that presented projects must have a European dimension, that the origin of the content must be European, and that they must contemplate at least 3 different languages of the member states of the European Union.

In relation to the maximum amount you can apply for co-financing the submitted projects, it is 50% of the total cost allocated for the presented project .

In relation to the total budget of the call, we are talking about 2 million euros.

Pilot Projects that have received support from the MEDIA Program

In the past four years a total of 15 pilot projects have received support, three of them in 2008, already under MEDIA 2007. The remaining twelve were part of the Media Plus Program (2001-2006) edition, a period where the need to promote the use of new technologies to ensure the competitiveness and internationalization of the European audiovisual had already been recognised.

The current edition will be the one that sees the creation of a line of specific aid for CDC and VOD, that will, to a certain point, coexist with the pilot projects, which until now had included these two ambits. From now on, pilot projects are more of a complement for the specific line. We will see how some of the pilot projects focus on pure technological issues and propose solutions to issues such as improvements in DRM.

- SF Anytime (2002-2003-2004)
- ORPHEUS (2002)
- NODAL (2002-2003)
- BIRTH (2002-2003-2004)
- Eurobox (2003)
- Digital Festival (2003)
- CinemaNet Europe (ex European DocuZone) (2003-2004-2005)
- Zooloo Kids (2004)
- MyChannel (2004)
- Reelport (2004-2005)
- MIDAS (2005)
- CN FILMS (2006-2007-2008)
- Pro2film (2008)
- Onlinefilm AG (2006-2007-2008)

- GLITNER (2007)

The basic description of each and every one of these projects is found in the Pilot Projects area of the MEDIA Program website.

1 SF Anytime (2002-2003-2004)

[<http://www.sf-anytime.com>] [Accessed: 25/02/2009]

This site has restricted area access because of copyright issues, and it can only be accessed from Sweden. So we have no access for in-depth analysis.

The objective of this project was to create an on demand service aimed at commercial distribution of digital entertainment films, television programs, and other forms of audiovisual entertainment content.

The final window through which we could see this content should be a TV set-top box, although during the first stage (we refer to the information available at the already mentioned MEDIA website), dissemination through PCs or TV connected PCs was foreseen.

Through this on-demand business, they hoped to create a new market with local (Nordic countries) and European audiovisual quality content and not only those products deemed most interesting from a commercial point of view.

They also expected to be able to allocate lower budgets for the distribution (lowering costs), and also to have a lower initial budget allocated to the dissemination and marketing of the diverse titles in their catalog .

We can see how, through the acceptance of this project, the MEDIA program encourages its basic principles :

- Cultural Diversity: We are talking about the promotion of the dissemination of works from a specific territory and of European quality works (not focusing on those titles with the largest expected circulation)
- It promotes the use of new technologies on the market: on demand video.

2 ORPHEUS (2002)

This project also follows the essential criteria that the fourth edition of the MEDIA Program intends to promote :

- Promoting the use of new technologies, this time for distribution and screening in cinemas.
- Promoting the dissemination and circulation of European works: in this case we speak of catalogs of European works that are already part of our heritage.

ORPHEUS encompasses a broad network of cinemas across Europe (Berlin, Rome, Vienna, Paris, Barcelona, Manchester) with digital cinemas. It must be said that the network is open to its extension to other areas and cinemas showing interest in joining the project.

The common goal for theaters in the Orpheus project is the promotion of audiovisual cultural products through its network of cinemas all over Europe. We speak of six pieces of digitized

audiovisual content, chosen from restored classic films, among other sources.

Once these contents have been selected, all of them part of the European audiovisual heritage, they have to be sent via satellite and projected at the cinemas in the network.

Thus, as manifested in the Orpheus project description, they intend to demonstrate how new technologies can help preserve audiovisual European culture.

3 NODAL (2002-2003)

[<http://www.filmlibrary.tv/>] [Accesed: 25/02/2009]

The objective of this project was to establish the first pan-European portal for audiovisual archives in Europe, in a shared e-commerce platform.

Through a multilingual search engine, they offer potential users to see first, and then buy if they are interested, audiovisual material that may be required for their productions.

It is also proposed that the platform works as an open system, allowing users to upload their own content, once the first phase of the project has been finalized.

In relation to the project currently running online (<http://www.filmlibrary.tv/>), it is an e-commerce platform for audiovisual content, particularly news content, provided by various international content owners (Archivio audiovisivo del movimento operaio e democratico; Archivio nazionale cinematografico della resistenza; Belgavox; CCM; ERT, Hellenic Broadcasting Corporation; ERTT; Filmske Novosti; ORF; RTBF; RTL-TV; RTP, Archives of the Portugal TV; Saint Thomas productions; VRMPP; Harmony Internet Broadcasting).

Among the offered content, according to the already mentioned content providers, we find:

- Interviews with historical characters
- Historical news on politics, economy, culture, sport, [...] in different languages about different countries
- Radio programs and television from different themes and genres (entertainment, documentary, sports, [...])
- The audiovisual archives of Serbia and Montenegro (Filmske Novosti)
- Images of Austria and Belgium in relation to several subjects: nature, history, culture and architecture, travel, European cities, [...]

Taking this into account, the archival footage of this initiative could be used by, or be of interest of, producers, documentarians, researchers, directors of documentaries, journalists and owners of audiovisual content having an interest in selling their content online.

4 BIRTH (2002-2003-2004)

[<http://www.birth-of-tv.org/birth/>] [Accesed: 25/02/2009]

The Birth Project Television Archive (BTA) is a digital archive available through the Internet with audio-visual, photographic and textual content, on the first decades of the origins of television in Europe.

It has been created from the archives of some major European television channels such as the British Broadcasting Corporation (BBC), Österreichischer Rundfunk (ORF), Nederlandse Instituut voor Beeld and Geluid, Radio Télévision Belgique Française (RTBF) and Südwestrundfunk (SWR), with the support of the project's technical partners: Joanneum Research and Noterik Multimedia.

It currently has more than 630 items of television programs, nearly 370 pictures, 110 TV guides and schedules, as well as nearly 80 articles.

The support of the MEDIA program was initially asked both for the search of material and to digitize it and ensure its sustainable preservation, and their subsequent deployment on the chosen platform.

We must also say that the project is designed as a business model based on audiovisual archival content to make the project sustainable.

5 Eurobox (2003)

[www.musicbrigade.com] [Accesed: 25/02/2009]

Aiming to be the market leader in digital distribution of music videos worldwide, it focuses on on-demand supply, via the Internet, of a wide selection of music videos from the most prominent local artists from the different member states of the European Union.

They present the project as an alternative to broadcast television via pre-programmed music videos and they intend to remove region restrictions and achieve diffusion and offer local artists, the opportunity to be visible across a new window, not subject to the standard programming.

Having seen this initial description, it must be said, however, that at present the website at www.musicbrigade.com offers a service from which, after free registration, users can upload their own music catalog, access it from any computer connected to the Internet and listen to music that has been previously uploaded.

As future options, they are offering the capability of listening to the previously uploaded music via mobile phone. They are also hoping to offer a free catalog of songs and music videos, allowing interaction with other users to share music, an advanced search engine of music and offering new software for online listening.

It will be important to see how they combine these objectives with respect to their interpreters database copyrights and catalogs created by their users.

6 Digital Festival (2003)

This project aimed to stimulate the production of digital films through film festivals and markets, and encourage their subsequent distribution and exhibition through digital systems. We have not found an online reference.

7 CinemaNet Europe (ex European DocuZone) (2003-2004-2005)

[<http://www.cinemaneteurope.com/>] [Accesed: 25/02/2009]

Known initially as the "European DocuZone" (<http://www.docuzone.at/>) [accessed: 25/02/2009] (EDZ), this was the first digital distribution and exhibition network of European films, specializing in documentaries, shorts, animation and small arthouse films, which included 8 European countries.

In the case of Cinemanet, cinemas in 5 European countries are part of the network: Austria, Germany, Netherlands, Spain and United Kingdom. The involved Spanish are:

- Auditori Fundació Caixa Manresa (Manresa)
- Aula Magna de Teixits (Canet)
- El gat del Rosal (Tàrraga)
- Filmoteca de Catalunya (Barcelona)
- Joventut Catòlica (Molins de Rei)
- L'Ateneu (Sant Just Desvern)
- L'Ateneu Bar (Banyoles)
- Teatre Cal Ninyo (Sant Boi de Llobregat)
- Teatre Comarcal De Solsona
- Teatre Principal (Vilanova i la Geltrú)
- Verdi Park (Cinemes Verdi Barcelona)

It is noteworthy that the list is restricted to theaters in the Catalonia area, and in all cases, except Verdi Cinemas, they are theaters or athenaeums intended for cultural activities, such as cinema.

The commitment of the project is to take to independent cinema screens documentaries in digital format. In order to do, in the first place theaters must be adapted to digital technology and, secondly, films to be screened must be sent to them through hard drives or DSL lines.

Through this initiative the dissemination of documentary films and other limited distribution films is expected to increase. If these films were to be circulated through celluloid, this distribution would entail prohibitive costs hindering their circulation and therefore making it more difficult for them to reach their audience.

On the Cinemanet web we can find a list of the films spread so far [<http://cinemanet.vbvb.nl/apache2-default/films.html>] [Accessed: 27/02/2009].

Currently the network consists of almost 180 cinemas, and a number of producers, distributors and exhibitors of 'independent film', believing the opportunities offered by new technologies will improve their chances of getting this type of film in front of a greater audience, are also involved in the project.

8 Zooloo Kids (2004)

[<http://www.zoolookids.com>] [Accessed: 25/02/2009]

The objective of this project is to associate producers under the European entertainment company Zooloo Kids with the goal of creating a catalog of animated films available via video on demand service to exploit it through broadband services from different member states of the European Union.

Their VOD service is expected to be distributed directly to end users based on agreements with various ISPs that are offering VOD services.

Meanwhile, through this project, producers expect to be present from the start in the new emerging distribution market through on demand services to ensure optimum distribution of their content. They also expect it represents an efficient way to fight piracy.

Currently, through its website, they only provide contact information.

9 MyChannel (2004)

[<http://www.mpsbroadband.com>] [Accessed: 25/02/2009]

The myChannel project was born as a joint venture between MPS Broadband AB and Lupulo Ltd. Its main focus is the development of new technological solutions for Video on Demand to be sold to different potential customers.

If we analyze their site, we can see that their service has already been integrated by different companies such as Canal + Sweden; film2home (Sweden); IEC in Sports, Telia Sonera or the Swedish hockey league. We can see full information on these cases on the myChannel website.

It should be noted that the services offered myChannel as a distribution platform for video on demand range from the uploading of audiovisual content and its conversion into digital format, or the adoption of various security measures, including DRM measures for the protection of copyright, to the provision of digitized audiovisual content in online spaces intended for users (online 'stores'), defining and adapting their systems to the business model chosen by the company contracting the platform (subscription, download to own, advertising models...). Finally they facilitate the distribution of audiovisual content to be received by the end customer in different mediums, such as PCs, mobile phones or other mobile devices. For more detailed information regarding the offered services we refer again to the myChannel website.

10 Reelport (2004-2005)

[<http://www.reelport.com>] [Accessed: 25/02/2009]

Reelport's goal is to become the leader in digital distribution for independent European movies (simultaneously streaming a film to a series of theaters, distribution of films for mobile, IP TV, VOD ...).

To ensure that this dissemination is carried with maximum guarantees for copyright holders, they intend to work with DRM systems that ensure the protection of the authorship rights.

Through the project's website we can see they currently have a library of over 2,000 movies, with streaming access, which can be bought online. They also offer a service related to festivals. Filmmakers are offered the ability to manage, through the platform, the sending of their digitized films. They also help festival organizers manage online, through the platform, the received movies.

From a search engine that lets you search for movies and short films from the film title, director, national origin, sale options depending on the distribution rights they have secured, category (comedy, drama, animation, video clips, science fiction, adventure, children and adolescents, documentary), they offer

information about the film rights and formats, the option to view the trailer, [...]

The list of producers and distributors participating in this initiative and that are listed on their site is very complete: Münchner Filmwerkstatt; Basque Short Films · Freak Shortfilm Agency · interfilm; KurzFilmAgentur; Megafilms.net; Network Ireland Telev. · Swiss Films; Talantis Films; Buenos Aires University · HFF Konrad Wolf; Actors at Work; Carter Films; Cinemaniax; Innereyefilms; Lunacy Film; Magnetfilm · Medusaproductions; microfilm; Nonstop; NovoCiné; OWN-Productions; Visual Possibility.

11 MIDAS (2005)

[<http://www.midas-film.org>] [Accessed: 25/02/2009]

"Moving Image Database and Re-use of European Film Collections: MIDAS" is a database at the EU level that, through various technical solutions, allows the search and extraction of archive materials from a large number of European audiovisual collections, centralizing the search process and data extraction, overcoming all linguistic barriers.

The search results provide information about the availability of material, its location, contact information about the collection they belong to, and information regarding the copyright and copyright holders.

The audiovisual documents from the archive can be searched by content, date and physical characteristics. The realization of the project can be viewed through the portal <http://www.filmarchives-online.eu/>, from where you can search. The last phase of the project began on 15 January 2008.

The list of files involved in the project is fairly complete. Among them: Deutsches Filminstitut - DIF (Frankfurt); Narodni Filmovy Archiv (Prague); British Film Institute (London); Cineteca di Bologna; DEFA Stiftung (Berlin); Cinémathèque Royale de Belgique; Deutsche Kinemathek; Fondazione Cineteca Italiana; IWF Knowledge and Media; Lichtspiel - Kinemathek Bern; Magyar Nemzeti Filmarchívum; Nederlands Filmmuseum; Norsk Filminstitut; Tainiothiki tis Ellados; Slovenska Kinoteka; La Cineteca del Friuli; Bundesarchiv / Filmarchiv; Lithuanian Central State Archive.

12 CN FILMS (2006-2007-2008)

This project was conceived with the objective of providing solutions to European independent distributors in the area of digital distribution.

They propose solutions to the lack of European films in digital format and to help independent distributors to experiment and adopt mechanisms for digital distribution to take advantage of its benefits through financial support and operational assistance. In this sense, his aim is to help European independent distributors to know and implement the new emerging digital distribution channels in their business models.

It should be noted that digital distribution has changed, and is changing, dramatically traditional programming systems and classical distribution methods. In this regard, the project proposes to develop a web platform through which the project partners will

become beta testers, offering them a common point of access through which they can manage their own digital distribution (scheduling, logistics, tracking the flow of their content through digital channels). They include digital distribution to cinemas and digital distribution via the Internet or digital for-TV distribution.

13 Pro2film (2008)

Through this project, stakeholders hope to unite three major projects to create a common umbrella for European B2B solutions: projects CINANDO, REELPORT the (which we reviewed earlier) and the PRO2FILM online festival management.

Taking this point into account, the Pro2film project was conceived as an answer to the changes that new technologies are bringing into the film industry, as Internet marketing, new digital accreditation systems for festivals, new circuits for digital delivery of films to participate in festivals, online film databases, ... and also with the aim to raise an element of unity of the different B2B models in the European audiovisual sector.

In the first phase they intend to create an interface for exchanging data between partners in the project and with third parties that may arise with similar goals.

In a second step they intend to integrate specific solutions for different purposes, such as online display of audiovisual works, evaluations of films by festivals ...

Finally, in the last phase, they would allow third parts to take part of the project.

The ultimate goal is that audiovisual professionals interested in using this tool can customize their own interface by choosing the tools they deem necessary for their personal goals.

Also, they make special emphasis on getting to the market, taking into account that they already have a network of festivals and buyers / sellers, and thousands of titles in its database.

14 Onlinefilm AG (2006-2007-2008)

[<http://www.onlinefilm.org>] [Accessed: 25/02/2009]

The objective of this initiative is to find mechanisms to facilitate getting independent documentary production to prospective consumers.

So far, the most direct channel for documentaries was television broadcasting. With the advent of new technologies and the potential for distribution over the Internet, this project proposes to provide new means of dissemination for documentaries to reach their audience through a direct communication channel between producers and their final public.

To achieve this they have created a multilingual internet platform [OnlineFilm.org] as a marketing tool that will allow advertising through the network documentaries that join the project.

So, they have created a portak with a list of important documentaries so they can be viewed via the Internet, at a certain cost (e-commerce platform) and offering an information sheet for each available audiovisual piece.

The project aim for its third year of implementation is to add tools to make the platform more usable for the end user. They also intend to help the international partners of the project to implement this system in their own communities and to look for new partners in other member states of the European Union to get more movies for their catalog and a bigger audience.

15 GLITNER (2007)

[<http://www.glitner.eu>] [Accesed: 25/02/2009]

The Glitner Project aims to give copyright owners a professional platform, using social networking technologies, in order to publish and "put on sale" their rights on audiovisual products to be disseminated on the network through VOD services taking into account the distribution territories.

Their aim is to provide liaisons between contact rights holders for works or catalogs of works to be disseminated through the networks and aggregators and Video on Demand service platform owners.

They expected, in this way, achieving an increase in the number of European audiovisual works that could be distributed beyond the national borders of each territory.

3. CONCLUSIONS

At this point, and once the supported projects have been reviewed, we can emphasize different basic lines of interest in the field of supporting the development of new technologies in the European audiovisual sector:

- Promoting CDC and VOD projects with catalogs of alternative content: documentaries, short films, informational files - historic, European audiovisual heritage - music video clips.
- Promoting VOD projects aimed at facilitating contacts between festival organizers and producers, for sending and viewing films.
- Projects designed to bring together and connect through a single search engine, film archives of various organizations / institutions.
- Projects designed to facilitate contact between copyright owners and content aggregators for online film exploitation.
- Projects of a highly technical nature aiming to facilitate a VOD platform adapting it to different final customers - Projects designed to implement DRM technologies on these platforms.

It is important to note that most of the reviewed projects focus on 'non-commercial' content, that is: on content that has not been deemed core content, characteristic or defining for the projects qualifying for the EACEA VOD and CDC calls. In fact we see they mainly focus on content with a strong cultural character, aimed for the support and maintenance of the European audiovisual heritage.

Moreover, if we focus mainly on the projects presented to the calls for Media 2007-2013, we observe they have a sharper technology character. This feature can be explained by taking into

account the coexistence of this call with the VOD and CDC projects.

This clear commitment of the European Union for the promotion and development of New Technologies in the Audiovisual seeks to achieve greater outreach and internationalization of both European core content and alternative content.

We will need to wait for reliable measurement of audiences, both for pilot projects and the VOD and CDC projects, to see whether they are certainly achieving their objectives.

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USER'S EXPERIENCE IN THE VISUALIZATION OF ARCHITECTURAL IMAGES IN DIFFERENT ENVIRONMENTS

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Abstract

The visualization of images, both photographic and infographic, is a process that depends on a series of features that define the user (user profile: age, sex, culture or experience, etc.), the visual message (type of image, resolution, content, quality, etc.), and the display (size, resolution, type of screen immersive or not, etc.). When we can determine how the tree features relate, the communicative messages based on visual aspects will be more efficient for both the user and the technological output.

The main objective of the research work presented in this paper is to determine whether differences in the visualization (immersive or not) of specific types of images (real and virtual) related to the architecture framework, differ depending on the gender of the user. The reflection of the existence of such differences in the future will allow us to define the characteristics of the image and the medium, and maximize the emotional communication of architectural ideas, depending on the type of user.

Keywords: Visualization; Immersive display; Architectural images; Emotional usability; User experience.

1. INTRODUCTION

In recent years, the new immersive techniques of visualization have led to the control of big volumes of increasingly complex multimedia information, therefore facilitating its analysis, interpretation, and manipulation [1, 31].

The visualization of architectonic projects has gone through a fast evolution in the last 20 years, due to 2D and 3D CAD-CAM technologies. The use of traditional photography and models has not been done away with as aesthetic resources used to check the space and shapes. But, increasingly, aside from these high-quality models, the use of infographic techniques has allowed the generation of images and animation, that let the professional or the architect, study details, change textures or illumination in a faster, more interactive, and comfortable way.

This work includes a multidisciplinary approach that aims to study the emotional response (affinity and activation) of a user according to the technique features of an image (color or black and white, and level of compression) and its display where it is visualized (immersive or not and the distance of visualization),

in order to obtain some first approaches to the generation of images with correct parameters that will optimize the way the user visualize the architecture project.

2. IMAGE PERCEPTION AND VISUALIZATION

The generalized use of the digital image has been very popular during the last few years, especially on the Internet, where there are many image banks where users share millions of pictures every day, including Flickr, Getty Images, Fotosearch, and many more like them. This development has caused the constant study of new methods and applications to resolve the inclusion of descriptive parameters in the image, also known as metadata [17]. Most of the preferred methods [8,16,36] base their efforts in extracting automatically the descriptors that define the image from an objective point of view. That is, by describing the elements that compose the image [4, 12, 23, 33]. There are very few works that reflect the ideas or concepts unique to the user [18] and that personalize the result according to the user.

For our study, we have used a system similar to Flickr: the image is stored externally in the database, but remains linked to all valuations that users do when they visualize it. Our iconographic system allows an easy navigation by the user, regardless of the display, and allows us an easy analysis of the data stored in the image.

Image perception

In a psychological area, we used works that would allow us to evaluate the differences of perception by the user [28], as well as measure the type and amount of emotions that the image provokes in the viewer [19]. We can find cultural differences as to how the user assigns different descriptors [26]. The interpretation of the colors, for instance, can have a direct influence on the emotions that the visual message generates in the viewer [38], and for this reason we believe that it is very important to find the best way to store them (the emotions).

Paul Ekman, a professor in psychology at San Francisco University and one of the major recognised experts in this subject, has demonstrated that, by studying the facial expressions, these emotions are universal [10]. Simply put, they can be studied [9]:

- By the use of a scale “pleasant-unpleasant”
- By the use of a scale “active-passive”

- By studying cultural and social differences, as emotional reactions are learned in a specific environment

Centered in the field of psychology and neuropsychology, the main study of how the user reacts in front of an image is the IAPS (International Affective Picture System [30]), revised and replied in several studies to check out its validity within diverse cultural frameworks [3]. In the case of the original IAPS system, the emotions are grouped into three variables: “valence” or level of happiness; “activation” or level of excitement (also called arousal), and “dominance” or level of control sensation. This system is defined as an effective method to check out abnormal behavior and emotional dysfunction in several types of users [18, 20].

Colour and Quality

The perception of color, as any other sense, is subordinated to subjective analysis criteria. Color depends on personal preferences, its relationship with other colors and shapes in the line of sight (contrast, expansion, received lighting, harmony with environment), the perceiver’s state of health, state of mind, and other factors. We should mention that some experts cite the Hypothesis of Linguistic Relativism (HRL), which states that language can affect the chromatic perception in some aspects, as different languages divide the spectrum received by the user in a different way [34].

Psychology and experimentation with colors and photographic image have confirmed the emotional influence that colors have on a user [2, 6, 19, 22, 29, 37, 38], including the differences between men and women and their cultural environment [24, 25]. On the other hand, we can find the quality perceived by the user. Nowadays, the study of quality perception in the image has generated great interest because of the benefits to business, and that has caused an increase in the research of this field [24, 35].

However, it is very difficult to define the concept of quality and measure it in an image. To start, it depends on the physiological aspects of each user [6], which gets more difficult when subjective aspects, such as society or culture of the user [32], are considered. The work of Peter Engeldrum [11], describes a systematic method called Image Quality Circle, IQC, which orders the main elements that define the image quality. Among these elements, we can find technological variables, physical parameters of an image, and finally, the human determining factors of the perception process that generates the rate of an image quality. The interconnection of these variables allows the creation of a “psychometric scale” based on the user appreciations, taking into account the different cultural variables. In order to work with users with the purpose of defining some scales of quality perception[24], it is necessary to define different stages:

- Psychophysical study to quantify the scales of perception. That is to say, the empiric study of models of human visual response, in which different concepts such as color, special and temporal sight, and different iterations, which lead to the final result, are related.
- Modeling of visualization to cover all stimuli.
- Iteration for verification.

Whereas we can study and understand the relationship between the different elements by which we can value the quality of an image perceived, we will get closer to being able to define all

features that an image must have so that the exercise of a user’s visualization is satisfactory and could be adapted to all requirements [27]. The assertion is based on the work described in this paper.

Immersive visualization

We can state that human vision is naturally immersive, as it places the individual in a specific environment. When we visualize a static image, this can be shown either in non-immersive display (TV, computer, mobile phone screens, etc.) or in immersive display (either projected in 2D showing the image in Head-Mounted Display (HMD), or in 3D in virtual reality display such as Binocular Omni-Oriented Monitors, ImmersaDesk, CAVE (Cave Automatic Virtual Environment [7]).

The user’s immersion allows the increase of peripheral vision, by increasing the communicative capacity of the environment and message, since the user is mentally absorbed by the environment [5]. But we need to know if this ability of the immersive display is affected by the characteristics of the image and the gender of the user. This is the initial hypothesis that we intend to explore in the following chapters.

3. INTERACTION RESULTS

Methodology

We have generated a new web application of easy-use classification for both expert and non-expert users. It is also, easy to learn, allowing image indexing from the personal valuation of users, so that we can extract any user-related information from any device with an Internet connection. To achieve it, we have developed a system based on Open Source technology [13].



Figure 1.- Screenshot Test Webpage

To generate an empiric approach in the visualization phase of architectural images, incorporating concepts, methodologies, and measurement techniques that are well established in media psychology and user-centered studies, we have divided our work into three phases:

- Phase 1: Replication and valuation of the IAPS model and the on-line test system of the project.[14].
- Phase 2: Implementation of a model combining original images of the IAPS and images modified in color and compression [15].
- Phase 3: Implementation of a model combining images of the second phase (such as “control images”) and original

images related to architecture (infographic, phototypesetting, and real images of projects). Architectural images have been presented both as originals and as the same type of compression and color-modification as the images of stage 2.

Study Phase: Number 3, evaluation of architecture image and immersive environment

This test has been carried out in two environments: the first one (not immersive) with a computer screen (12 women, $A:27,7 - SD:7,2$ and 22 men, $Av:28,86 - SD:7,01$).



Figure 2.- Users realizing test on Computer Screen

The second one was with an immersive screen (Head Mounted Display, HMD) in our laboratory (6 women, $A:25,83 - SD:6,36$ and 8 men, $Av:27,25, SD:6,45$).



Figure 3.- Users realizing test on HMD

The typology of users who carried out test number three was: teachers, students, and professionals of the architecture framework: and other users who are unrelated to the field. We took into consideration the resolution of the screen, visualization distance and image size, information that we will later use to study in depth the importance that the above mentioned parameters have in the visualization action. The value of the estimated error for this phase was 1.6% on the total sample of 2.980 valid punctuations, bearing in mind the response time of the user, and the variables that have remained without validating every image.

Main Results

The first experiment carried out was to observe the quality perceived by users in the specific case of images with a high compression level (JPG2000 black and white photographic images with a compression level of 95% equivalent to a bit rate of 0.05, according to the procedure of the previous phases).

The results show us a clear difference in the visualization between male and female as we can see in the following figure:

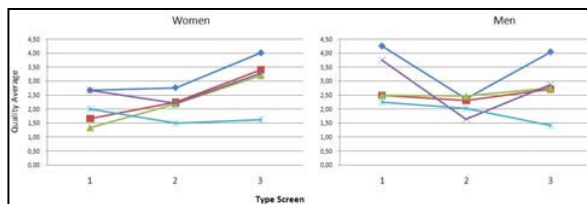


Figure 4. Quality Perceive (6 JPG2000 images in B&W High Compression) by gender in three environments: 1: HMD, 2: Computer Screen, 3: Projector Screen

The quality perceived by women is higher viewing a large display with standard quality (reaffirming the initial study of the

phase 2), while on close-up displays (computer screen and HMD) the average of perceived quality of the same images is lower. The behavior of women corresponds more closely to the expected model: When the image is visualized at a very short distance, pixels and the possible errors of compression are more easily perceived and the quality perceived decreased.

The male behavior is an interesting case study. This group perceives the image with more quality in the screen (HMD) with minus resolution (HMD: 800x600, projector: 1024x768, computer: 1280x1024) with results very close to the projector screen. The visualization on a computer screen is where they perceive pixel details and compression errors more clearly, resulting in lower marks in comparison with the other environments. Also, we can observe (reaffirming previous results) that the quality perceived is directly related to the happiness and nervousness levels of the users (valence and arousal levels in the IAPS System):

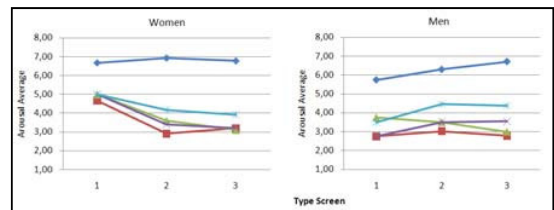


Figure 5. Arousal Average (6 JPG2000 images in B&W High Compression) by gender in three environments: 1: HMD, 2: Computer Screen, 3: Projector Screen

In the previous figure we can see that for both men and women, a higher perceived quality leads to a decrease in the level of nervousness of the user, which results in greater empathy with the displayed image.

The second study was focused on the evaluation of computer-generated architectural images (also known as infographic images). We studied two environments (computer screen and HMD) with four types of images: JPG color original, color images compressed in JPG2000 with 80% and 95% rates, and finally uncompressed images in JPG, but in black and white.

As predicted, the perceived quality decreases according to the level of compression (Figure 6). Further significant observations include the reduction of the quality perceived in the case of uncompressed B&W images (computer screen average:5,67-SD:0,24; HMD average:4,99-SD:0,26) compared to the same images in color (CS_Av:6,28-SD:0,34; HMD_Av:6,18-SD:0,48) and that the above mentioned decrease is more accentuated in HMD visualization (23,97 %) than with the computer screen (10,67 %).

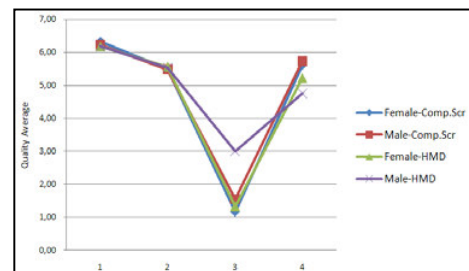


Figure 6. Quality perceived at infographic images. 1: Color without compression, 2: Color with 80% compression, 3: Color with 95% compression, 4: B&W without compression

If we look at emotional behavior according to gender of users we obtain the following results:

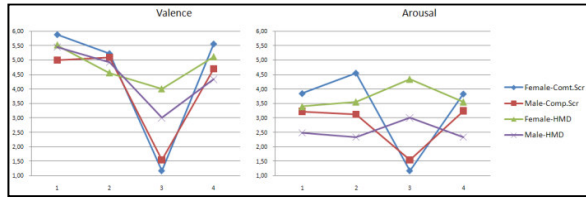


Figure 7. Valence and Arousal at infographic images. 1: Color without compression, 2: Color with 80% compression, 3: Color with 95% compression, 4: B&W without compression

As we can see, the behavior of the valence is similar to the quality perceived (which reaffirms their direct relation). Moreover, there is a clear emotional difference based on the display of visualization and that is corroborated when the information of the arousal is studied.

The visualization in an immersive environment reduces the loss (more than 8%) of the valence (Av:4,61-SD:0,78) with regard to computer screen visualization (Av:4,27-SD:0,41), which maintains a direct relation with the perceived quality.

Computer screen arousal follows the graphs of valence and quality, so we can affirm that there is a direct relationship between them, whereas in the case of immersive visualization we might conclude that the loss of quality observed generates a major excitement with a high decrease of the valence.

4. CONCLUSION

In architectural project visualization, and with images in general, we can distinguish the behavior of the users according to gender. Women perceive images with a better quality in not immersive and common environments (visualization in projector screen), while men value the perceived quality more highly in immersive environments (HMD). These data support the conclusion that the generation of images for a particular customer and for a particular display must take into account such variables for a streamlined communications experience.

A direct relation exists between the perceived quality and the emotional evaluation of the image by the user. While the user does not perceive a quality loss, values the image with a high valence (in an independent way to the semantic category in the one that circumscribes the image), the perception of the errors of compression reduces the "affinity" with the image and increases the activation of the user (especially for the women). This behavior is more notable in immersive environment in comparison with classic visualization situations.

The visualization of black and white images of architectural projects generates lower values than color images of equal resolution and quality of compression, generating in turn a decreased emotional response with respect to the project in color.

The compression of infographic images must be much more restrictive than for photographic images, since at equal levels of compression (from JPG to JPG2000 to 80%), both the evaluation of the quality and the valence is lower when compared to photographic images. This observation, not only supports the values but, according to the typology of the image, it increases them. This situation is due to the fact that the image generated by computer "lacks realistic imperfections" which

correspond to the real image, being more sensitive to the errors produced by the "pixelation" or the compression. Although it could use an extended future study.

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YOUNG ADULTS AS MEDIA CONSUMERS. INTERNET AS A RELATED MEDIA BUT WITH FEW COVERAGE.

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Abstract

This communication has as aim to know the young adults, in special those who we consider Mileuristas, as media consumers.

After the data analysis, we realize that the Mileuristas are big consumers of Television (83%), Outdoor (66%) and Magazines (65%). Their media consumption is not very different from the rest of the Spanish population.

Internet and Cinema are the media with major affinity and the ones that young adults mention as those which they identify with. In spite of this, their coverage is quite low: 55% of penetration for Internet and only a 9% for Cinema.

The Mileuristas affirm to be habitual consumers of general information Newspapers, monthly Magazines and musical Radio.

On Television, they assure to choose the channels depending on the entertainment that they offer. They are, therefore, more faithful to a program than to a channel. Among their favourite programs we find the contests, the informative and investigation programs, children's programs, cartoon and reality shows.

The Mileuristas see Internet as "a new great media that will change their life". They believe that it saves them a lot of time and that it is already an indispensable tool to study and work. Regardless it is not considered to be a good way to meet people, but they assure to be influenced by the Internet.

Keywords: Young Adults, Mileuristas, Media and Consumption.

INTRODUCTION

In August 2005, a letter to a newspaper editor was published with great social impact. Carolina Alguacil, complained about the situation of young adults with high academic training in Spain. For the first time these people had a name that defined and identified them: Mileuristas.

At academic or sociological level, there has been talk of young adults and Adulscents (Anatrella: 1997) or Adulscents (Verdú: 2001), but the social setting of the Mileuristas, which has filled many pages of newspapers and television minutes so far has been little explored.

This communication is aimed to known young adults mileuristas as target media planning and as consumers.

To prepare this study, we used data from the media audience Estudio General de Medios (EGM) and analyzed surveys

completed by AIMC Marcas 2006, filtering answers for the population we consider Mileurista:

- Individuals 24 to 34 years
- With higher education
- Up to EUR 19,999 annual gross income

YOUNG ADULT MILEURISTAS AS MEDIA TARGET

If we analyse the media consumption, we see that the Mileuristas are major consumers of television and radio. Their consumption data for media is not very different from the rest of the population.

If we analyze the data that gives us the EGM (Mobile Year March 2008-April 2009) for the Mileurista target, we see that television remains the most consumed. More than 83% of Mileuristas watch television daily. Still, this figure is below the average consumption of the population, almost 89%, a fact that makes this media becoming the least related to this target.

The second media for Mileuristas, in terms of penetration, it is the outdoor media. This is given by its cosmopolitan profile. Backers of the external environment, especially muppis (small billboards), tend to be located at strategic points throughout the city, like shopping malls, cinemas, etc. That's why 66% of the Mileuristas claim to be exposed to them daily.

Magazines are the third media in coverage. These are read by about 65% of this target. Despite the handicap of being a media of payment and the great growth of the online competition and free hard copy appears that this still enjoys good health for this target, which makes consumption well above the average of the population.

Radio is the fourth most used media for Mileuristas. They are, especially, great listeners to the "radio formula", especially the major networks music.

Despite the strong affinity that has Internet within this target, it is in the fifth position of the most consumed. Almost 56% of the studied target ensures connect every day. The trend, however, is growing every year.

Newspapers, consumed a little over 55% of the Mileuristas, are the sixth half with more penetration. We must emphasize the great importance of free newspapers in these younger age groups.

31% of the Mileuristas read the Sunday supplements. This figure, although not too high, is positioned above the population mean.

Finally, we have Cinema. Despite being the media with a greater affinity index for this target Mileurista (198) it is consumed only by 9%. Keep in mind that there are many factors that influence: the high price of tickets, the boom of free downloads of movies over the Internet through improved bandwidth, etc.. Everything seems to point that in the future, this information of assistance to the film may be increased due to the added value will the release of films in 3D.

Conclusions about media

Although in absolute numbers Television remains the most consumed by Mileuristas, it is at the same time, the least related.

The most related to this group would be: Internet, Cinema and Sunday Supplements.

The means that they consider essential to their daily Internet and Cinema, the same with most identified.

Regarding advertising, they say fixing especially those that appears on television, newspapers or magazines.

Magazines and Television are precisely media which they say are more saturated with advertising. Although Radio is the media they consider ads to be more annoying.

The cinema and newspapers, by contrast, are the best means to believe that combine content and advertising.

The means which are the most interesting information to make a buying decision are television, newspapers, magazines and internet. The latter is helpful, especially in purchasing decisions at considerable expense.

Referring to information published in Newspapers and the Internet is considered more credible and Magazines, Supplements and the Internet the most original and innovative.

For entertainment, the chosen media are Television, Cinema and Internet.

The Mileuristas claim to be heavy users of general information daily Newspapers and monthly Magazines.

Regarding Television consumption, they say to choose the channels that offer entertainment function. They are therefore more loyal to a particular program than to a chain. It also has a considerable weight targets are displayed when issuing the information and show a style with which they identify.

Sport programs, unlike the rest of the population, are hardly followed by Mileuristas. Only consumption of tennis matches is more akin to them than to the rest of the spectators.

Among his favourite shows are quiz, news programs, research reports, children's programming and sitcoms and reality shows like Big Brother.

Another genre that stands out is the fiction tastes. They are consumers of movies and series, both Spanish and foreign.

Referring to the movies, they like all genres. Among his favourites include the thriller and horror films, romantic comedies. They are also followers of Spanish films. The film

is regarded as a moment of leisure, which used to be accompanied by an outing with friends.

Radio is a media that helps them feel that hang out, to feel together, and what are some of the faithful. He is seen as a resource which stirs the emotions and helps them to reflect on their own ideas. Value shown plural and objective. They also claim to be more faithful to the speaker or that particular program in the same station.

The Mileuristas see the Internet as "a major new medium that will change people's lives." They believe that it saves a lot of time and is now an indispensable tool for study or work. Still, it is still considered a good way to meet people and claim to be influenced by advertising of websites.

THE MILEURISTAS AS CONSUMERS

To understand the behavior of young Mileuristas appointed as consumers have used the answers d'AIMC-MARCAS, filtering only those belonging to the group studied. We have compared these responses with the rest of the population to see the degree.

We have divided this analysis into different sections: general information, training, employment, housing, values, fashion and consumption and savings.

Background

Notably the percentage of women (61.1%) forming the group of Mileuristas, well above the average of the population. This is due to two main reasons: job insecurity is more pronounced in the case of women and these, at the same time have a higher educational background.

Although among Mileuristas, include youth who are still living in his parents' home, also include young couples without children, youth and independent single-parent households. These latter types of target are currently being studied deeply by advertising agencies and new types of consumers: DINKIS (Double Income No Kids), singles and single parents.

By income level, are considered middle class and upper middle. This figure shows how, despite not having a very high income level, there are other segments of the Spanish population living in a situation even more precarious.

A new fact to emphasize is that Mileuristas are cosmopolitan, since they often live in medium or large cities. They emphasize, especially to populations of 10,000 to 200,000. It also has much effect the city of Madrid.

Only 25% of Mileuristas live in households with one or two people. We emphasize the affinity for households of three to five people. This data is mainly due to two reasons: one would be young people who are not yet independent and share the apartment with his family, the other young people would have done so but who are forced to share apartment to cut expenses.

Although the vast majority of Mileuristas have a steady partner for over two years, many of them can not become independent, to live together and most of those who do have to share a flat with other partners to reduce costs.

Training

The study Mileuristas just at an older age than the rest of the population, or it never stops. This notes two trends: over-current youth and the need to continuously train and retrain to maintain skilled employment.

English is the language that emphasizes long, in the formation of Mileuristas. Virtually no knowledge of a second foreign language might be important as French or German.

Work

90% of Mileuristas is currently working. This fact is given by the very definition of the term we have done mileurista, which means earning up to € 19,999 gross per year. The rest received a grant of unemployment.

Most of these young people has a full-time contract, but stresses the affinity of part-time work for this group. This fact is given by the combination of work and studies.

Virtually 100% of what makes working Mileuristas employed. It shows a definite criterion of the intention to work for themselves in the future.

These youth are conflicting opinions on the fact of working only for money. Although there are young people who see work as a means of livelihood, we must also see a more vocational component.

It highlights a clear priority between family and career. If we compare this figure with that of the total population, we see that Mileuristas responses are not as clear as the rest of respondents who put family ahead of the race. Surely this fact is given by the fact that most Mileuristas has not yet had the opportunity to form their own family.

Housing

Despite the great affinity with rental housing, the vast majority of these young people live in a house property. Keep in mind though, that many young Mileuristas not yet emancipated from the family home.

Values

Young people are in the ecology Mileuristas the most valued asset for the foreseeable future. Feature This ecological thinking far above the rest of the population. This is a feature to be considered by advertisers and advertising agencies who want to lead this target, as it may mean a good communications strategy to impact them.

As in the previous case of ecology, Mileuristas are equally highly aware of sustainability, recycling and responsible for maintaining the environment.

Also featured is a profile in the Mileuristas hedonistic. More than half of respondents in this target ensures want to enjoy the pleasures of life above all.

Although 60% of the Mileuristas ensures not go out at night, highlights the proximity to the world of entertainment above the population mean.

Although they have financial constraints, stresses the affinity with couples who are thinking about going to live together or marry. This segment however, despite being at an age conducive to family empowerment, only represents only 25% of Mileuristas.

The priority for children is the same for Mileuristas for the rest of the population, and particularly its economy and job insecurity makes the age of delaying having children is going more and more.

Consumption and fashion

Although price is one of the basics and more Mileuristas take into account when making purchases, over 83% of these young people say promotions consider when deciding on an article, they claim to be agree to pay more for green products.

The Mileuristas say not to buy the best known brands. We can see therefore that over the advertising of a product value that this is environmentally responsible and offers a promotion to packaging. It appears that this target is not as "marquista" such as a younger segment of population who still is the parents who buy consumer goods.

The appearance is considered important to 55% of the Mileuristas. Despite not being a figure too high, is above the average of the population. The Mileuristas define their style of clothing as practical and informal (42%), young (26%) and / or fashion (7%). They use practical clothes.

It is remarkable that these young little value brand or designer who has produced clothes. Less than 10% of the value Mileuristas a renowned designer label when buying clothes. They are the major consumers of low cost chains.

Savings

Despite not having an income too high, say Mileuristas be able to save part of their income. This data comes in part from the fact had not been independent of the family.

The vast majority of claims Mileuristas wake up to live with your current income, 5% above the average population. Nearly 30% also said to live in comfort. Less than 20% of these youths say they are harder to reach the end of the month.

Over 60% of claims Mileuristas feel fairly or completely satisfied with their living standards. This figure is slightly above the average level of the population.

Lifestyles of the Mileuristas

As explained Solanas and Perez, lifestyles and consumer behavior have long been studied. Interest in the lifestyles the wishes and / or need to simplify the complexity of the consumer, making their products fit into their lives and their brands within their lifestyles.

The study of these lifestyles shows a cultural dimension in consumer research, as stated Busquet:

"The lifestyle includes the development of practices, customs and cultural habits in a broad sense (...) lifestyle, for example, is reflected in the type and structure of family spending (...)

tastes, forms of behavior or level of material consumption can become a good indicator to locate people in their social group". Lifestyles allow classifying or segmenting individuals into groups based on a multidimensional system of variables that refer to activities carried out, to places of interest and concern, the views, values and beliefs, and significance of all the acts of consumption.

Once filtered AIMC survey responses given by respondents Brands we believe that fit our profile mileurista, we see the 5 styles of life that best represent them due to its high affinity. These lifestyles are, in order:

- . The Demanding (affinity index 270)
- . The Implicated (affinity index 247)
- . The Innovators (affinity index 213)
- . The wealthy (affinity index 134)
- . The Investors (affinity index 124)

The main features of these related lifestyles in Mileuristas can be summarized as follows:

a) Demanding

This lifestyle is made up of parents and young mothers. They are educated and active workforce. Many of them occupy positions of responsibility medium and high, although no accompanying salary.

They have a high consumption rate in all sectors including finance and insurance.

They, above all, quality of life and comfort, and like mostly functional items, simplify their daily tasks.

They value the items they buy are environmentally friendly. Quality is also an important criterion when making purchases.

They believe that the service they receive in the distribution channels is essential. They prefer to buy in stores and supermarkets.

b) Involved

Its members are men and women with one or two children under 10 years. Often live in large populations, working in positions of responsibility. The family economy more or less stable, and that both men and women work.

They are very involved in consumption, putting it in the service of quality of life and comfort. Have a high level of purchases in all sectors. They buy functional items and innovation.

In their diet, give great importance to natural products, ahead of the elaborate. They are faithful to the distribution channels if they find a good service.

c) The Innovators

This lifestyle consists of young singles from 20 to 34 who are not yet independent. Their homes are middle class and upper, and are distributed throughout the Spanish geography. Highly educated and already have joined the workforce.

They have a heavy consumption, especially in all sectors related to personal consumption: textile, hygiene and beauty, beverages, personal equipment, holidays, sports and leisure. They're aware of all new products coming onto the market and if they are innovative, sophisticated or help you simplify your task of buying without being bothered by having to pay a higher amount.

They define themselves as followers of fashion, novelty seeking, that selective and quality. Attach great importance to brands and are faithful to those that meet.

Your favourite outlets are those that offer a wide range of brands and items. So get used to shopping in department stores and specialty stores, always find a good service. They also buy online. It's the kind of lifestyle that most use e-commerce.

d) The well

It consists of people over 20 years. Although most of them are married or cohabiting, there is a high percentage of independent or single-parent families. Probably they have one child under five years.

Labour activists are living in populations over 10,000. Its use in all sectors and the use of distribution channels is slightly higher than the average for the Spanish population. They look for quality and comfort. When buy functional products and comfortable to use.

e) Investors

Men and women over 30. They are active in the workplace and can occupy positions of responsibility.

Give priority to the welfare of their families, devoting an important part of their economic resources. Also, invest and use other financial products.

Before making a purchase especially in fixing value for money and do not mind purchasing the articles in time discount or promotion. They use to do their shopping in supermarkets and hypermarkets.

Conclusions

These five styles of life have in common a high consumption rate in all sectors. Most respondents also agree they do not mind paying more for a good or service if it is of higher quality. Here we see a clear contradiction in Mileuristas: although the salary does not allow it, they live with a quality of living above their means.

In short, it seems that many of these young adults do not want to compromise on the status of living they had before independence. Surveys show that many are using financial

services (mortgages, personal loans, etc) or who continue to receive significant financial support from parents despite emancipated.

According to their lifestyles, we can conclude that these young people are not poorer than other segments of Spanish society. The only group that has achieved a higher standard of living would be 50 to 65 years, the age of Mileuristas parents. These young adults, who had a good quality of life when living with their parents, want to have it once emancipated.

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DIGITAL TWINS

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Abstract

Today 580 million people in Internet have a profile in virtual worlds. In a virtual world the player represents an individual and takes on a role. Your digital alter ego interacts with other people online and live. It is a lasting world because it will still exist even if you abandon it. One prediction is that in 2012 one billion Internet users will be connected to virtual social nets. This perspective for the future has shown a new business niche. This niche is orientated to satisfy the basic requirements of the cybernetic population: To generate a characterised Digital Twin for every user.

There are two common methodologies to create your Digital Twin. The first one is by choosing preset configurations like hair colour, sex, high and weight. This originates a similar pattern of your real person. The second one is by 'pasting' a dimensional picture in to a generic 3D model, whose movements are limited by the incongruity between face and body. NUUME, a company located in Barcelona, has was the first one to propose the creation of an avatar which photo-realistic in order to identify yourself in your virtual relationships.

Keywords: Digital Twin, virtual world, internet, avatar.

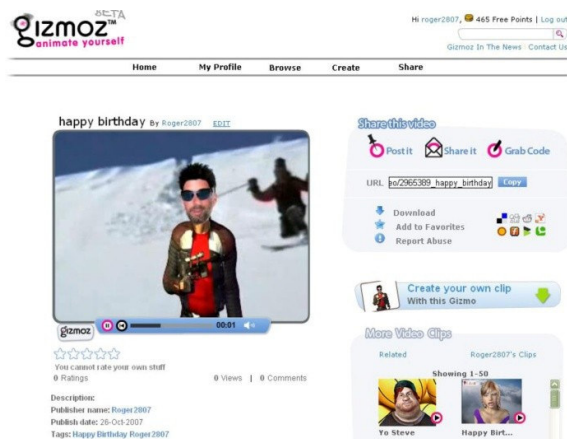


Figure 1.-Cartoon-avatar, human-alike.

1. INTRODUCTION

This article offers a new approach to business technology based on the particular experience of a young company, NUUME [1], which is looking for different ways to manage its knowledge of

commercial and virtual 3D visualization resources. The management of this company, which exists thanks to having obtained international loans such as Neotec (€ 300.000), puts into question the value of high-technology in a free and democratic market like the Internet.

As teachers, researchers, simple students or members of congress, we tend to relate tech with university projects leaving these infrastructure, which are being used around the world by most companies behind. NUUME is an example of the technological research conducted by future companies selling entertainment.

2. WHAT IS NUUME?



Figure 2.-NUUMEs logo

The first time I contacted NUUME members, I didn't clearly know their work objective. I thought of creating avatars as something linked to a very elitist type of customer, a specific group of virtual worlds such as *Second Life* users, who are able to pay a large sum of money to get their virtual twin. The design process of an Avatar had seemed to me be hard and expensive, the same manner as virtual characters in the movies made by computer. When I asked to Roger Hubmann (the company founder) how long it takes and how much it costs to make an avatar in NUUME, his reply puzzled me: "*it takes 60 seconds and is cost free*". It is straightforward to create your digital double from www.nuume.com. Just sign in to this web address and follow the instructions to have at your disposal a digitized photograph of your face to passport size. With three simple steps and a brief physical description you're going to get your digital photo-realistic twin in less than a minute and you'll enable it redirect to other internet platforms where you want to appear. How is it possible to design an avatar in so little time? What business prospects are hiding behind a company that distributes its product for free?

At that moment I realized that the technology is available today worldwide and that researching 3D visualization has no meaning beyond a university environment. The technological process, which allows the adaptation of your photo and specific physical characteristics to a virtual character, is fully automated

thanks to the programmer on NUUME's team, Christoph Schibli, who has extensive experience in dimensional modeling projects. Chris improves ways to enhance the resemblance between user-person features and digital twin shapes: colors skin, nose type, bone structure, etc. Giving priority a photo-realistic model over other kinds of avatars in internet, often two-dimensional designs, is going to increase user satisfaction in the fact that he'll feel more identified with his own representation in the web.

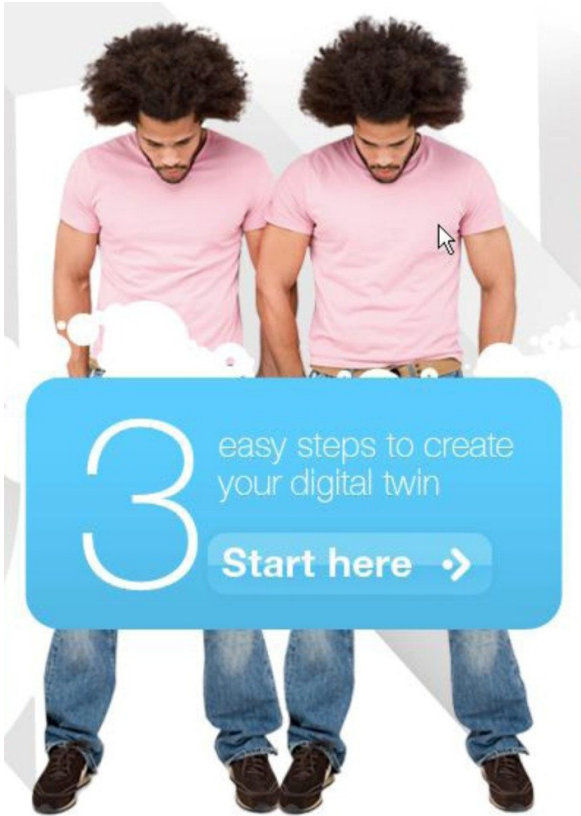


Figure 3.-Your avatar in three simple steps

"If I were to launch a web 2.00 business today, I wouldn't rely on advertising or subscriptions or maximizing pageviews. I wouldn't worry about technology at all in fact I'd become a personal avatar consultant, helping nervous people construct and manage their menagerie of online selves"

Nicholas Carr, author of "it doesn't matter?"[2]

NUUME has perfectly understood this 'Big Idea' put forward by Nicholas Carr, which gives priority to users over companies in their role as potential customers for the interests of any business related to Internet. Beyond the technological advances that have led to the globalization of communication system, we must take into account the social phenomenon that has accompanied this fact. The easy access to Internet and its universal and democratic character has developed a community of users whose objectives are both covering their leisure time and finding virtual relationships. The predictions and statistics provide for a big increase population in that uses internet games and virtual worlds, taking into consideration that within the virtual worlds group we mean not only *Second Life* (19 mil users), *Habbo* (135 mil users), *Poptropica* (76 mil users) or *Neopets* (54 mil users), but also *Facebook* (350 mil users) or

Tuenti (300 mil users). Sooner or later all these internet surfers will need to interact with more than a lifeless picture, like that shown on their email profile. What they are going to want is having their particular digital twin that enables their selves to express emotions and mobility on the social net.

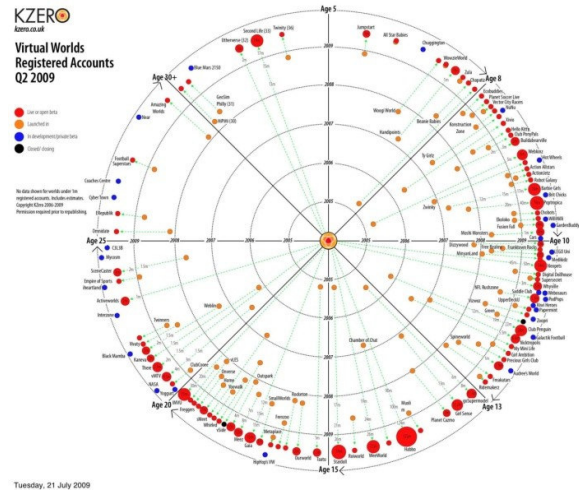


Figure 4.-Virtual Worlds Registered Accounts Q2

3. EDUCATION VERSUS ENTERTAINMENT

The title this Invited Session, "New Multimedia Technologies for Visual Education and Entertainment", suggests a little but important detail; multimedia technologies could be employed in two different ways, education and entertainment. It's common to relate education to the university environment and entertainment to customers willing to have a good time, thus we can conclude that entertainment proposals are usually owned by business projects, such is the case of *Avatar* [3], the movie produced by James Cameron last year. In my first approach to NUUME, I wanted explain the hardware used in these project types, but time has made me understand that the best contribution from my experience won't come from the technology itself, but from its use. Taking into account this great difference: entertainment doesn't use infrastructure as an aim, a product, but as media to achieve it.



Figure 5.-Avatar movie Poster

"We enable individuals to access online dimensions personally through their digital twin"

Roger Hubmann, NUUMEs founder

That's the description used by the company in all its presentations, note the absence of 'education' vocabulary: quality, technology, research, etc. Today, users aren't going to search for perfect resolution for their avatars; suddenly they are looking for an instrument that makes their internet relationships easier. Your 'virtual me' is thought of an application whose mission is to connect you with all your visited webs in a more interactive way, your double on the screen enables real time expressions and movements, an attached life to yourself up, like an endless sequence of an Emoticon. Full avatar design process is achieved through a close relationship between the user and NUUME, who has no intention of selling you anything more than your twin, where other companies use it in way to make a more attractive presentation of its own products and doesn't let you transfer it to other webs. Examples of this type management of custom avatars are currently shown by clothing sites or multi-players platforms to attract people. Although the twin-provided NUUME is owned by the company too, it has been expressly created under a universal extension: you can link it by any Internet connection, game or social network from the main page of NUUME.

At NUUME, the information, freely available on the Internet, leads up to technology, finally being included as strategic collaborations with several university projects such as MIRALab in Geneva or Multimedia in Ottawa. Among the most ambitious projects in MIRALab we can find the title 'virtual clothing', a particularly interesting program for the design of realistic avatars. This project borrows information from some anthropomorphic studies published by various European ministries in relation to the future change in standardized sizing system (S, M and L), in sense to include the physical reality of the population by having implemented many 3D body scanned at both the men and women. 3D scans show the incongruence between physical reality and the stylized models that currently appear in virtual worlds or selling clothes on web sites.

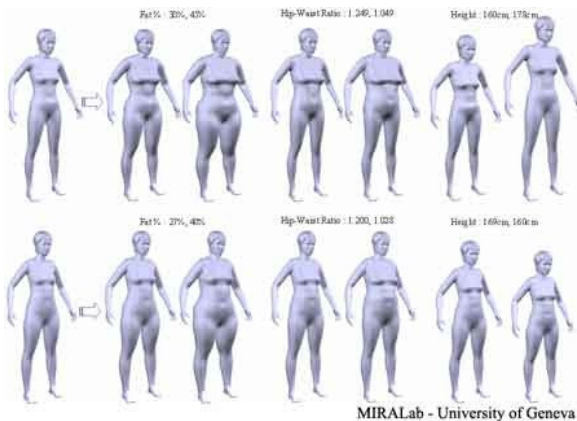


Figure 6.-Computer Graphics and Animation. MIRALab-University of Geneva [4]



Figure 7.-Computer Graphics and Animation. MIRALab-University of Geneva [4]

Other studies followed closely by NUUME and focused by MIRALab led to specific areas of human three-dimensional representation: hair simulation, facial animation, modeling techniques, personality and emotion simulation, and so on. On the other hand the University of Ottawa provides the computer for possible haptic applications at cyberspace [5], whose results will transform keyboards into objects that vibrate and move in a forward step to the four dimensions of digital technology.

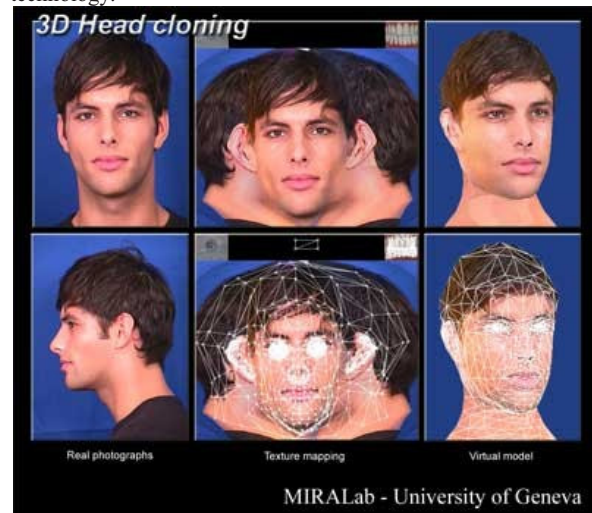


Figure 8.-Cloning techniques. MIRALab-University of Geneva

The open and participatory nature of NUUME's business relationships makes possible the free use of technology and programming from its virtual twins. Real 3D, its modeling system, is an infrastructure created by and for the company, with no license cost and free access, so that NUUME presents itself as viable and economically competitive compared to those who need to rely on external TIS (infrastructure technologies). The models biodiversity, which that the company is working forwards with its realistic avatars conception, represents a key aspect in its business ideal against potential competitors; Real 3D owner technology is finally settled as exportable for outside company programs, as happens with EPOCH [6] design projects of virtual environments focused by culture interests to the dissemination of heritage. These performances require a lot of anonym actors in historical costume, so that from this platform

it is decided provide incentive for trained teams in the creation of entire communities of avatars using digital programming that allows changing human features of race, ethnic clothes or anthropomorphic styles.



Figure 9.-Life simulation in ancient Pompeii. EPOCH [6]

Looking into this business methodology we should conclude that nouvelle and ambitious companies seeking to sell technology as NUUME orients more efforts to explore markets and to fix collaborations that in innovation. The incomes aren't getting from high-tech, but from the way the company manages its sources to bring itself closer to 3D visualization research programs.

4. CONCLUSIONS

I always thought that private initiatives were one step ahead of the official's duties, which has never had to fight in a competition as equals with other companies. Academic system must pay attention on the success of these companies that even having few economic resources, are prepared to present viable projects with a new point of view.

NUUME shares Nicholas Carr opinion on the secondary role of infrastructures in the design of a business, in fact fast dissemination of information makes impossible to control it properties and look after new hardwares (too easy to copy). In our communication age has no meaning to sell innovation, but organize management its access taking into account the common user's situation.

Even more the university is being focused on this way to favor transversal connections between different researches programs in sense to a marketing development. The Bologna Process, established now in Spain, which regulates a unique intra title to all graduates of countries of the European Community, is proof of this preference for an interdisciplinary and multicultural academician over the classic professor settled to a specific sector with fewer options for promotion.

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A Relationship among Information Technology, Organization Culture, and Job Satisfaction in Pharmaceutical Industry in Thailand

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ABSTRACT

Information Technology is used widely in every organization. It is used to support many processes and functions, so that it can improve organization performance. Using Information Technology in organization successfully depends on active employers. Also the organizational environment, such as management styles and supports has some impacts on adopting the Information Technology. This research considers how Information Technology along with organization culture related to job satisfaction—an organization performance measurement. Pharmaceutical industry in Thailand is mainly used to be sample. The questionnaires are developed to collect data. Multiple linear regressions are used to analyze the collected data. The results show that organization culture has some effect on characteristics of Information Technology and job satisfaction. Information Technology has no effect on job satisfaction.

Keywords: Job Satisfaction, Information Technology Characteristic, Organization Culture, and Organization Performance Measurement.

INTRODUCTION

Nowadays, Information Technology involves in every organization. It can create the competitive advantage and innovation for every business [8][14][43]. However, Information Technology itself cannot create the value-added to the organization [42]. It can only make the better products and services via changing the working processes. Moreover, every organization can acquire the same technology and also it is easy to be copied in a short period of time [31]. To sustain the competitive advantages, managers should focus on the resource management, which includes the management of assets, knowledge, personnel, technology, etc [3][9]. When using effectively information technology in the organization, the satisfaction of the user is expected. The user satisfaction is related to job satisfaction [1]. In the service sector, there is a relationship between job satisfaction and customer satisfaction directly [21][40][41][47].

There are some researches found that the effective use of information technology in any organization is affected by the organization culture [17][39]. Also people do not like to change from the old information technology to the new information technology [51], due to they have to spend time for learning the new technology. Moreover in the beginning period of using the new technology the overall performance decreases because the working processes might be changed. From this reason, it

indicates that the culture of the organization can affect the job satisfaction of the employees [24][35].

The objectives of this study are finding the relationship among characteristic of information systems, organization culture and job satisfaction. The pharmaceutical industry in Thailand is focused. The companies in this industry in Thailand are mostly retailers. They import medical products from their head offices abroad. These companies also produce some basic medicines for using in domestic. For management, the head offices will set business strategies, plans, and procedures broadly. These companies have to adapt to fit their business environment in Thailand. The companies in pharmaceutical industry sell medical products to hospital using direct sale strategy. For regular drug stores and small physician clinics, they hire other companies to be their representatives for selling and freighting. With these business characteristics, this industry uses information technology mainly for contacting with its head office and other branches abroad, inventory management, office automations, and researching. We chose only the anti-biotic companies located in Bangkok and vicinity to study.

CHARACTERISTIC OF INFORMATION SYSTEMS

[2] proposed the measurement of information systems by considering five aspects, which are the numbers of applications using in the network, the frequency of usage, the average using time, the physical boundary of using the system, and the proportion of connection time. This measurement uses user feeling of using computer as a working tool, which is subjective. [30] proposed a measurement of information systems characteristics. This measurement considers two dimensions. Reach considers how far the information systems can connect and also how many people can access the information systems. It ranges from internal locations to anyone anywhere. Range considers the level of information that shared automatically and directly across services. It ranges from standard messages to cooperative transactions. Both reach and range can affect the quality of service. Due to good connectivity and communication can reduce operation time and steps, and also errors, so there leave some free time to research and to develop new products and services, which can create the competitive advantage. For service industry, board boundary gives convenience and fast services. This increases the level of service quality. Moreover, companies need fast and suitable response; information systems must be capable to connect and to support sharing information among internal departments [5][12][31][43]. Information systems will provide the differentiation to companies for creating competitive advantages when they have a good management and are fit with the business environment [13][31][36][42][51].

ORGANIZATION CULTURE

Organization culture consists of value and standard [32]. Value means target accepted by most people or by a group of people. It influences the behavior of those people in that group. Value is last long even the member of the group changes. Standard means the way to do or to act that is accepted by most people or by a group of people. If the prospected member can act as standard stated and can accept the value, then the group will accept that people as a new member; otherwise, they will not accept as a new member. [51] stated that organization culture came from beliefs and giving ones an importance so they became the behavior or group's rules. Organization culture can be considered as knowledge of the organization [22][29]. [45] stated that organization culture is a group of significant hypotheses accepted by the main of group members. Most of them was not recorded anywhere. Different groups have different cultures depending on the history and experience of the group members [46].

Organization culture is always used to explain the problems between Information Technology department and the users [17]. It is also used to explain many occurrences in the organization. It has a lot of impact on long-term organization performance, so it is the major variable to make the organization success and failure. On the other hand, even it is hard to change; it can enhance the organization performance [32]. This research adopted the definition of organization culture of [11]. The organization culture was considered in 8 aspects: the response to changes, centralized or decentralized decision making, individual of collaboration, relationship to the external environment, basic of making decision and operation, knowledge exchange, performance measurement, and time.

JOB SATISFACTION

Many researchers studied about job satisfaction, customer satisfaction, and organization performance [21][40][41][47]. Today customers want both quality and good service [30], so it is important to consider job satisfaction as a basic organization performance. There are many factors affecting job satisfaction such as working place, colleagues, etc. [34] stated that dissatisfaction is equal to requirement subtract by receive what we get, and then multiply the result by the importance. This implies that not every factor affects the job satisfaction. It depends on how important that factor is. [48] stated that almost employees would like to have the chance to get promote. Wage, management, and working hour have no effect on job satisfaction. There may be other intangible factors that employees concern [35]. [24] presented job satisfaction as a relationship between what to put in a job, such as education, time, and try and what to get from working, such as wage, position, working environment, and other personal factors.

[44] defined job as a combination of working experience, while satisfaction was defined as an evaluation of personal feeling about job. Job satisfaction can be considered in many aspects: attitude and feeling about the job in charged, opportunity and response from management level, and salary, working hour, and management. This definition is used in this research.

RESEARCH HYPOTHESES

When level of communication and working boundary of information systems get higher, they yield fast, correct, and convenient working processes. The chance to get a job done is high, so the level of job satisfaction is also high. In addition, when the employees get correct information for doing a job, they can finish their job efficiently. This would partially make higher job satisfaction [6][50]. Information systems can provide data and information, so information systems in term of reach and range can affect job satisfaction as well. This leads to the first hypothesis as:

H1: Characteristic of information systems has an effect to job satisfaction.

Organization culture is rooted partly from knowledge and experience of employees. It took a long period of time to be norms [51]; organization culture has an impact on the success of an organization. To consider using information systems successfully in an organization, organization culture also has an impact [15]. The integration of organization culture and characteristic of data and information provided by information systems affects the usage of information systems [16][28]. [19] found that technology has no impact on any change in organization; on the other hand, technology was adapted suitably to organization culture. These evidences lead to the second hypothesis.

H2: Organization culture has an effect to characteristic of information systems.

The study of [23] found that organization culture had an impact on job satisfaction and had an indirect impact on customer satisfaction level. This supported by the studies of [24] and [35]. Knowledge and individual experience led to individual expectation. Information systems are expected to provide a good data and information to employees. Information systems have an effect to job satisfaction [50]. If employees considered information systems providing valuable information to get any job done, information systems had an impact on job satisfaction also. This leads to the third hypothesis.

H3: Both organization culture and characteristic of information systems has an effect to job satisfaction.

DATA ANALYSIS

A questionnaire was developed to collect data in this study. The questions in the characteristic of information systems part are adapted from [5], using a 7x4 dimension table to evaluate the level of reach and range. Each corresponding row and column has a specific score representing characteristic of information systems. The questions in the organization culture part are adopted from [27] adjusted from the theory of [11]. These questions were measured using 5 Likert's scale. The questions in the job satisfaction part are adopted from [35], which was used the theory of [44]. These questions were also measured using 5 Likert's scale. Each question for organization culture and job satisfaction has the same weight, so the sums of each construct were calculated [11]. All of constructs were passed validity and reliability tests.

The questionnaire was sent to 700 small and medium enterprises in service sector located in Bangkok and vicinity. These companies are listed in Department of Business Development, Ministry of Commerce. It also sent to 4 micro-biomedicine

companies in Thailand located in Bangkok. Due to the micro-biomedicine companies is large, so 75 sets of the questionnaire were sent to each company to give to sale representatives and product managers to fill.

20 questionnaires were sent back from small and medium enterprises and 128 questionnaires were received from micro-biomedicine companies. Six questionnaires were incomplete. The response rate is 14.2 percentages, which was acceptable [20]. The data were coded and analyzed using multiple linear regressions in SPSS version 11.5.

FINDING

The respondents from the sampling organization use Internet and Intranet relatively high. They use them for internal communications, searching for business information, and communication with customers and suppliers. 47.1 percentages have branches aboard. 16.9 percentages have branches in other provinces and aboard. 10.6 percentages have branches in other provinces. 25.4 percentages have no branches. Most sample organizations are in private sector. The characteristics of the samples are closely to the characteristics of the population.

Table 1 shows the results from multiple linear regressions. The result shows no relationship between characteristic of Information Systems and job satisfaction, which leads to reject the first hypothesis at significant level at 0.05. Only organization culture has an effect on characteristic of Information Systems, so the second hypothesis is accepted at the same significant level. Also only organization culture has an effect on job satisfaction.

Considering in more details, the number of organizations that can access the Information Systems anywhere any time is small, same as the number of organizations that can communicate with their suppliers and customers without using specific applications. Even the number of organizations that can communicate with their suppliers and customers with a specific application is low also. The number of organizations that have internal communication with some branches in aboard and other provinces is relatively low. Even the number of organizations that can contact internally in the same building is also low. These findings can lead to the reason why characteristic of Information Systems has no effect on job satisfaction. Moreover, whether Information Systems are an important part in doing any job, but they have no effect on employees' promotion and work opportunities or employee's performance. As [48] mentioned, job satisfaction is affected by wage and salary, working opportunity and promotion, employer's response to the employees' request, and manager-employee's relationship.

Considering in more details about organization culture and job satisfaction, the result from multiple linear regressions shows that only response to change, motivation to knowledge exchange, and performance measurements have some effect on job satisfaction. Firstly, change the working process can lead to the improvement of organization performance. If the performance of organization is better, it has a high chance to have higher wage and salary [54][55]. Secondly, good information is used to support effective working and then creates organizational knowledge, so high motivation to exchange knowledge can affect the employees' performance, also the job satisfaction [6][50]. Lastly, reasonable performance measurements make employees feel stable and happy to work. Performance

measurements have an effect on employees' wages and salaries, so do on job satisfaction [1].

Considering about organization culture and characteristics of Information Systems, the result from multiple linear regressions shows that only the way of decision making and performance measurement have some effect on characteristic of Information Systems. Information Systems are used widely in any organization, so bringing Information Systems to use should be agreed by every department in the organization, not only by the decision of Information Technology department [17][51]. Also even using Information Systems is not stated in any performance measurement, it should be supported by the executive for promoting to use [27]. Because effective working performance needs good information, Information Systems can help accessing a lot of good Information from both internal and external organization [30]. Figure 1 shows the result of this research.

LIMITATIONS AND CONCERNS

Most questionnaires received for data analysis were from micro-biomedicine companies. As the nature of the pharmaceutical industry discussed above, the nature of information systems in this research would be based on the companies in this industry. The results in this research can represent the relationships of organization culture, job satisfaction and characteristic of Information Systems only in this environment or likewise environment. It would be valuable to repeat this research in other environment or industry to explore the relationships of these three constructs. Also the multiple linear regression models indicate that there are other factors affecting job satisfaction and characteristic of Information Systems.

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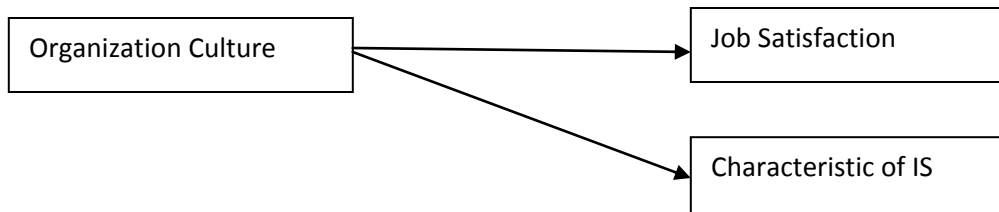


Figure 1: The Relationships of Three Constructs

Dependent Variable	Independent variable	Hypothesis	F	Sig.	Result
Job satisfaction	Characteristic of IS	H1			Reject
	Organization culture	H3	0.569	0.000	Partly Accept
Characteristic of IS	Organization culture	H2	0.249	0.003	Accept

Table 1: The Results from Regression Analysis

Comparative Study of the Use of Extensible Business Reporting Language (XBRL) in Projects for the Supervision of Banking Institutions

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ABSTRACT

The objective of this research is to make a comparative analysis of the use of Extensible Business Reporting Language (XBRL) in the projects undertaking for the mandatory filing of banks' financial information in the United States and the European Union. The agencies overseeing these filing requirements are the Federal Financial Institutions Examination Council (FFIEC) and the Committee of European Banking Supervisors (CEBS) in the United States and the European Union, respectively.

This comparative analysis is made for the following five dimensions: 1) project definition and scope; 2) planned project activities and responsibilities of stakeholders; 3) project management methodology and process; 4) progress monitoring, deadlines, and milestones; and 5) outcomes in terms of project goals and objectives.

Keywords: Extensible Business Reporting Language (XBRL), Bank Filing Requirements, Federal Financial Institutions Examination Council, Committee of European Banking Supervisors, Project Management.

INTRODUCTION

The objective of this research is to compare two projects mandating the use of Extensible Business Reporting Language (XBRL) for the filing of banks' financial information to banking supervising agencies in the United States and the European Union, respectively.

In the United States, the Federal Financial Institutions Examination Council (FFIEC) oversees institutions with deposit insurance from the Federal Deposit Insurance Corporation (FDIC). It mandates that insured institutions submit Reports of Condition and Income, stored in a central data depository since March 31, 2001 [9].

In 2006, the European Union decided to adopt an XBRL project with similar goals to that of the FFIEC, expected to be finished by 2009. One of the XBRL taxonomies related to this project is the Financial Reporting (FINREP), which falls under the jurisdiction of the Committee of European Banking Supervisors (CEBS), the FFIEC's counterpart [3].

The contribution of this research is the evaluation of relative success, by comparing outcomes and goals of projects developed to improve accounting information systems of banking institutions. The aim of these improvements is to increase transparency in financial reporting by providing users with more timely and accurate information so that they can form judgments or make decisions to enable them to make the most productive use of their financial resources.

OBJECTIVES OF XBRL PROJECTS

XBRL allows the storage and transfer of financial data and reports through the Internet. The basic components of an XBRL based reporting system are the taxonomy, the instance document, and the style sheet. The taxonomy is a list of definitions of elements and their numerical and hierarchical relationships. Tags for numerical values of a financial report's individual line items match them to taxonomy elements. These tags describe an item's content in a manner similar to that of a barcode number representing an individual product item to be sold. Taxonomies exist for different industries and countries [2].

These different taxonomies store relationships between tagged information in separate files. An example of a relationship is hierarchies like definitions of financial statement elements and the items they contain (parent-child relationships). Another example is descriptions of how to calculate additional values, based on stored data, such as subtotals and totals [13].

Finally, the instance document is converted into the final report. This conversion occurs by means of the style sheet or template that prescribes the format for the display of stored data in software such as Excel [2].

Previous research finds several benefits of the use of the XBRL language for communicating and analyzing the operational results and financial condition of different companies.

Expected benefits of XBRL include overcoming shortcomings of traditional business reporting models. These shortcomings include the relevance of financial accounting information communicated to financial report's users. Relevant information should address different user needs and have the potential for making a difference in the users' judgments and decisions. An additional difficulty is the incompleteness of such relevant information contained in financial reports [1].

An additional benefit is greater comparability due to increased standardization of documents and classification of individual line items in financial statements in such a way that it is independent of accounting principles underlying such items [14].

XBRL also has been found to improve the efficiency of reporting processes. This occurs as a consequence of cost reductions through increased accuracy and timeliness of financial reporting, which contributes to greater information availability or transparency [12]. Predefined taxonomies, act as "checklists" that help prevent errors and omissions, thus, reducing the time needed to prepare financial reports [14].

FEDERAL FINANCIAL INSTITUTIONS EXAMINATION COUNCIL'S XBRL PROJECT

This section describes the use of XBRL for the Federal Financial Institution Examination Council's Call Report Modernization Project.

Project definition and scope

The Federal Financial Institutions Examination Council assessed the need for improved call report information. To satisfy this need, it designed the Call Report Modernization Project with the goal to improve the quarterly bank Call Report process. Specific objectives were to:

- 1) automate data entry tasks to achieve cost reductions,
- 2) identify errors and filing problems in a timely manner,
- 3) improve data validation, analysis, reliability, and comparability [11].

The phases of a banking institution's reporting process are: business operations; internal financial reporting; external financial reporting; investment, lending, regulation; and economic policymaking [11].

The major deliverable for the modernization project is the Centralized Data Repository (CDR) for filers and users to retrieve data for analysis and decision making. The purpose of the CDR is to allow for improved bank supervision and judgment and decision making by analysts of banking information.

The project requirements included ability to for banks to provide explanations for results not meeting report expectations. Additional requirements were increased data accuracy and timeliness in report analysis, and publishing and flexibility in making necessary changes to reports [11].

The project scope is limited to call reports filed by financial institutions. These reports are requested for assessing financial health and analyzing risk. Previously, information was stored in several formats including PDF, Word, and Excel documents. The Central Data Repository was created to store call report data in a single format (XBRL) to facilitate bank financial analysis and performance assessment [11].

Planned project activities and responsibilities of stakeholders

To be able to accomplish the project objectives, it is essential to plan specific project activities and decide which stakeholders are responsible for them.

Stakeholders include banks, software vendors, regulators, analysts, and the public. Banks are required to validate and submit their financial data through the Internet to the Central Data Repository (CDR). The responsibility for data validation is shared with software vendors who provide support to banks for this purpose. The regulators are in charge of the security and accuracy of data received in the CDR and of disclosure of financial institutions' financial information to analysts and the public [8].

Project management methodology and process

The reporting process has two main sub processes: the internal financial reporting and review process and the call report collection process.

The methodology for banks to complete their internal financial reporting did not have to be changed to submit their data to the Central Data Repository (CDR). However, call report requirements for the CDR, including forms and instructions, are prepared using XBRL. The purpose of XBRL is to facilitate the electronic transmission of data submitted by banks [10].

Before submitting the data to the CDR, banks must complete an internal review process to ensure the quality of the data. This must have occurred by the call report due date [10].

The Central Data Repository Call Report collection process begins by banks using specialized software to input and transmit their financial data. Next, banks receive an email notification that is their receipt for having complied with the mandatory reporting [10].

The CDR information system checks bank data for quality edit failures. According to the FFIEC, the average for these quality edit failures is 3 to 4, which is considered to be low enough to be acceptable [10].

Banks are responsible for submitting any necessary edit failure explanations, which are reviewed by call report analysts. The FFIEC Reports Task Force's Data Quality Working Group revises or adds data as required by edit failures. The final data becomes part of the individual bank statistics [10].

Progress monitoring, deadlines, and milestones

Banks must make the filings on a quarterly basis. The original project start date was October 2004. It faced several delays due to postponements to quarters ending March 31 and June 30, 2005 [16], and did not begin until October 1, 2005 [15].

These implementation postponements were to allow more time for banking industry feedback, testing, and enrollment [16].

Outcomes in terms of project goals and objectives

As of 2006, the major results for the Call Report Modernization Project were as follows.

Ninety five percent of original bank filings met FFIEC data requirements, and one hundred percent of data were accurate and reliable [11].

FFIEC began receiving data earlier, less than one day after the end of calendar quarter. Analysts from banking supervision agencies were able to take ten to thirty three percent more bank cases; decreasing costs [11].

Data could be published almost immediately to enable the public to receive it sooner. XBRL taxonomies allowed changes to be made in minutes or hours [11].

These results show the Modernization Project allowed FFIEC to achieve the objective of cost reductions through automation and increase in bank cases per analyst. The objective of timely error

and problem identification was also met through enhanced comparison of filings to data requirements. Lastly, there were validation, analysis, reliability, and comparability improvements due to XBRL taxonomies allowing changes to be made and published within a short time period. To summarize, report quality and public availability of bank information was accomplished.

COMMITTEE OF EUROPEAN BANKING SUPERVISORS' XBRL PROJECT

Project definition and scope

On December 2005, the Committee of European Banking Supervisors (CEBS) established the guidelines on financial reporting (FINREP). The goals of these guidelines were to:

- 1) increase the comparability of financial reports submitted to European Union banking supervisors,
- 2) increase the cost-effectiveness of such supervision,
- 3) facilitate reporting for cross-border credit institutions,
- 4) remove a potential threat against European Union's financial market integration [4].

The CEBS set forth a list of 3 priorities or requirements that defined the scope of the FINREP project. The first priority was that FINREP be based on a dimension specification developed as an XBRL information technology (IT) solution. The IT solution is the main deliverable of the FINREP Project. Another priority was that this IT solution had to be standardized, with the same rules to be shared among and extended by different countries. This standardization process would be enhanced through XBRL. As a third priority, the process would enable compatibility between past, present, and future XBRL taxonomies [17].

Planned project activities and responsibilities of stakeholders

The most important stakeholders of the FINREP Project are the core project team, national supervisors, and banks.

The activities of the core project team include taxonomy development and building and testing the collaborative XBRL network, with the help of 4 software vendors.

The national supervisors are in charge of receiving the financial reports based on XBRL dimensions. They may also extend XBRL taxonomies to meet individual country specifications.

Banks are meant to be the end users of the XBRL data [18].

Project management methodology and process

National supervisors make the decision about whether to make FINREP Guidelines mandatory in their European home country. The FINREP project is based on a set of tables to be filled with core and noncore bank information. The core information is the consolidated balance sheet and income statement. Noncore information provides greater details about balance sheet or income statement items.

National supervisors may also establish a particular method and reporting frequencies for compliance with FINREP guidelines. If such requirements were not to exist, banking institutions could choose the methodology to be used.

The FINREP information system links CEBS website to national websites. The CEBS website provides templates with recommended tables for data collection purposes. There are both: summary and detailed tables [5].

Progress monitoring, deadlines, and milestones

The target date for qualitative banking information was set to end of year 2006. The statistical information had been planned to be ready by the middle of year 2008 [5].

The FINREP taxonomies' deadline was September 2006 with the intent to implement the operational phase of the project by 2007 [17].

Outcomes in terms of project goals and objectives

During the 2007 reporting period, the CEBS assessed its accomplishments in regards to the FINREP Project. Its major conclusion was that the Guidelines were a first step in the goal of increasing comparability of financial reports by improving convergence between information requirements of European Union countries. Convergence had been achieved, to a great extent, for the core framework of the FINREP Project. The noncore information, however, showed that significant differences still existed [7].

After the conclusion of year 2008, CEBS still recommended XBRL and began, in March 2009, a project to revise guidelines in order to achieve a greater progress in convergence of bank financial reporting supervisory standards [6].

COMPARISON

Both projects, the FFIEC Central Data Repository (CDR) and the CEBS FINREP, shared the objectives of greater comparability and cost-effectiveness and the use of information technology based on XBRL.

However, contrary to the CDR, FINREP is not mandatory in all instances. Its use is only required if and when national supervisors decide on it. The same happens for reporting frequencies. There are no single requirements for FINREP, while CDR data must be submitted on a quarterly basis.

The fact that banks in the United States must comply with CDR instructions, makes it necessary for them to use a common method for external supervisory reporting purposes.

The CDR Project began earlier and was more successful in achieving its objectives than the FINREP Project. However, these results were, very likely, influenced by the mandatory nature of CDR Instructions, contrary to FINREP Guidelines.

CONCLUSIONS

The United States Federal Financial Institutions Examinations Council (FFIEC) and the Committee of European Bank Supervisors (CEBS) have undertaken major Extensible Business Reporting Language (XBRL) projects. Common goals of these projects are to increase comparability of bank financial reporting and to obtain cost reductions.

These projects have important implications as they provide for the wider acceptance of XBRL as a universal business reporting language. However, it remains to be seen if these convergence efforts towards a common reporting method extend across regional borders.

The FFIEC Central Data Repository (CDR) Project appears to have been a lot more successful. But, this conclusion must be viewed with extreme caution.

It is important to note that CDR's use being mandatory makes it easier to ensure individual bank compliance. Also CDR was developed for a single country, while FINREP Guidelines were established for multiple countries. An alternative for future research would be to study convergence outcomes within individual European countries and compare them to those of the Union as a whole.

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“Sustainable Glocalization” Through Inter-Disciplinary Appropriated Technologies

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CURRENT CONTEXT AND CRUCIBLE

Cyber-connectivity offers wired and widened, but not wizened, channels and intersections to inter-relate but not necessarily integrate knowledge, technologies, communication and services by which simple to complex societies may create social and economic entrepreneurship that may be sustainable locally and globally for the present improvement of the human condition without jeopardizing the future condition of humanity. A thoughtful approach to informing, inspiring, engaging and directing cybernetics and informatics for the purpose of “sustainable glocalization” is offered here.

“Sustainable glocalization” is a process by which an inter-connected, inter-active and inter-dependent network of local communities generate and maintain global social, economic and cultural relationships that produce, apply and enjoy increasing prosperity in a manner that nurtures, cultivates and harvests social and economic entrepreneurship that favors all parties to the process benefiting continuously over time, no parties irreparably damaging the natural environment and the principles of Fair Trade (rather than the short term brutal Free Trade) being applied in economic relationships in which commodities are involved and in which knowledge, technology, communication and service disproportionately favor larger, dominant partners in local enterprises that have international dimensions for expansion. Neither

human beings in their signature social environments nor flora, fauna and natural commodities in their bio-regionally distinct natural environments should be irreparably destroyed in favor of short term economic gains at the expense of the integrity of social and natural environments.

FLAT WORLD

If Thomas Friedman’s premise that *The World Is Flat* and geography (human proximity) is less important to human progress than is cyber-connectedness and informatics-accessibility, then it becomes important to identify, articulate and implement a coherent individualized set of philosophical criteria; analytical, critical and creative mental processing steps; practical decision-making steps; and some outcome measures and assessments by which to equip, encourage, enable and empower any individual to become competent in making the best possible decisions and choices as social and economic entrepreneurs within a locally and globally sustainable set of priorities.

SECTORAL RATIONALES TOWARD “SUSTAINABLE GLOCALIZATION”

The five sectors of influence and components within are listed below.

Individuals and Communities

- Theology: Cosmology based upon Divine role models, scriptures meaning of life, nature and worldview of progress
- Meology: Self-centered, selfish or maybe selfless
- Globalology: Ethical perceptions and priorities reflecting shared planet, processes, products and performances that benefit, diminish, destroy or renew Earth and its inhabitants into the future through current planning and purposeful advances in human shared prosperity, representative governments and inclusive social and economic enterprises

Non-Governmental Organizations: Cultural, Scientific, Other

- Specialized altruistic, greedy, needy, justice-oriented, ethical, deceptive
- Values, vision and vitality outside corporate or government parameters, although may be regulated by government tax, environmental, health or safety criteria
- Faith-based versus scientific focus may clash, coincide or complement, facilitated by mediation, arbitration or adjudication

Business: Agricultural, Mining, Commercial, Banking, Finance, Scientific, Manufacturing, Communication and Information

- Capitalist model: Profit equals progress
- Humanistic/Humanitarian Model: Human betterment by best practices and products. Ethical products, technology and services
- Ethically informed: Doing the right thing (social good) is better than doing things right (expedient profitable returns)

Governmental and International Governmental Organizations

- Law and order preempt exceptional obstacles and opportunities
- Judicial activism explores positive and negative applications of law: letter of the law versus spirit of the law
- Promise and possibility driven, respectful of the Human Rights, Environmental Rights and Property Rights of all parties-rank order

Educational Enterprises: Classical to Contemporary

- Academy vertical model with standardized testing or wealth as access
- Democratization, wide access model from Pre-K through university
- Versatile public, proprietary, charter, religious, vocational, expert mode

FUNCTIONING “FIVE MINDS FOR THE FUTURE”

One approach to the present and future educational preparation of an effective

participant in an inter-active, inter-connected, and inter-dependent world is offered in Howard Gardner’s book *Five Minds For The Future*. He believes that a person is best prepared for the present and future if she is:

- Disciplined (academic disciplines and inter-disciplinary comfort, as well as self-disciplined)
- Synergistic (able to “connect the dots” and/or imagine more than linear possibilities about how things do or could inter-relate)
- Respectful (allowing for genius or profundity to come from anywhere, hence respect for insights and ideas must be broader than immediate familiarity may allow)
- Ethical (honoring honesty, integrity and even altruism to elevate an enterprise rather than deceptive practices, fraud and corruption taxes to deplete an enterprise or relationship)
- Creativity (facilitating the envisioning and pursuit of desirable alternative futures and related innovations for progress)

An innovative step beyond Stephen Covey’s, *Seven Habits of Highly Effective*, the Gardner work emphasizes access to new-comers, non-existent approaches and imaginative non-linear alternatives to shaping a better future, while not discounting Covey’s basic principles.

Within *A Flat World*, the smallest educational transaction, principle, program or expertise can become global in its implications and implementation – or smothered by self-interested/limited external forces not adept yet dominant in cyberspace. Free video-conferencing, free translation services, free access to various data bases can break down physical geographic barriers and expedite free access and exchanges of appropriate educational purposes, priorities, processes, practices, and measures of success.

Education can become what Peter Berger describes in *Sacred Canopy* (intermediating institution/process) to advance “sustainable glocalization” among the widest and most

diverse populations. Cybernetic context and informatics techniques may expedite ethical effective education.

POIGNANT PROMINENT HIGHER EDUCATION MODEL

One simple, clear, feasible and assertive example of a higher education institution ([Miami Dade College](#)-America's largest, most diverse and most internationally representative) anticipating "sustainable glocalization" by insisting on core performance expectations by all faculty and their students in ALL disciplines and across disciplines posits that the practices and student learning outcomes ([SLO](#)) and Learning Outcome Assessments (LOA) measures move toward what can be described as "sustainable glocalization" by pursuing the following outcomes:

- Communicate effectively using listening, speaking, reading and writing skills
- Apply quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate and apply information
- Demonstrate knowledge of diverse cultures, including global and historical perspectives
- Create strategies to fulfill personal, civic and social (societal) responsibilities
- Demonstrate knowledge of ethical thinking and its application to social issues
- Use computer and emerging technologies effectively
- Demonstrate an appreciation for aesthetics and creative activities
- Describe how natural systems function and recognize the impact of humans on the environment

Other simple, clear, feasible and assertive examples for Pk-12 educational institutions are the [Framework for 21st Century Learning](#), the [United Nations' ICT standards for teachers](#),

[ICT standards for students](#). Initial to lifelong education and training has existing exemplary models, modes, standards and measures for and to mark advancement.

ANTICIPATING APPROPRIATE TECHNOLOGIES – OPEN TO ALL

Practically speaking, all of the above appears to be most effectively expedited among developed countries, middle and upper economic levels and more traditionally well-educated people. Yet, decreasing cost of and cooperative center's access to appropriate technologies applied to widely accessible information and instantaneous communication and the ease of new service modalities permits a new paradigm to local and global sustainable development and social and economic entrepreneurship to be quite feasible across the widest spectrum of potential participants, beneficiaries and co-creators of a wider prosperity than ever before.

BEYOND PROLETARIAN, INFOTARIAN, TECHNOTARIAN, CYBERTARIAN

In the early 1990s, a new personnel phenomena and strategic relationship change occurred within corporate workforces. This was associated with the decrease in the number of proletarian jobs in the new information/service society/age and the rise of new and significantly influential worker--the technotarian. In the service/information society and to a certain extent in the industrial age and even agrarian societies, the person with the information had significant power. With the service/information society the rise of the power of the technotarian to create new production, accelerate production and/or stop production emerged. As workplaces became more technologically dependent and interdependent, technology workers needed to be added to payrolls or outsourced. In the initial phases of the rise of integrated technology, in work, the technotarians were the people who built interconnected hardware and wiring systems and reformatted the information from and for infotarians in multiple formats. Initially with the rise of the World Wide Web and Internet, the language to publish something on

the Internet was known mostly by the technotarians and not the infortarians.

With recent emergence of Web 2.0 applications and simpler web publishing languages and programs, cybertarians are producing products on the web with simple text interfaces. One does not have to be formally trained in technology to publish on the Internet and one does not have to have reliable nor valid of information to publish. Nor does anyone have to be an expert or even a person to profess knowledge in cyberspace as in the case of the virtual worlds and avatars.

Cyberspace communities connect individuals, cultural and sociopolitical borders for good and evil. There are numerous sites where people are able to donate to humanitarian causes or garner support for ideas and causes. The new possibilities can be undermined by present and emerging perils or enforced and extended by socially promising potentials in the content and powership among proletarians, infortarians, technotarians and cybertarians.

SIX CHALLENGES FACING SOCIETY, CYBERNETICS AND INFOMATICS

Cybernetics and Informatics will continue to profoundly influence micro and macro societies. The impacts and influences of Cybernetics and Informatics will be shaped by the following challenges.

- If cybernetics and informatics progress as neutral fields that can expedite realization of a highly functional, inter-active, inter-connected and inter-dependent global society, what values, vision, and vitality should inform and animate the priorities, performance, processes and outcomes of society (local and global)?
- Is it desirable to infuse all local communities, cohorts and individuals (in nations or states) with the technologies of cybernetics and informatics? Or should only the “most advanced” cyber-informatics groups be empowered to be representative, pre-emptive and assertive on behalf of the dominant local communities in a global world?
- What would an ideal “Sustainable Glocalization” look like in 2025 or 2035? Should a statement like the Jeffrey Sachs-generated model that underpins the [United Nations Millennium Development Goals](#) – identifying minimum standards of success in pursuit of enlightened cybernetically-informatically infused world – based on a set of norms (values and vision) be drafted?
- Who benefits from exclusivity in the advancement of cybernetics and informatics as their impacts shape the formation of a global society in the short run, mid-run and long-run? Would there be greater general benefits and top end benefits if cybernetics and informatics were more broadly implemented simultaneously in all communities contributing to “sustainable glocalization”?
- What role does cybernetics and informatics play in the “Continuum of Authority of Knowledge? Who is deciding what accurate expertise is and what is truth, facts and fiction, history and memory? As we shift from a controlled to democratically mediated determination of what is truth, factual, expert, ethical and wise from a few (legitimate and verifiable, accountable and transparent with defined standards) sources to many sources (open-ended, ad hoc, unaccountable, unverifiable sources) are cybernetic contexts and informatics strategies amoral, irresponsible, unethical and disinterested in what they are purveying, facilitating, delivering and expediting?
- Are cybernetic content constructs and informatics technologies and techniques amoral (value free) and only contribute to, diminish, or detract from the human, social, cultural, economic and political progress in the heads, hearts and hands of the

interdisciplinary interveners and practitioners? Or should governmental or non-governmental regulators be inserted for the widest representation of all interested parties.

AN INTER-DISCIPLINARY INITIATIVE IS APPROPRIATE

Social Sciences, Information Sciences and Education disciplines could intervene and provide some clarity among vagaries, some equity among disparities, some accountability and transparency for the protection of creators, innovators, consumers, producers alike in an era wherein Information, Communication, Technology and Service produce more new wealth than any other combination of resources today and in the near future.

CONCLUSION: Cybernetics and Informatics Intermediate Dynamic Infusion- But not Acceptance-of Means to an End

Ironically, self-protecting iconic unions and a self-serving iconic corporation inhibit the widest participation and most inclusive access to prosperity for local and global citizens through cybernetics and informatics as a means to enjoy, empower, equip, encourage, engage and enlighten themselves today by their self-centered, self-serving, selfish behaviors – avoiding accountability, transparency and proof of measurable outcomes, as suggested by the role of a dominant search engine globally and two major teacher unions efforts to maintain their exclusive domination (warding off competitive innovation in one case and measurable successful performance/results in the other) of their respective fields. (Reported in the New York Times Business Sunday and New York Times Magazine 5/23/2010). The pathway to “sustainable glocalization” is made up of “stepping stones” and “stumbling blocks” that can be organized by cultural, social, economic and political forces, expedited by effective education and facilitated by cybernetics and informatics or not.

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Oracle, meeting ground or learning community?

Teachers' use and evaluation of the web-based guidance service "Teachers' Forum".

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ABSTRACT

The article employs a phenomenological framework of understanding and presents an analysis of selected queries raised by teachers on the web-based guidance provision Teachers' Forum. The analysis looks particularly at the extent to which teachers explicitly describe their own practice in relation to the problem that is presented. The analysis shows that a significant proportion of the teachers do not position themselves as actively involved in the problems they raise. The article discusses understandings of this and the consequences it can have for the guidance process. The article also discusses how systematic analysis of the enquirers' questions can yield tools that may be of help to the guidance process.

Keywords: Online guidance, teachers, survey, phenomenology, professional support.

1 INTRODUCTION

The project "*Practice-based guidance in school teaching*" project (the PVG - project) was started in 2006, with twin aims:

To develop a web-based service for teachers and student teachers in Norway. The service will provide help in connection with all practice-related problems that teachers bring into the forum ..." and thereafter

"... to yield information about significant aspects of this web-based guidance service, especially with a view to assessing the possibilities this medium has to offer for the field. The project will contribute to strengthening both research and the practical basis of teacher training by exploiting the possibilities inherent in a more extensive use of the electronic network (Skogen and Sjøvoll 2006).

The web-based service "*Teachers' Forum*" was set up in autumn 2006 as an open website, "www.laererforum.net", in which anyone who performs a simple registration procedure can write messages including questions to the forum, with the possibility of commenting on others' entries. A team of advisors provides rapid answers to questions, often in the course of 1-2 days. The usage of the forum is now great enough to develop research-based findings through the data possessed by the forum.

A questionnaire-based survey was carried out in spring 2009 amongst Norwegian users of the Teachers' Forum. The survey took as its basis the research questions outlined in the project description and its intention was to increase our understanding both of people's knowledge and use of the forum and of how users regarded it. Assessment of the forum involved both consideration of its practical use and an assessment of the extent to which use of the forum could contribute to people's improvement of their own practice. In addition, the survey aimed to find out more about how teachers regard their access to guidance and professional support at their own workplace. Knowledge of this can provide some pointers for assessing the need for a web-based guidance system such as the Teachers' Forum. Our attention was principally directed towards the users of Teachers' Forum, their knowledge, choices and views. This article builds principally on findings from the questionnaire, supplemented by statistical data concerning the use of the Teachers' Forum on the website www.laererforum.net.

2. THEORETICAL BASIS – UNDERSTANDING OF WEB-BASED INTERACTION AND LEARNING

2.1 What is web-based learning?

The terms "*e-learning*", "*web-based learning*" and "*online learning*" are all used in connection with learning processes involving interaction and access to specialised resources with the help of ICT tools . Goodyear, Banks, Hodgson & McDonnell (2004) choose to use the term "*networked learning*" and provide the following definition;

"...learning in which information and communications technology (ICT) is used to promote connections: between one learner and other learners; between learners and tutors; between a learning community and its learning resources. (Goodyear, Banks et al. 2004 p. 1)

If we compare the description of the "*Teachers' Forum*" to this definition, we can see that the elements mentioned are also found in the "*Teachers' Forum*". There is the learning element, in which ICT is used to create

connections; between one party in a learning situation and others who are in a learning situation; between those who are in a learning situation and their advisors and between a learning fellowship and the learning resources. It is also relevant to speak of "learning resources" in connection with the Teachers' Forum in the sense that people recognise as "learning resources" other teachers' portrayal of problems, colleagues' commentaries on these and the replies made by the advisers. It is also assumed that the term "learner" is not narrowly connected to participation in a formal learning programme but that "learner" is understood simply as being in a learning process. (Lauvås and Handal 2000; Vygotskij and Kozulin 2001; Dysthe 2003).

2.2 Perspectives on web-based learning

Goodyear, Banks *et. al* (2004) describe three different perspectives on knowledge and learning that can form the basis of development of web-based interaction and learning. One perspective bears the hallmarks of liberation or radical pedagogy (McConnell 1994) in which emphasis is placed on the contribution of dialogue to questioning assumptions, for instance in relation to one's own practice. Another perspective is based on didactic-psychological thought, which examines the connection between dialogue and understanding and between collaboration and problem solving. (Dillenbourg 1999) A third perspective is to look at web-based learning as participation in a fellowship of practice and to understand learning as moving from peripheral to less peripheral participation in the fellowship. (Lave and Wenger 1991).

Gunawardena (2003) claims that academic groupings have increasingly had a constructivist understanding of web-based learning and have made use of learning principles based on a social-constructivist understanding. Gunawardena distinguishes between a constructivist understanding, (Säljö 2001; Vygotskij and Kozulin 2001; Peavy 2006) which emphasises the individual's own construction of knowledge and frameworks of understanding, and a socio-constructivist understanding in which *"we will attempt to analyze how knowledge is co-created by the members of a group, by a process of negotiating of meaning within the group"*. (Gunawardena 2003 p. 95).

3. DESIGN AND METHODS

3.1 A survey

According to Ringdal (2007) a survey is "a standardised questioning of a large representative selection of people" The research that was carried out amongst the users of the Teachers' Forum in the period 31.3.2009 to 15.5.2009 was a typical survey. An invitation to take part in the research was issued to all 229 registered users of the Teachers' Forum. The survey was carried out in the form of a web-based questionnaire.

3.2 Population, selection and opportunity for statistical generalisation

The population of this survey is drawn from amongst registered users of the Teachers' Forum. Of the 229 who were invited, 78 replied, giving a reply proportion of 34.06 %. With this approach, the selection criterion was that those asked were willing to reply: a so-called self-selection. A certain imbalance is implicit in this type of selection which means that the selection cannot be regarded as "random". This precludes statistical extrapolation of findings into the population as a whole. There is however a distinction between statistical generalisation and analytical generalisation. In an analytical generalisation there is a discussion in relation to each individual query concerning the extent to which it can be academically justifiable to transfer tendencies and patterns from the selection into the population at large.

3.3 Development of the questionnaire

In the development of the questionnaire, emphasis was placed on aspects that may affect both the percentage of replies and the validity of the study, such as the layout and structure of the form, the presentation of the questions and the order and wording of the questions. Those questions that involved an element of judgement were set out as statements for which the respondent could give a response on the so-called Likert scale, a five-stage scale graduated from "entirely disagree" to "entirely agree".

4. FINDINGS

4.1 Access to guidance and professional support at own place of work

One of the questions read as follows: *"What opportunities do you find for guidance and support in your daily work?"*

Here we found that less than 11 % reported that they had regular for guidance in their work, but 80 % reported that they had the opportunity of professional discussions with colleges. Almost 74 % reported that they had colleges they could ask for advice.

4.2 How is the Teachers' Forum used?

Two questions in the survey are particularly suited to describing how Teachers' Forum is used: *"For what purpose have you used Teachers' Forum?"*

Here we found that 94 % had read postings and commentaries, and 55 % had sent in own postings, and 44 % had commented other's postings.

And the other question is: *"If you have received a reply to questions posted on Teachers' Forum, what did you do with the reply?"*

Here we found that 78 % had read the replies, 69 % had given the replies a careful consideration, 65 % had discussed the replies with others and 39 % had tried out measures suggested in the answers.

4.3 How is Teachers' Forum regarded?

The questions in this part of the survey demanded answers on two different levels. Some of the questions were concerning the observed qualities of Teacher's forum as such, while other questions were concerning the experienced effects of using Teacher's forum. A clear tendency was that the answers were positive to several qualities of teacher's forum as such, but more doubtful when it came to questions regarding the effects of using the forum. If all respondents entirely agreed to the positive statements, that would give a score of 5,00. We find that questions regarding qualities give a mean score of 3,91, but questions regarding effect give a mean score of 3,65.

5. DISCUSSION OF FINDINGS

5.1 Use of the teacher's forum

The first question that tells us how Teachers' Forum is used is "For what purpose have you used Teachers' Forum?" We see that a certain proportion of respondents have used the forum to read the posts and comments of others, without sending in their own posts. A quote from the survey's only freely-formulated question can illustrate this:

"... it is excellent that such websites exist where one can sit down at leisure and look for relevant information ..."

This kind of use of Teachers' Forum provides an opportunity to draw on ideas and read about topics of interest, but also in some cases to get answers to questions through finding queries that address the same issues. This use of the forum raises thoughts in the direction of what Lave and Wenger describe as "legitimate peripheral participation". Legitimate in the sense that the forum does not restrict access to reading other people's problems and peripheral participation in the sense of gaining insights without revealing anything of oneself. In this type of understanding, writing a post for the forum, or commenting on others' posts, involves a movement towards a less peripheral role in the learning community. Furthermore we can see a far greater correspondence between the number of respondents who have submitted their own posts to the forum (54.9%) and those who have commented others' posts (43.9%). On the basis of a socio-constructivist understanding of learning, I would suggest that what is described in the survey as commenting on other people's posts also is a kind of learning. There are far more people involved in a learning process than merely those who receive individual answers to "their" problems.

The next question relates however to those who have posted one or more queries to the forum and who have received answers. "If you have received replies to your posts on Teachers' Forum, what did you do with them?" It is here that we get our first surprise: that only 78.4% claim to have read the reply. My assumption is that this relates to someone who has taken part in the shaping of other peoples' queries, for instance as students doing group work, without feeling a personal interest in the actual query.

In addition, 68.6% state that they have "thoroughly thought through the replies". The next reply alternative is: "I have discussed the answers with others". 64.7% answered this question affirmatively. This is an interesting aspect in that it represents a link between Teachers' Forum as a potential learning community and other potential learning communities, such as fellow teachers. This must be balanced against the relatively modest agreement with the statement "My use of the Teachers' Forum has contributed to professional conversations with colleagues". The average value here is 3.55. What we can say on the basis of this is that the use of Teachers' Forum to some extent generates professional conversations in other contexts, but there is no basis on which to claim that this occurs to a great extent.

It is also interesting to see that 39.2 % reply that they have "tried out solutions recommended in replies". This question implicitly requires that answers in Teachers' Forum recommend courses of action. This touches upon the understanding of what form of guidance is being given in the forum. Is it a matter of a dialogue in which basic preconceptions in a problem are being challenged, or is it a matter of an answer that is more fundamental to a course of action and in which some particular measure is recommended? That nearly 40% of respondents state they have tried out measures recommended in Teachers' Forum points in the direction of a significant proportion of submitted replies containing recommendations for courses of action.

5.3 Assessment of Teachers' Forum

User-friendliness

Three statements deal with different aspects of the quality that can be described as user-friendliness: "I think that registration in Teachers' Forum was straightforward" (3.93); "the division into guidance areas was convenient" (4.46) and "The website provides good information about the use of Teachers' Forum" (4.41). That the statement regarding registration in Teachers' Forum scores an average of under 4.00, which equates to "partially agree", points in the direction of there being some room for improvement in relation to lowering the threshold for using the forum.

Professional quality and experienced effect.

As mentioned earlier some of the statements are directed specifically towards Teachers' Forum as such or towards qualities that it possesses. One example of this type of statement is "*Teachers' Forum raises issues that are relevant to my own practice*". The other statements are largely directed towards the effect of using Teachers' Forum. An example of this type of statement is: "*My use of Teachers' Forum has contributed to professional conversations with colleagues*". It should be noted that this division is subjective and that we cannot speak of a clear distinction between the two categories.

A possible explanation of this is found in the question: "*How often do you use Teachers' Forum?*" – to which only 5.6 % state that they have visited the forum several times a week. 31.9 % state that they have visited the forum a few times a month and 51.4% state that they have visited the forum a few times a year. This does not suggest that the general pattern is of particularly frequent use of the forum. Against this background we can understand that the experienced effect of using the forum is not as high as the potential that a large proportion of respondents claim to see in the forum.

Relevance, a quality of Teachers' Forum?

Several of the statements touch directly or indirectly on the question of the professional relevance of the forum. "*Teachers' Forum takes up issues that are relevant for my own practice*" (4.39); "*Teachers' Forum has given me skills that I can use in my daily work*" (4.17); "*Teachers' Forum has given me factual information that I can use in my daily work*" (4.06) and also the "reversed" question "*I have found the advisor's answers to have little relevance*" (1.76). That several items, all of which deal with the same qualities, all score relatively highly provides a basis for suggesting that the professional content in Teachers' Forum is overwhelmingly regarded as relevant by the respondents. The statements do not distinguish clearly between the qualities of "relevance" and "usefulness". There is therefore reason to assume that these answers contain a positive assessment of the quality of the replies which has broader implications than simply that they are thematically "appropriate". There is also reason to assume that users who have experienced the content of Teachers' Forum to be relevant may have been more inclined to answer a survey of this sort than users who have found the content to be irrelevant.

What form of guidance is given in Teachers' Forum?

Amongst other things the survey aimed to find an answer to what sort of help respondents found from Teachers' Forum. We saw earlier that nearly 40% stated that they had tried out measures suggested by Teachers' Forum. The statement: "*Teachers' Forum has given me concrete advice in relation to my own practice*" gains a medium-high approval rating, with an average of 3.92. This points

towards a form of guidance which for some people has had significant emphasis on concrete advice with recommendations for action. It is however difficult to affirm that respondents see this feature of the forum in opposition to other qualities such as reflection. In fact, the statement "*Teachers' Forum has contributed to reflection in respect of my own practice*" receives a higher approval rating, with an average of 4.29. In addition we observe a positive correlation between these two dimensions. The same people who agree that Teachers' Forum provides "*concrete advice in relation to my own practice*" also have a tendency to agree that "*Teachers' Forum has contributed to reflection in respect of my own practice*". There is, incidentally, even stronger correlation between the items "*reflections over my own practice*" and "*Teachers' Forum has given me factual information I can use in my own practice*".

Qualities experienced at a relational level

Some statements deal with how respondents have experienced the relational qualities of responses from Teachers' Forum. Examples of such statements include "*The adviser has shown genuine interest in my post on Teachers' Forum*" (3.65) and "*Teachers' Forum has given me support and recognition*" (3.5) and the "reversed" statement "*I have found that the adviser has talked down to me*" (2.44). The positively-formulated statements both score under 4.00, which would have been the average if everyone had claimed to be "partially in agreement" with the statement. These responses can hardly be interpreted as a unanimously positive assessment. A possible way of understanding this is that the group of advisers, along with any fellow teachers who have made responses, have not emphasised, or have not fully succeeded in signalling, a genuine interest, support and recognition in their responses. Another possibility is that the respondents in general have a somewhat distant relationship to Teachers' Forum, such that a positively-meant formulation in Teachers' Forum nevertheless fails to create an impression of support and recognition.

6. CONCLUSIONS AND ISSUES TO BE RAISED IN FUTURE RESEARCH

6.1 Who can this study tell us about?

With reference to previous discussion of the application of this study beyond the initial selection, my view is that the main reservation relates to the degree of satisfaction with the forum. I have highlighted degrees of satisfaction with user-friendliness, relevance and usability and with qualities on a relational level. Given that the purpose of this study is not to establish the extent to which Teachers' Forum as such as "good" or "bad" but to gain insight into teachers' use of and views on the forum, my assessment is that the study provides knowledge about the patterns and tendencies that are relevant in relation to further work with the assessment of web-based guidance, for example via the Teachers' Forum.

6.2 Oracle, meeting place or learning community?

Does this study provide any idea of the metaphor that can best describe Teachers' Forum? Much of the research on web-based learning (Goodyear, Banks et al. 2004; Perez and O'Neil 2006) consists of studies of people in a learning situation, in which participation in a web-based learning community forms a compulsory part of a course of study. A characteristic of such learning communities is that demands are made of participants, that a limited group can participate and that participation occurs over a period. In Teachers' Forum, these pre-requisites do not exist to the same extent. Use of Teachers' Forum is not mandatory, reporting of use does not indicate that regular use is the norm, and the forum is in principle open to anyone. Anyone who wishes to can freely read both questions and answers and anyone who goes through a simple registration procedure can post queries or make comments on other people's posts. On the basis of this survey we can thus say that significant external features of what Jobring defines as a learning community can only be found to a limited degree in Teachers' Forum. From a communication-theory standpoint, we could be more inclined to regard anyone who has posted queries or who reads, interprets, reflects on or sometimes comments on these queries participates in some form of learning community. One aspect is the external characteristics, but another is the understanding of participants. How are we to understand Teachers' Forum? In order to approach an answer to this we will probably need to use other approaches than the questionnaire. Jobring also uses the term "meeting place" in respect of the forum for web-based interaction. I understand the "meeting place" metaphor as a meeting of equals in which professional views are exchanged and in which a new understanding arises through the meeting of participants. Whether "meeting place" is an appropriate description of Teachers' Forum, or whether "the oracle" – providing the key answer – is a more suitable metaphor cannot be substantially answered on the basis of the findings from the survey. Perhaps we need to use several metaphors in parallel in order to describe the breadth of understanding and use?

6.3 Appreciation of the forum's potential – reservations in respect of experiences

The survey provides some grounds for claiming that the concept of Teachers' Forum is highly regarded by the respondents. Assessment was positive in respect to qualities such as relevance, usability and professional contribution. A significant proportion of those who have received replies from the forum report that they have tried out ideas that were recommended. It is true that there were not many freely-formulated responses, but they do give a very positive assessment of the concept.

One feature of the survey that I wish to highlight is the earlier mentioned tension between the positive potential seen in the forum by respondents and the use and experience that has been reported so far. What we can read from the survey points in the direction of the reported use of the forum and its significance for personal practice not being entirely in line with the consistently positive message that respondents are giving about significant aspects of the provision. If we draw on Kirkpatrick's model for evaluation, (Kirkpatrick 1998) there seems to be a certain disparity between level 1, which focuses on immediate reaction, motivation and interest, and level 3 which focuses on behaviour and how knowledge, skills and attitudes are used in practice. This sort of pattern can be related to several issues. I have already touched on the time aspect. Questions relating to how the concept has been implemented and how the provision is known and regarded by school management and colleagues form another aspect.

6.4 Theoretical divisions – little significance in practice?

It is also interesting to note that the division between reflection reflection (Lauvås and Handal 2000; Jobring and Carlen 2005) and concrete advice recommending specific courses of action, which receives considerable attention in the literature, does not appear to be regarded by the respondents as a distinction between opposites. Similarly there is no distinction between concrete advice and more formal factual information. Those people who regard Teachers' Forum favourably in respect of one of these aspects, such as contributing to reflection over one's own practice, also generally regard the forum in a similarly positive light in relation to practical advice and to factual information. It is possible that respondents regard these qualities as dissimilar, but not contradictory, aspects of receiving help, or perhaps they regard the various qualities as different phases within a process? So far we do not know to what extent the system managers and the group of advisers in Teachers' Forum share the opinions of the respondents, or whether they perceive a greater distinction between these qualities.

6.5 Questions for future research

The questions that remain after this survey serve in themselves to highlight the limitations of a questionnaire-based survey containing largely pre-determined alternative answers. We do get, albeit sometimes only to a limited extent, answers to the questions that were asked when the questionnaire was devised and we do find out about the extent of phenomena to a far greater extent than we find out about the understanding of phenomena. To gain more knowledge concerning how teachers relate to a web-based guidance provision such as Teachers' Forum there are other appropriate sources of information. The textual material consisting of users' enquiries and the responses of advisers and colleagues is available for analysis. Furthermore, it is possible to contact individual

users of the forum to gain more knowledge by means of research interviews . In addition, on the basis of an action research approach we can examine the entire dynamics of the development and implementation of Teachers' Forum and consider individual observations and entity on the basis of this perspective.

Several questions emerge in the course of work with the available material. One such question is the relationship between individual teachers' use of Teachers' Forum and guidance and professional support within their place of work. It is possible to imagine several types of relationships. Do the two guidance "arenas" compete such that good access to and extensive use of the one means less use of the other? Or is it the case that a focus on and culture of guidance in the place of work produces a greater demand for guidance from all available arenas? One can also imagine a form of interaction, in which discussions and ideas presented in Teachers' Forum and at the individual workplace could mutually propagate each other. Such questions again raise the issue of the legitimacy of Teachers' Forum in the eyes of management and colleagues, which again raises questions concerning the implementation of this type of provision. Is it to be a personal, indeed, private tool for the individual teacher, or can a whole school or nursery school take ownership of an arena of this sort?

We have a good deal of knowledge about the practical elements of use of Teachers' Forum, but we would like to have yet more knowledge about the types of problems teachers choose to bring into Teachers' Forum, how they present these problems and what sort of responses they desire and expect. A related question would be the degree of correspondence between user expectation or desire and the perceptions and expectations of those who have been central in developing and running the forum, in other words the project managers and advisory group.

There are many questions. The survey has helped to answer some of them but at the same time has raised new ones which perhaps demand other approaches to come closer answering them. For the moment, the field of practice is there, open for further research.

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Using Information and Communication Technology to Improve Citizen Access to e-Government Services

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Abstract: The paper present an approach, that consists on: (1) to organize geographically, autonomous and heterogeneous e-Government services for citizens, provided by many agencies, in a network of communities based on taxonomies of terms; (2) to use a single entry point implemented by a compressive middleware to manage the network of communities, to register e-Government services with the communities; (3) to provide support for navigating on the taxonomies of terms in order to select generic operations from communities, to invoke selected operation to execute e-Government services unregistered with the networks of communities. Expected outputs and results refer to: taxonomies of terms to cluster e-Government services; communities of generic operations for main domains from e-Government; network of communities and e-Government services; navigation and querying the network of communities to select generic operations in order to be executed; execution of generic operations by directing them to e-Government services registered with the network communities. Based on this approach, this paper presents an experimental system, designed and developed through the Romanian Research National Program, in order to provide easy and personalized access to online services for elderly persons.

Key words: E-Government services, Semantic Technology, Domains Taxonomy, Community Ontology.

1. INTRODUCTION

Accessing public services from several domains including social programs, healthcare, tax filing etc. posses bureaucratic challenges for all citizens. To capitalize on this trend, many agencies now offer online forms to access e-government services dedicated to citizens' needs. Unfortunately, such efforts had a little effect in the lives of citizens in terms of their receiving better care and services.

The WebAgeing experimental system was developed through a research project, financed by a Romanian National Program. This system takes in consideration the

European approach regarding service accessibility and initiatives concerning semantic Web Services. Regarding services' accessibility, WebAgeing system is based on 'Web Accessibility Initiative' (WAI) created by W3C group¹, that offers a guide concerning the projection and structure of Web services. Regarding the semantic initiatives for the modelling of Semantic Web Services (SWS) there are two types:

- initiatives that require anthologies' defining for the representation of any aspect of SWS (for example OWL-S, WSMO);
- initiatives that encourage the extent of the actual SWS, with open possibilities to reason over SWS definitions, in the purpose of extracting service capabilities, in order to match these capabilities with the ones demanded by the clients (for example METEOR-S, WebDG, WSMX).

WebAgeing approach, being part of the second type of initiative, takes in consideration the following technologies and standards: WSDL, WSDL-S, UDDI, RDF-S, OWL, OWL-S, SOAP, HTTP, RMI. The following European projects address certain aspects relevant to WebAgeing approach:

- SENIORWATH addresses the need for a better understanding and monitoring of web services for the ageing population;
- HealthService24 is a eTEN project, that validates a new platform for the continuous elderly monitoring. Thus, the senior citizens are equipped with sensors, driven by a mobile phone. The measurements are sent wireless to a medical centre where the data is analyzed immediately and the personalized feed-back is sent to the patient in real time;
- SENIORITY, a eTEN project, that uses ICT to furnish quality models for the European sector for care for the elderly;

¹ <http://www.w3.org/>

- Onto Gov (Ontology-enabled E-Government Service Configuration) (<http://www.ontogov.com/>), a deploying IST project whose objectives are the development, testing and validating a semantic-enriched platform (using anthologies), that will ease the consistent composition, reconfiguration and evolution of government services;
- Semantic Gov is a project that helps the analysis, display, implementation and evolution of an intelligent and integrated platform for furnishing services in public administration. The project is based on the paradigm of Architecture oriented Services (SOA), implemented through the Semantic Services technology.

Other projects taken in consideration for the approach of WebAgeing are the following:

- WebDG project, that concentrates on the composition of Web services and on keeping the data confidentiality
- METEOR-S project, that furnishes the semantics at the data level, functional, non-functional and executive.

WebAgeing approach exploits the results obtained from projects mentioned above and adds to there results, mechanisms for:

- Organizing services destined for the elderly in communities based on semantic domains, communities that are defined by a set of semantic attributes, that identify the community (community category, community synonyms and community specializations). A collection of generic operations is identified through semantic attributes (operation category, purpose of the operation, operation synonyms, and operation specializations) include in-out parameters, rules of the operation eligibility etc. For the loading of semantic attributes values different standards are used, like: NAICS (North American Industry Classification System), UNSPPSC (Universal Standard Products and Services Classification), Rossetta Net, cXML, EDI etc.
- Service registering with semantic communities, using matching algorithms between generic operations of the communities and concrete operations of Web services.
- Personalized composition of services, based on rules and regulations from the domain of accessing services and on user profile. The rules and regulations for accessing services by the ageing population are implemented using relationships between generic operations (pre-operations, post-operation) and eligibility rules attached to generic operations.
- The interrogation of communities' collection as a data base. The user has the possibility of consulting the communities in the purpose of

selecting generic operations to be included in the users' demands.

- Ensuring information security and confidentiality for Web services, using credentials and data filters. The security and confidentiality policies can be found and recorded with the user profiles.

The innovative character of the approach used in experimental system consists on: domains taxonomy including interest domains (synonyms) for citizens; functions taxonomies including interest operations (synonyms) for citizens; organizing Web services to be easily discovered at run time (communities based on term taxonomies, each community having a single domain of interest, selected from domains taxonomy, and a collection of generic operations selected from functions taxonomy); agile integration of Web service, matching of service capabilities with community capabilities using service ontology and community ontology.

2. WEBAGEING SYSTEM DESCRIPTION

The main objective of the WebAging system is to provide easy and personalized access to online services (services provided by government agencies, non-governmental agencies, foundations, institutions, trade organizations etc) for elderly persons. In this context, WebAging system organizes Web services in communities, each community corresponding to a domain of interest for elderly people. Communities in their turn are organized in a hierarchical structure using domains taxonomy. This organization provides elderly people with an easy access to Web services designed for them. Elderly people will browse among the nodes of Domains taxonomy and will select generic operations in order to invoke them, without the need to know details about Web services that will be executed as a result of invoking generic operations. Mapping generic operations over the concrete methods of Web services that implement these generic operations is provided by the system. Semantic structure of domains (synonyms, etc) as well as the semantic structure of generic operations (function, synonyms of function, the role of Input/ Output parameters), enable elderly persons to easily make a selection of interest areas and then the generic operations to be invoked.

The WebAgeing architecture (fig.1) is „open middleware”, and it is based on semantic technology able to provide personalized composite services to ageing persons according with their profiles.

Based on this architecture Web Ageing system provides the following functions:

- definition and management of domains taxonomy, including interest areas for services designed for elderly people (social, health, etc.);
- definition and management of Web services descriptions;

- services registration in WebAgeing;
- user profiles management and customizing services access;
- Web Services execution.

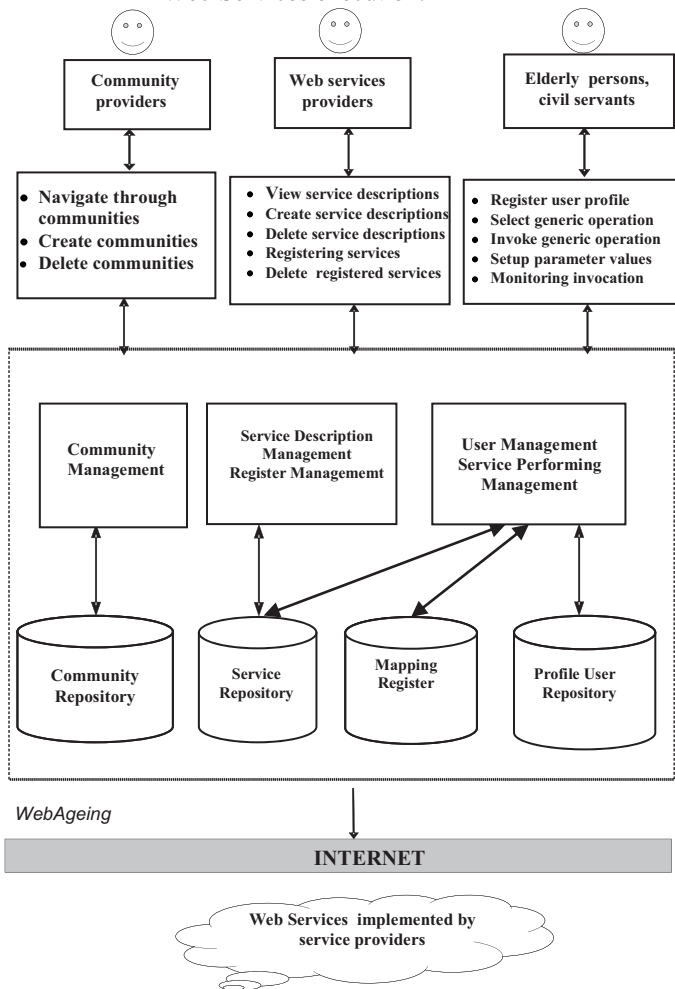


Fig. 1. WebAgeing architecture

In order to perform these functions WebAgeing contains the tools for request management and use profiles addressed to the WebAgeing system, such as: *instruments for the management of requests addressed to the WebAgeing system by the community providers; instruments for the management of requests addressed to the WebAgeing system by the web service providers, the management of requests addressed to the WebAgeing system by the elderly.*

2.1. The management of requests addressed to the Webageing by the community providers

In order to create the experimental system, during the project stage, there have been identified communities that belong to different fields. For example, for the social field there have been identified 14 communities as follows: *institutionalization prevention (home care), elderly assistance. elderly home, retirement legislation,*

elderly people banking services, document issuing by the public institutions, taxes, legal counseling for elderly persons, bill payment, housekeeping services, home sanitation, online shopping. Each community supplies specific information through the operations defined for them. For example, The Elderly Club Community offers information regarding elderly clubs in different towns through operations such as: registering the list of towns where there are elderly clubs registered with the community, registering the club list in the selected town, information regarding location and timetable, information regarding types of activities in the respective club, information regarding access conditions for the elderly. The community providers interact with the WebAgeing system, by using orders such as: Navigation on community taxonomy (fig.2), New community set up, deletion of existing communities.

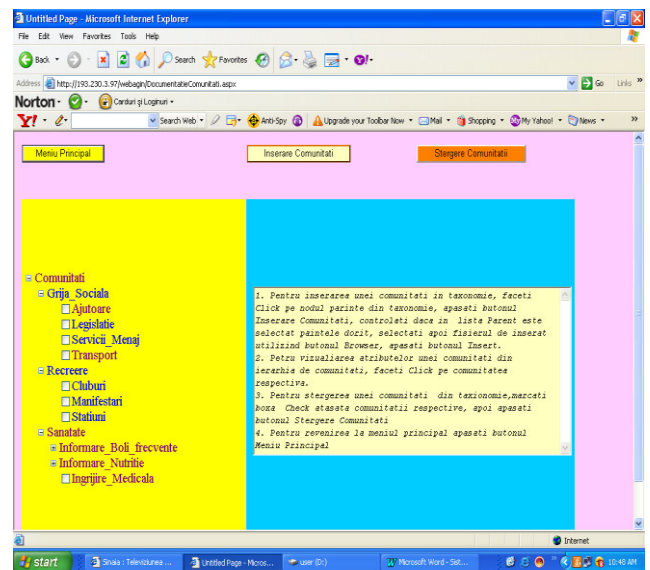


Fig. 2 Community taxonomy

Community providers navigate on the community taxonomy with the aim of visualizing the existing communities in the WebAgeing system, such as the visualization of communities (*digestive diseases, endocrinology, heart diseases, bone diseases, lung diseases*, etc.) of the “*Frequent_Disease_Information*” class. The visualization process can also be expanded. For example, for the *digestive disease* community, the generic operations which can be visualized are as follows: *liver-cyrosis, biliary_cyrosis, gastritis, liver insufficiency etc.* The expansion process can continue with syntactic and semantic attributes of the generic operations.

2.2 Management of requests addressed to the Webageing system by the Web service providers

This function of the WebAgeing system allows:

- **The visualisation of the Web service description**

After log in, the Web service providers can visualise the description of the above-mentioned services stored in the system. By selecting the **Attribute** button, the system will list the attributes of a service description, such as: *bindings, methods, types of data, methods' data inputs and methods' data outputs.*

- **Creation of new descriptions for Web services**

The providers of Web services are able to create folders containing the description of Web services developed by them and upload such descriptions in the WebAgeing system, by using the system's interface if such description complies with the extended WSDL format.

- **Deletion of Web services' descriptions from the system**

A provider of Web services is allowed to delete the description of a Web service from the system if the user deleting the description is its actual owner. Otherwise, the respective description will not be deleted.

- **Registration of services in communities contained in the taxonomy of communities**

In order to map generic operations with the methods used by the Web services, the system checks, with the help of the matching algorithm, if such mapping is possible, as follows:

- the generic operation and method have the same domain or similar domains;
- the generic operation has a number of input arguments equal or higher than the method's number of input arguments;
- there can be established a correspondence between the types of data of the input arguments from the generic operation and method.
- **Management of mapping registry: viewing the mapping registry; deleting records from the mapping registry**

The service providers are able to see the contents of the mapping registry or delete the registry's records.

2.3. Management of demands addressed to the Webageing system by elder persons

The elderly and public servants may access the WebAgeing system using Login, which encloses the following buttons: **Community Management, Service Management, Service Access, Administration.** Such buttons are activated/deactivated depending on the role of the user filling in the Users and Password fields and selecting the Login button. For instance, if the user is a service provider, the Service Management button will be activated and if the user is a community provider, then the Community Management button will be activated.

The requests addressed to the system by the elderly refer to:

- The selection of a generic operation for the purpose of generating the precedence tree – the system allows the user to select a generic operation for the purpose of generating its precedence tree.
- Generating the pre-operation tree attached to the selected operation.

The pre-operation tree is defined by: the tree root is the selected generic operation, level 1 of the tree contains the generic operations to be invoked prior to the root operation, Level 2 of the tree includes the generic operations to be invoked prior to each operation on level 1, level n of the tree includes all the generic operations to be executed prior to the operations on level n-1.

The generated tree depends on the values of the attributed stored in the profile of the user who selected the generic operation.

- Execution of the pre-operation tree

The execution of the pre-operation tree involves invoking of each generic operation in the tree, starting with the terminal nodes. Invoking a generic operation involves:

- Screen display of the control attached to the invoked operation.
- The system selection of a concrete method which implements the invoked generic operation.

3. CONCLUSIONS

WebAgeing system was developed in order to increase in the access of the elderly persons to their services. This system provide to the elderly persons the facilities to select the communities and generic operations (targets), the performing of the operations, the vizualization of the results following the performing of the generic operations. The precedence relations between generic operations allows to access the services for elderly persons according to the legislation and regulations in force.

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***<http://www.webserviceshelp.org/wsh/Practices/Interoperability/Designing+the+WSDL.htm>

Information and information services in educational portals in Spain

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ABSTRACT

This study aims to show the existence of educational virtual portals in Spain, a content analysis methodology and preferences by gender and users. We have applied the techniques of pre-selection of sites under the criteria of preliminary survey, design and validation of a form type of content analysis and a questionnaire for data collection of the target population, and protocols for in-depth interviews and group discussion. As results, are clearly among others: *educational portals are web sites that provide information, data search, teaching resources, tools for interpersonal communication, education, entertainment and educational counseling*. Among the most important resources offered include: *didactic counseling and teaching and external courses, among those with the greatest need include references to laws and access to other media*. The recipients are students, trainees, teachers, parents, managers, general education professionals. In the assessing by gender is noteworthy that women especially appreciate any information on subjects of study, graphs, drawings, samples and sound digitization. Males values the existence of information to do a job, the organization of the home page and interesting multimedia content.

Palabras clave. Portales, Comunidad virtual, Innovación, Recursos, Valores.

Key words. Websites, Virtual communities, Innovation, Resources, Values.

1. AN APPROACH TO THE SUBJECT OF INVESTIGATION.

This study is part of the research project entitled "Cybermedia: innovations, processes and new developments of journalism on the Internet, mobile telephony and other knowledge technologies" (National Plan R & D-Call 2007 SEJ2007-67138). The principles and objectives developed in the memory try to glimpse the new cybermedia and sociocultural horizon that opens within the information society and its transformation into knowledge society (p. 6), learn the uses and journalistic applications of the web sites (p. 5), understand and systematize the diversity of information services that generate and check its building and other developments (pp. 12 and 13) are some of the major social issues of concern discussed in this study. Internetlab, Council for Scientific Research (CSIC) under the Ministry of Science and Innovation, has just published the second edition of the Ranking Web of Universities 2008 (<http://www.webometrics.info/>), which measures the web presence of universities worldwide. In this edition, the ranking stands at 25 Spanish universities among the top 500 in the world.

According to researcher and project leader -Isidro F. Aguillo- the purpose of this ranking is to assess the presence on the World Wide Web global universities, promote open access to scientific publications and academic material. The used indicators are not based on the number of visits or page design but in the operation and the global visibility of universities. Among European universities, highlights the weight of Germany by number of universities, but are the British and the Nordic which represent the first places. Cambridge University remains the leading European university in the web, ranking number 26. The study found that "it remains a digital academic divide since, among

the top 200 universities worldwide, 123 are American (106 U.S.), while Europeans place only 61 universities. Asia-Pacific has 14 universities in this group and Latin America only two. Of the 61 European universities located among the 200 best in the world, the only Spanish is the Complutense, who is ranked 140.

In the Ranking Web of Universities 2008, the CSIC Internetlab increased global coverage and has paid more attention to developing countries, especially Latin American institutions, African and Arab world. As regards research centers, the list is led by U.S. institutions like the National Institute of Health or the National Aeronautics and Space Administration (NASA). For Spain, the State Agency of National Research Council is better placed worldwide institution, ranked 28, followed by Spanish Iris Network R & D, in position 37. Link to full ranking: <http://www.webometrics.info/>. Given the proliferation and use of portals, we can establish the following types:

- **Megaportals or general portals.** Portals are designed for a wide audience, have general content and its claim is to cover the topics most in demand. They also offer value added services such as free web sites, virtual communities, chat, email, etc. This model, addressed especially to beginner users, is being outdated, in part, by the proliferation of such sites and because the market demand goes through the thematic specialization, geographic or corporate.
- **Corporate Portals.** They are dedicated to persons connected with a company or institution, tend to be a natural extension of corporate intranets, which is provided to employees of company information and links to public sites and vertical market.
- **Specialized or thematic portals.** They are aimed at users interested in a particular subject, specializing in a particular issue.

2. RESEARCH DESIGN.

2.1. Objectives.

1. Know the map of Spanish language portals which for their intrinsic and extrinsic characteristics can be called educational.

2. Determine a set of objective and verifiable elements to enable quality assessment and input from them.
3. Analyze the variables and categories that take part in each.

2.2. Methodology.

Based on the proposed targets and the few specific investigations so far on these issues, we have considered to use the following method:

1. *Observation.* Initial tour of educational portals inventoring significant elements of valuable contributions to the learning process.
2. *Documentation.* Inventory those sites that best suit what may be a permanent virtual training proposal.
3. *Designing a model of quantitative and qualitative form* that would quantify and record singularities of each portal.
4. *Quantitative and qualitative analysis* of the data and their interpretation.

3. THE SAMPLE: SELECTION OF SITES FOR ANALYSIS.

We have selected 17 portals as a representative sample. We have taken into consideration as criteria, the diversity of addressees, the frequency of use, availability, accessibility and seniority. These are:

1. Educared <http://www.educared.net>
2. La carabela del conocimiento - <http://www.lacarabela.com>
3. Becas.com. <http://www.becas.com/>
4. Embusa.es <http://www.embusa.es>
5. Fundación Caja Madrid <http://www.fundacioncajamadrid.es>
6. Servibeca. <http://www.servibeca.es>
7. Alphacom <http://www.alphacom.es>
8. Educaweb: <http://www.educaweb.com/>
9. Agencia nacional Sócrates . <http://www.oapee.es>
10. profes.net. <http://www.profes.net>
11. Actividades Educativas culturales <http://www.aec-spain.net/>
12. Aula virtual. <http://www.educoea.org>
13. Educasites – <http://www.educasites.net>
14. El rincón de los becarios - <http://www.becarios.com>
15. Selectividad.info-<http://www.selectividad.info>
16. Universia - <http://www.universia.es>
17. Educamadrid. <http://www.educa.madrid.org>

4.- QUANTITATIVE AND QUALITATIVE ANALYSIS OF SELECTED INFORMATION.

Codified, systematized and analyzed the data of the 17 educational portals, we present the following tables and their interpretations.

Global data of the 17 Portals																		
Main services offered																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Informational	News	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x
	Agenda	x					x		x		x							
	Legislation			x	x	x						x						
	Media access				x	x		x			x	x	x			x		x
	Educational Resources Information		x	x	x	x		x	x	x		x	x	x	x	x		x
	List of study centers	x			x	x	x	x	x	x		x	x	x		x	x	x
	Search Engines	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Training, teaching resources and counseling	Educational Tips						x		x	x	x		x	x	x	x		
	Courses on the Web		x	x					x	x	x	x	x	x	x	x	x	x
	External Courses	x	x	x	x	x		x	x	x	x			x		x	x	
	Educational materials: papers, notes ...		x			x		x	x		x		x		x	x	x	
	Dictionaries, atlases...							x				x						
	Educational Counseling	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
	Other Advices	x	x	x	x	x												
Media & Entertainment	Job Opportunities			x			x	x			x			x				x
	Classifieds			x							x		x	x	x	x		
	Access to forums	x	x						x		x			x			x	x
	Email Services	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
	Creating Blogs	x													x		x	x
	Creating forums	x	x											x		x		x
	On-line Translator							x										
	Online Games													x				

4.1. Analysis.

Of the 17 sites analyzed, we see how, except two, all other offers news and current information. Next in frequency in 13 of the cases analyzed the performance in terms of information on educational resources, schools, and search engines. It is a little bit poor the focus on laws and access to other media resources.

We value after the quantitative and qualitative analysis of the benefits in the field of training, teaching resources and pedagogical advice that is a property well maintained and serviced in most portals, signifying especially educational counseling with 16 records, materials made available, as well as external courses and specifically those that can be viewed via the web. Surprisingly, almost half, 7 did not pay attention to dictionaries and atlases which are good educational tools.

Of the three dimensions analyzed, communications and entertainment are the least served. Some features as a translator and online games are only present in a portal. Access to forums and emerging blogs show an incipient presence. Data are similar to those obtained in another study entitled "Evaluation and development of skills in the use of virtual communication tools for the knowledge society throughout life." Order number: SEJ-2004-06803.

In assessing the technical aspects, we established four categories and five dimensions. The dimensions of inferior quality are the ease of use and originality and that in fifteen cases are given low ratings. As overall assessment, it is clear that the technical aspects do not have a very positive assessment.

Pedagogical dimensions are rated with positive categories as excellent, in 7 portals is rated the interest and the attractiveness and in 3 the matching of addressees. The four size ranges globally significant scores, being the didactic quality of the websites as the worst rated, in 15 cases is considered low.

5. CONTRIBUTIONS FROM THE DISCUSSION GROUPS.

To learn more in depth the assessment of these 17 portals, we have developed four focus groups each formed by six persons, in total 24 participants. Twelve women and twelve men aged between 21 and 24 years, all students of the Second Cycle of

Information Sciences. We developed previously a protocol with 11 questions, five closed and six opened, all of them involving quantitative and qualitative assessments. Interventions were recorded and analyzed and the results were grouped by gender and are as follows.

The numbers correspond to the sites mentioned and the digit that goes inside the parentheses corresponds to the number of times that this portal was encoded. Those who did not appear were not assessed.

Women appreciate the most popular portals which are Cajamadrid Foundation, Educared, Educaweb, The corner of Fellows and Universia. For women, sequential estimation would be: CajaMadrid Foundation, Universia and EducaMadrid The caravel. No differences were significant. In the category fair knowledge we have by women: CajaMadrid Foundation, National Agency for Socrates, The corner of Fellows and EducMadrid. Men set Educared, Educaweb, CajaMadrid Foundation, The corner of Fellows, Awards, Embusa, Selectividadinfo, EducMadrid and Universia are positively evaluated as very high by women: CajaMadrid Foundation, Universia Scholarships and Virtual Classroom. For men: Universia, EducMadrid, CajaMadrid Foundation and The corner of the fellows reaches a regular valuation and for women Awards, The corner of the fellows and Universia.

6. INFORMATIONAL LINKS.

In order to check the consistency, continuity and permanence of virtual spaces analyzed 8 months after the first analysis (May 2008, 1 February 2009) we are back to conduct another review to verify the cases listed, the links which hold the most new information. We present the results grouped by portals:

1. Educared <http://www.educared.net>.
2. La carabela del conocimiento - <http://www.lacarabela.com>.
3. Becas.com. <http://www.becas.com/>.
4. Embusa.es <http://www.embusa.es>.
5. Fundación Caja Madrid <http://www.fundacioncajamadrid.es>.
6. Servibeca. <http://www.servibeca.es>.
7. Educaweb: <http://www.educaweb.com/>.
8. Agencia nacional Sócrates . <http://www.oapee.es>.
9. profes.net. <http://www.profes.net> .
10. Actividades Educativas culturales <http://www.aec-spain.net/>

11. Aula virtual. <http://www.educoea.org> .
12. Educasites – <http://www.educasites.net>.
13. El rincón de los becarios - <http://www.becarios.com>.
14. Selectividad.info - <http://www.selectividad.info>.
15. Universia - <http://www.universia.es>.
16. Educamadrid. <http://www.educa.madrid.org>.

7. CONCLUSIONS.

1. The portals that aim to offer integrated educational services in the same web site, have the intention to become the essential and necessary reference in terms of educational resources in the school community. If they finally manage to enter the teaching and become the desired reference although it is necessary to articulate clear mechanisms for documentation, evaluation and standardization for these spaces.

2. Contribute with a full integration of educational technology to train professionals in higher average levels, higher and postgraduate, to the generation of knowledge and the tasks of social integration and extension.

3. Motivate and support the development and production of multimedia educational materials, incorporating educational technologies such as video, television, audio, web pages, online courses, educational software and audiovisual media.

4. Promote access to extensive resources and information and communication services such as: *audiovisual, telecommunications, library collections, digital libraries, online educational materials, multimedia and information banks internal and external.*

5. Support the strengthening in the academic unit, the various educational methods that promote innovative learning environments and collaborative work, such as Face and Distance Education, Virtual Campus Polytechnic, Open Learning Systems, Virtual Learning Environments and Virtual Communities.

6. Sensitize, train and advise to the community of the academic unit for the use and development of educational technology.

7. It is remarkable the following features that come together in these virtual spaces: the recipients are

high school students, trainees, teachers, parents, training centers directors and education professionals. Most of them, 10, has addressed to two segments: teachers and students, alike. For access, in 16 cases is free. In one you need to register and obtain a password. Advertising is inserted in 8 portals. The other nine did not accept it. The links are highly correlated with the information line of each portal.

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<http://www.becarios.com>. (7 -11- 2008)
<http://www.becas.com/>. (3 -11- 2008)
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<http://www.educared.net>. (9 -10-2008)
<http://www.educasites.net>. (9 -10- 2008)
<http://www.educaweb.com/>. (9 -10- 2008)
<http://www.educoea.org>. (22 - 10- 2008)
<http://www.embusa.es>. (3 - 11- 2008)
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The Relationship Between Learning Styles and Student Learning in Online Courses

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ABSTRACT

Just as learning styles affect how students learn in traditional face-to-face courses, learning styles also influence student learning in online courses. This paper reviews multiple research studies that have addressed learning styles and student learning in online courses. Some of these studies have found a relationship between learning styles and student learning, while other studies failed to detect a significant relationship. Since different researchers have used different learning style inventories as research instruments, comparisons can not always be clearly drawn, yet each of these studies constitutes a contribution to the field of learning styles and online learning. Conflicting results and a need for a clearer understanding of the relationship between learning styles and student learning in online courses point to a need for future research in this area. An understanding of the relationship between learning styles and student learning in online courses will assist those involved in instructional design and delivery in effectively meeting the needs of all students.

Keywords: Learning Styles, Cognitive Styles, Online Learning, Distance Education, Instructional Design and Delivery

INTRODUCTION

“With the proliferation of distance education, more and more learners are taking online courses” (Hu and Gramling, 2009, p. 125). As online courses become a more common format of instructional delivery, research needs to examine how online learning can best meet students’ needs. As in traditional face-to-face classes, students’ learning styles shape their experiences in online courses (Graf, Liu, & Kinshuk, 2010). Learning styles provide information about differences in students’ learning preferences; therefore, learning styles can suggest ways in which instruction can be best designed in order to support student learning (Akdemir & Koszalka, 2008).

Kemp, Morrison, and Ross (1998) insist that instructors should consider learners’ characteristics, abilities, and experience when designing learning environments. In this way, learning can be flexible and responsive to students’ needs. Akkoyunlu and Soylu (2008) assert that it is essential that instructors are aware of students’ learning styles in order to guide them in the design and management of Web-based learning environments. Fahy and Ally (2005) caution that if students do not have the opportunity to participate in distance learning pursuant to their individual styles and preferences, “the requirement for online interaction may ironically become a potential barrier to learning” (p. 19).

LEARNING STYLE THEORY

The concept of learning styles is grounded in the classification of psychological types. Because of various innate qualities, personality characteristics, values, previous learning experiences, and upbringings, different individuals perceive and process information in different ways. Dunn et al. (1989) provide a simple definition of learning style, “a biologically and developmentally imposed set of personal characteristics that make the same teaching method effective for some and ineffective for others” (p. 50).

Learning style models and inventories have been created by Gardner (1983), Fleming (1987), Kolb (1976, 1985, 1993, 1999, 2005), Felder and Silverman (1988, 1993), Dunn and Dunn (1989), Myers and Briggs (1962, 1985, 1998), Hermann (1982), and many others. Each model has value, as each “advocates acknowledging and honoring the diversity among individuals” (Dunn, 1990, p. 15). These different models have all been widely used and have been evaluated for validity and reliability. “A reliable and valid instrument which measures learning styles and approaches could be used as a tool to encourage self-development, not only by diagnosing how people learn, but by showing them how to *enhance* their learning” (Coffield et al., 2004, p. 145). When used in this way, learning style inventories can be very useful resources to lead students to academic success. It is imperative that teachers recognize the diversity of student learning styles so that they can address these varied ways of learning in order to effectively teach and reach students.

Learning style theory conjectures that students’ learning styles have an especially strong influence on their learning when students are exposed to an unfamiliar learning environment (Sheard & Lynch, 2003). Since many students experience online learning for the first time in university settings, it can be expected that these students’ learning styles will have a major impact on their learning in online college courses.

LEARNING STYLES AND LEARNING IN ONLINE COURSES

Ford and Chen (2001) conducted a study in which they explored whether matching the instructional style to students’ cognitive style resulted in higher achievement. The researchers used Riding’s Cognitive Styles Analysis, which measures learners’ degree of field dependence. After the participants completed Riding’s (1991) Cognitive Styles Analysis and took a pre-test on HTML, the entire sample population was assigned the task of creating several Web pages using HTML. The researchers split the participants

into four groups. Half of those who were classified as field independent received instruction termed “depth-first” while the other half received instruction entitled “breadth-first.” Half of the field dependent learners also received “depth-first” instruction while the other half received “breadth-first” instruction. The difference in instruction dealt only with the order in which the instruction was presented to students; the content was identical, and both versions were online instructional packages designed for students to use in working with HTML. Ford and Chen administered a post-test after the students had completed the tasks in the unit. The researchers calculated a gain score for each student in order to determine how much students learned from this instructional experience. Task performance for the unit was also assessed, and task gain was calculated. The study’s data showed that matching instruction to students’ cognitive styles produced significant differences in the gain score, while no significant differences were seen in task gain. Ford and Chen (2001) concluded that, “The results of this study combine with those of others to suggest at least the possibility that the notion of matching cognitive and learning styles with information presentation formats may be an important building block in the design of effective learning” (p. 21).

Boles, Pillay, and Raj (1999) conducted a similar study in which participants’ learning styles were assessed. One group of participants received instruction that matched their learning styles while others received instruction that was mismatched. The computer-based instruction consisted of four sessions over a period of four weeks. The findings of this study showed no significant difference between test scores for the matched and mismatched cognitive style groups. There was also no significant difference between scores on individual sub-tasks, however the mean score of the matched group was consistently better than that of the mismatched group on all of these sub-tasks. The mean time that it took the matched group to complete the computer-based instruction sessions was less than the time required for the mismatched group to complete the instruction. This observation shows that learners can learn more efficiently when material is presented to them in a manner that is in accordance with their learning preferences.

Overbaugh and Lin (2006) investigated the effects of learning styles on achievement in Web-based and lab-based undergraduate courses. The researchers used the Paragon Learning Style Inventory, which is based on the same principles and same classification scheme as the Myers-Briggs Type Indicator. The researchers also used Martinez’s Learning Orientation Model. This study showed that introverts perform better in Web-based courses, while extroverts perform better in face-to-face courses. Judges performed equally well in the face-to-face and the online sections of the course, but perceivers’ achievement declined dramatically in the Web-based section. These results indicate that there is a relationship between individuals’ learning styles and their performance in courses of various formats.

Sheard and Lynch (2003) conducted a qualitative study that explored students’ experiences in a course that was supplemented by online instruction that included discussion forums. The authors described, in detail, five participants’ reactions to the course Web site while noting

how their learning styles related to their reactions. Unfortunately, the researchers failed to mention any common trends among the responses of participants with various learning styles. It appears that reflective and active learners were most comfortable using the Web site as a learning tool, while global learners did not find the Web site appealing and struggled to use it. “The data presented here suggests that the relationship between learning style preference and learners’ reactions to online environments warrants further inquiry” (Sheard & Lynch, 2003, p. 255). While the authors state that it was not their intention to focus on learning styles, it became apparent to them that this was an important factor in learners’ responses to online learning. Upon realization of this conclusion, the researchers insist that instructors need to acknowledge the needs of all types of learners. “Future developments in online course provision technology, if such technology is to facilitate truly student-centered teaching and learning, need to be smart enough to respond to the challenge of catering for individual learners’ needs and preferences” (Sheard & Lynch, 2003, p. 256).

Fahy and Ally (2005) studied the relation between learning style and online communication. Forty graduate students who were enrolled in one of two master’s level courses completed Kolb’s LSI. As part of the course, they participated in online discussions. Fahy and Ally recorded that convergers made significantly more postings and longer postings (in word count) than did divergers. It was also noted that accommodators created more scaffolding and engaging sentences than assimilators. Like other studies, this study’s results indicate that a relationship exists between learning style and performance in online courses.

Results of a study conducted by Chapman and Calhoun (2006) showed that learners who are more field-independent derive greater benefit from a computer-based course than those students who are more field-dependent. This is an indication that learning styles are a predictor of student learning in distance education.

Mehlenbacher et al. (2000) researched the relationship between learning styles and academic success in a technology-enhanced technical writing course. The researchers found that reflective and global learners experienced more success than active learners and sequential learners in an online learning environment.

Kinshuk et al. (2009) conducted a study in which the interactions between students’ learning styles, behavior, and performance were analyzed in an online course in which instruction did not match students’ learning styles according to the Felder-Silverman learning style model. The findings showed that learners with strong learning style preferences can benefit from adaptivity in the form of instructional adjustments that coincide with their learning style preferences or in the form of assistance in how to best learn in a course in which such a mismatch exists. Like in the study conducted by Mehlenbacher et al. (2000), participants who were classified as active learners struggled in this online course. Reflective learners were less hindered by the mismatch between instructional approaches and their preferred learning styles, while active learners had more difficulty in coping with the mismatch. The researchers note that this information should alert instructors to make instructional adjustments for active learners or to provide them with assistance in online learning environments in

which instructional approaches are not aligned with active learners' preferences.

Battalio (2009) conducted a study that sought to investigate the relationship between student learning styles and success with online learning. The Index of Learning Styles (Felder and Soloman, 1991) was used as a research instrument in order to assess students' learning styles. Concurring with the findings of Mehlenbacher et al. (2000) and Kinshuk et al. (2009), this study reported that reflective learners were significantly more successful with online learning than active learners and also adapted to the online learning environment better than active learners. Contrasting the results of the study conducted by Mehlenbacher et al. (2000), this study's results also suggested that sequential learners were more successful with online learning than global learners. Data from this study suggests that there is a relationship between learning styles and student learning in online courses. Battalio (2009) takes a position based on this study's results: student learning styles could be used as a determinant of preferred instructional format and as a measure of students' potential success with online learning.

DeNeui and Dodge (2006) conducted a study in which they looked at use of the Blackboard Course Management System by students enrolled in introductory psychology courses. The findings of this study "suggest that individual differences in learning styles may influence both how students utilize online components as well as the degree to which students derive benefit from them" (DeNeui & Dodge, 2006, p. 258).

Du and Simpson (2002) explored the effect of learning styles on students' self-reported enjoyment levels in an online course that used Web CT. Participants completed Kolb's Learning Style Inventory and then gave reports of their performance and enjoyment level near the end of the course. This study showed that learning styles significantly impact students' enjoyment level. This is another example of the influence that learning styles have on students' experiences in Web-based courses.

Schellens et al. (2007) gathered data about students' learning styles and academic performance in a blended seven-credit course for freshmen. The researchers reported that students' learning styles significantly influence students' final exam scores in an online course. Out of four factors that the researchers considered, learning style had the greatest impact on exam scores.

Both Salmon (2001) and Downing and Chim (2004) presented the results of studies that pointed to a relationship between students' learning styles and their performance in online courses, though the results of their studies conflicted in terms of the ways that students with specific learning styles performed in online learning environments. Salmon (2001) named activists and pragmatists as the "online extraverts" and theorists and reflectors as the "online introverts." Downing and Chim (2004) found that reflectors flourished in online learning environments, performing as extraverted and active learners. The researchers posited that reflectors thrive as participants in online courses, because online learning affords students time for reflection as well as the opportunity to participate in asynchronous discussions with teachers and other students.

Graf, Liu, and Kinshuk (2010) conducted a study that investigated differences in navigational behavior exhibited by students with various learning styles. The researchers assessed students' learning styles using Felder and Soloman's (1997) Index of Learning Styles. The findings of their study indicated that learners with different learning styles navigate online courses differently. The researchers suggest that students' learning styles can be predicted through the observation of their online course navigational patterns, concurring with other researchers (Cha et al., 2006; García et al., 2007; Graf et al., 2008) who also asserted that learning styles can be identified automatically from students' behavior in online courses.

Moallem (2007) researched how instructors can incorporate students' learning styles into the design of instruction and the effects of doing so on students' learning, attitude, and satisfaction. In this mixed-methods study, the researcher assessed student learning styles using Felder and Soloman's (1998) Index of Learning Styles Survey. Participants were graduate students taking an introductory instructional technology course. Graded products from the first two units included a team product and participation in a large group discussion that consisted of both synchronous and asynchronous portions. Learning products from the third and fourth units included team products, individual reflective blogs, and discussion forum postings. In reviewing their experiences after completion of the course, reflective students indicated that they wished to spend less time reading and responding to forum postings, while active learners wanted more time to work with team members on the team activity. The researcher remarked, "Integrating learning styles in the design of instructional materials seemed to encourage learners to spend more time interacting with the course content and exploring various instructional materials to achieve learning outcomes" (Moallem, 2007, p. 239). If the consideration of student learning styles in the instructional design process promotes heightened student-content engagement, instructors should allow learning styles to guide their planning.

While multiple studies have pointed to a relationship between learning styles and student achievement, the findings of several other studies (Ingebritsen and Flickinger, 1998; Neuhauser, 2002; DeTure, 2004; Price, 2004; Xu, 2004; Liu, Magjuka, and Lee, 2008; Chen, Toh, and Ismail, 2005; Wang, Hinn, and Kanfer, 2001; and Mupinga, Nora, and Yaw, 2006) have shown no relationship between learning styles and academic success in online and computer-assisted learning environments.

Ingebritsen and Flickinger (1998) aimed to uncover information in order to improve the development and assessment of Web courses that use streaming audio and video technologies. These researchers determined that learning styles do not influence student achievement, but student use of learning strategies correlates positively with student achievement.

Neuhauser (2002) conducted research on an online section and a face-to-face section of the same course, both of which were taught by the same instructor. The findings of this study indicated no significant differences between learning styles and course grades in either section of the course.

DeTure (2004) desired to identify learner attributes that could predict student success in online courses. DeTure assessed students' learning styles with the Group Embedded Figures Test. DeTure deemed learning styles to be a poor predictor of student success in online courses.

Price (2004) researched the usefulness of Honey and Mumford's (1994) Learning Style Questionnaire (LSQ) in predicting performance in two course formats: a traditional correspondence course and an Internet version of the same course. The Internet students had access to a course Web site with all interactions being electronic, while the students in the traditional correspondence course communicated by telephone, by mail, and in person. The researchers were also interested in seeing whether students with different learning styles were attracted to different versions of the course. Price (2004) hypothesized that activists would be inclined to enroll in the Internet version of the course. The researcher collected data on students' final grades and used evaluation questionnaires that inquired about students' experiences in the courses and their levels of satisfaction. In the conventional group, the pragmatist scores were positively related to overall academic achievement, but these results were not matched in the Internet group. No significant relationships were identified between student LSQ scores and academic achievement. Additionally, no significant relationships were identified between LSQ scores and course preference. Price (2004) concluded, "the LSQ may have been inappropriate or insensitive for measuring individual differences in this situation" (p. 689).

Xu (2004) conducted a mixed-methods study with undergraduate computer science students as participants. This study focused on the effects of learning styles on students' course performance and final grades in a blended course. The researcher found no relationship between these variables. A concern that this author has regarding the study was the researcher's lack of consideration of the potential influence of student motivation on the dependent variables.

Liu, Magjuka, and Lee (2008) posited that cognitive styles are a poor predictor of students' learning in online courses, yet they suggested that cognitive styles could forecast students' virtual team performance.

Chen, Toh, and Ismail (2005) studied the effects of a virtual reality (VR)-based learning environment on the performance of learners with different learning styles. Participants completed a VR-based pretest and a VR-based posttest that assessed knowledge of traffic signals and traffic rules. In addition to this test, participants completed the Kolb Learning Styles Inventory. The findings showed that learners, regardless of their learning styles, benefit most from the VR guided exploration mode.

Wang, Hinn, and Kanfer (2001) investigated the effects of learning styles on learning outcomes in computer-supported collaborative learning. No significant relationship between students' learning outcomes and their learning style was indicated by the results. Additionally, no significant difference in satisfaction scores was apparent among the four learning style groups according to the one-way ANOVA. "This study failed to detect any significant interaction between learning style and...a computer-supported collaborative learning environment." (Wang et al., 2001, p. 82).

Mupinga, Nora, and Yaw (2006) conducted a study, seeking to determine the learning styles, expectations, and needs of online industrial education college students. They also explored how these characteristics can be used to design effective online instruction. In their study, students completed an online Myers-Briggs Cognitive Style Inventory. Students also answered the question, "What are your needs and expectations as an Internet student?" The reliability of this study needs to be questioned on the basis of how participants were permitted to respond to the open-ended question regarding their needs and expectations. Students could choose to email their responses to the researchers, or they could post the responses on a class discussion board. Student responses could be skewed by this factor, because students may not have truthfully reported their needs and expectations, knowing that their peers could read their responses. Participants' responses may also have been affected by the reading of others' responses. The researchers found that students in online courses, regardless of their learning styles, expected to have frequent communication with the instructor, regular feedback on their progress, and challenging material. The researchers noted that forty-six percent of the student participants in their study were introverts, sensors, and judges. They reasoned that introverts are drawn to online courses, because they can complete these independently. The researchers concluded that, "no particular learning styles were found to be predominant among the online students; hence, the design of online learning activities should strive to accommodate multiple learning styles" (Mupinga et al., 2006, p. 188).

SUMMARY

Studies conducted by Ford and Chen (2001); Boles, Pillay, and Raj (1999); Overbaugh and Lin (2006); Sheard and Lynch (2003); Fahy and Ally (2005); Chapman and Calhoun (2006); Mehlenbacher et al. (2000); Kinshuk et al. (2009); Battalio (2009); DeNeui and Dodge (2006); Du and Simpson (2002); Schellens et al. (2007); Salmon (2001); Downing and Chim (2004); Graf, Liu, and Kinshuk (2010); and Moallem (2007) suggest a relationship between learning styles and student learning in online learning. Ingebritsen and Flickinger (1998); Neuhauser (2002); DeTure (2004); Price (2004); Xu (2004); Liu, Magjuka, and Lee (2008); Chen, Toh, and Ismail (2005); Wang, Hinn, and Kanfer (2001); and Mupinga, Nora, and Yaw (2006) found no significant relationship between learning styles and academic performance in online courses.

In light of these conflicting results, additional research is necessary in which the relationship between learning styles and academic performance in online courses is explored. The results of future studies may have implications for instructional design and delivery. Boyd (2004) noted a need for research on the relationship between learning styles and distance learning. Gallagher (2007) suggested further research that investigates the characteristics of successful online learners as well as an investigation into whether the characteristics of successful online learners differ from the characteristics of successful learners in face-to-face courses.

This author believes that there is a relationship between learning styles and student learning in online courses, and further exploration of this relationship and its implications for instructional design is necessary. "Online instruction and assessment must balance the requirements of technology, delivery, pedagogy, learning styles, and learning outcomes" (Gaytan & McEwen, 2007, p. 130). The achievement of an optimal balance of these requirements will augment the online teaching and learning process.

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Autopoiesis and Knowledge in Self-Sustaining Organizational Systems¹

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Abstract

Knowledge and the communication of knowledge are critical for self-sustaining organizations comprised of people and the tools and machines that extend peoples' physical and cognitive capacities. Humberto Maturana and Francisco Varela proposed the concept of autopoiesis ("self" + "production") as a definition of life in the 1970s. Nicklas Luhmann extended this concept to establish a theory of social systems, where intangible human social systems were formed by recursive networks of communications. We show here that Luhmann fundamentally misunderstood Maturana and Varela's autopoiesis by thinking that the self-observation necessary for self-maintenance formed a paradoxically vicious circle. Luhmann tried to resolve this apparent paradox by placing the communication networks on an imaginary plane orthogonal to the networked people. However, Karl Popper's evolutionary epistemology and the theory of hierarchically complex systems turns what Luhmann thought was a vicious circle into a virtuous spiral of organizational learning and knowledge. There is no closed circle that needs to be explained via Luhmann's extraordinarily paradoxical linguistic contortions.

Keywords: Autopoiesis, Organization Theory, Nicklas Luhman, Social Systems Theory, Self Observation, Karl Popper, Evolutionary Epistemology

Introduction

Knowledge and the communication of knowledge as "information" are critical for self-sustaining organizations and other social-systems comprised of people and the tools and machines that extend the physical and cognitive capacities of people and organizations [1],[2],[3]. However, working with core ideas lifted from often incommensurable fields, are a long way from having a common understanding of organizations, information or knowledge [4],[5],[6]. Beginning with a background in evolutionary biology [7],[8],[9], followed by 25 years in industry working with information and knowledge management problems [10],[11], Hall sought a deeper understanding of organizations than offered by the approaches summarized in the above cited review articles.

An understanding of organizations can be found in a synthesis of Humberto Maturana and Francisco Varela's original concept of autopoiesis ("self" + "production") [12],[13],[14],[15],[16],[17] and Karl Popper's evolutionary epistemology [18],[19],[20],[21]. Autopoiesis defines life as "circularly organized" or "operationally closed" [17] complex dissipative entities with the autonomous capacity to self-produce components they need for life and able to observe themselves to apply self-regulating feedback in the face of perturbations that might otherwise cause them to disintegrate. Karl Popper's evolutionary epistemology [18],[20],[21],[22] defined knowledge as "solutions to problems of life" and accounted for its growth through time as a consequence of an iterated process of speculation followed by the elimination of errors by Darwinian or conscious selection. This easily accounts for the generation and growth of knowledge in autopoietic frameworks [23],[24],[25],[26],[27] in a way that made the original concept of autopoiesis applicable to systems at any level of organization in a complex scalar hierarchy [28],[29], [30],[31] where parameters of systems at different scalar levels of organization meet the criteria for a complex system to be considered autopoietic.

This biophysically based approach to understanding organizational knowledge and cognition competes directly with Nicklas Luhmann's esoteric use of autopoiesis in the development of his social systems theory [32],[33],[34],[35],[37],[38] incorporated in European Post Modern organizational theory [39],[40],[41] and second order cybernetics [42],[43],[44],[45]. Here we compare Luhmann's "autopoietic" social systems with the approach we and our colleagues have taken that treats autopoietic organizations as third order biophysical entities above second order multicellular humans in the complex systems hierarchy of the world.

Maturana and Varela's Autopoiesis

Maturana and Varela recognized that living things (i.e., autopoietic systems) are thermodynamically driven assemblies of components that have within them the autonomous capacity to produce all the components they require to continue their existence. Varela et al. [15] gave six properties (paraphrased

here for brevity) considered necessary and sufficient to recognize when a complex system could be considered to be autopoietic, and thus living:

- Bounded (demarcated from the environment)
- Complex (different components within the boundary)
- Mechanistic (system driven by energy dissipation)
- Self-differentiated (system boundary intrinsically produced)
- Self-producing (system produces own components)
- Autonomous (self-produced components are necessary and sufficient to produce the system).

The properties of autopoiesis are embodied in the persistent “organization” of the network of dynamic interactions among the components of a system that perpetuates autopoiesis as its instantaneous structure changes continually as matter and energy pass through it.

As Maturana expressed it in [13], a living (i.e., autopoietic) entity is defined by the physical interactions of its (molecular) components and not the components themselves, where the autopoietic entity is recognized

[as a] dynamic molecular entity, [that is] realized as a unity as a closed network of molecular productions in which the molecules produced through their interactions:

- a) recursively constituted the same network of molecular productions that produced them; and,
- b) specified the extension of the network and constituted operational boundaries that separate it as a discrete unity in a molecular space.

[The autopoietic system is] ...a molecular system open to the flow of molecules through it as molecules could enter it and become participants of its closed dynamics of molecular productions, and molecules could stop participating in such molecular dynamics leaving it to become part of the molecular medium in which it existed.... [13]: p. 7

Living systems are not the molecules that compose and realize them moment by moment, they are closed networks of molecular productions that exist as singularities in a continuous flow of molecules through them. Indeed, the condition of being closed molecular dynamics is what constitutes them as separable entities that float in the molecular domain in which they exist.... [13]: p. 10.

“...autopoietic systems in the physical space must satisfy the thermodynamic legality of physical processes that demands of them that they should operate as materially and energetically open systems in continuous material and energetic interchange with their medium... [where] ...the physical boundaries of a living system... are realized by its components through their preferential interactions within the autopoietic network... as surfaces of thermodynamic cleavage” [12]: p. 30.

Maturana infers from this,

the law of conservation of organization (autopoiesis in the case of living systems) and the law of conservation of adaptation, that is operational congruence, with the medium in which a system (a living system in our case) exists. These two laws of conservation are both relational conditions of the realization of living systems that must be satisfied for living to occur at all. [13]: p. 10.

In their writings on autopoiesis, Maturana and Varela emphasized the importance of “circular organization” or “operational closure” [17] whereby negative feedback from self-observation maintained the autopoietic nature of the organization. Some authors, e.g., Luhmann, considered that the operation of feedback from self-observation formed a paradoxically and viciously closed causal chain, where A causes B and B causes A – an issue pursued by second order cybernetics [42],[43],[44]. Nicklas Luhmann went to esoteric extremes in an attempt to work with the apparent paradoxes.

Luhmann’s Paradox of Self-Reflection

The way we have used autopoiesis differs greatly from Luhmann’s [46],[47]. Thus, we make no claim to fully understand Luhmann’s paradoxically convoluted expression. To us his style of recursive self-negation seems semantically vacuous. However, some quotes will help to provide a backdrop for considering the contrasting approach to autopoiesis deriving from evolutionary epistemology.

Luhman highlights the apparently paradoxical nature of an observer trying to understand the development of knowledge at any level of structural organization:

...we need [paradoxical statements] when we have to distinguish different observers from each other or when we have to distinguish self-observations from external observation, because for the self-observer things may appear as natural and necessary, whereas when seen from the outside they may appear artificial and contingent. The world thus variously observed remains, nevertheless, the same world, and therefore we have a paradox. An observer, then, is supposed to decide whether something is natural or artificial, necessary or contingent. But who can observe the observer (as necessary for this decision) and the decision (as contingent for the observer)? The observer may refuse to make this decision, but can the observer observe without making this decision or would the observer have to withdraw, when refusing this decision, to the position of a nonobserving observer? [38]: p. 80.

Luhmann’s social systems theory reduces social systems to organizationally closed networks of self-producing “communications”:

The system disposes over internal and external causes for the production of its product, and it can use the internal causes in such a way that there results sufficient possibilities of combining external and internal causes.

The work which is produced, however, is the system itself or more exactly: the form of the system, the difference between system and environment. This is exactly what the concept of autopoiesis is intended to designate.... The concept of autopoiesis, then, necessarily leads on to the difficult and often misunderstood concept of the *operative closure of the system*.... It is ... the necessary consequence of the trivial (conceptually tautological) fact that no system can operate outside of its boundaries. This leads to the conclusion - which forms the first stage of a clarification of the concept of society - that we are dealing here (that is, if we want to use the form-concept of system) with an *operatively closed autopoietic system*. ([35]: p. 70 – Luhmann’s italics)

...[W]hich is the operation which produces the system of society?... My proposal is that we make the concept of communication the basis and thereby switch sociological theory from the concept of action to the concept of system. This enables us to present the social system as an operatively closed system consisting only of its own operations, reproduced by communications from communications. With the concept of action external references can hardly be avoided. ... Only with the help of the concept of communication can we think of a social system as an autopoietic system, which consists only of elements, namely communications, which produce and reproduce it through the network of precisely these elements, that is, through communication. ([35]: p. 71).

Using arguments deriving from Spencer Brown’s Laws of Form [49], Luhmann claims the network of communications is its own boundary, and that people and their actions are formally external to and not part of the networks [48],[39]:

A system is the form of a distinction, possesses therefore two sides [sic]: the system (as the inside of the form) and the

environment (as the outside of the form). Only the two sides together constitute the distinction, constitute the form, constitute the concept. ... *The boundary between system and environment separates the two sides of the form, marks the unity of the form and is for this reason not to be found on either side of the form. The boundary exists only as an instruction to cross it - whether from inside to outside or from outside to inside.* [35]: p 69 my italics.

Here, we understand Luhmann to be saying that the boundary of a system is intangible; as some kind of distinction or separation between physical reality and ghostly connections of a network of intangible communications realized in some imaginary phase space orthogonal to the real world's dimensions – an argument developed from Spencer Brown's Laws of Form [49] relating to the imaginary part of a complex number. In this sense, perhaps one could argue that the "boundary" represents an epistemic cut [50] between the ghostly network and the physical world.

The distinction between the problem of truth and the problem of reference thus leads to a distinction of distinctions, namely, to the distinction between the distinction true/untrue and the distinction self-reference/external reference. The two distinctions are located at right angles to each other. They have no mutually unbalancing effects. That is, self-referential observations and descriptions, as well as those of external reference, can be both true and untrue. ([36]: p. 65)

However, to Maturana self-observation was only "apparently" paradoxical (e.g., Maturana, Biology of Cognition, in [14]; [51]), but he lacked the epistemological framework and vocabulary to clear the fog. Because Luhmann and his followers accepted that self-observation of autopoietic self-maintenance and self-production was viciously paradoxical, they performed extraordinary linguistic and logical contortions in an attempt to work within the circle. However, Karl Popper's evolutionary epistemology turns the apparently vicious circle of self-observation and self-criticism into a virtuous spiral [52], [53], clarifying many aspects of Maturana and Varela's also recursive writing.

Popper: There is No Vicious Circle

To Popper, knowledge of the external world consisted of constructed solutions to problems of life; or at least claims, tentative theories, or tentative solutions [18],[19],[21],[22] relating to the world. Although Popper's primary concern was human cognition and knowledge, he presented a broadly based ontology of three worlds and the roles of knowledge applicable to all living things [18]¹.

World 1 ("W1" - physical events and processes) is dynamic physical reality and everything in it, including physiology.

World 2 ("W2" - cognition) is the domain of embodied behavior, mental states and psychological processes within minds, dispositional and tacit knowledge. W2 encompasses active processes and subjective results of cognition. Cognition produces knowledge embodied in living things as, "dispositional" or "situational" knowledge (propensities to act in certain ways in response to particular situations). This bears some resemblance to Polanyi's "tacit" knowledge [55],[56]. By extension, W2 includes the embodiment of all kinds of cybernetically self-defined and self-regulated dynamic processes [12],[13],[14],[16],[57]. In other words, W2 contains the semantic significance or meaning of cognitive processes and their results, while the physical dynamics of the matter

involved in the processes remains always in W1. The survival knowledge (i.e., solutions to problems of the world) the autopoietically living entity requires to maintain its existence must be expressed in W2 as cybernetic "control information" [58].

World 3 ("W3" - objectively persistent products of knowledge) is the domain of persistently codified knowledge, where encoded content can exist objectively, independent from a knowing entity. Popper defined W3 to include knowledge in the objective sense, which includes "the world of the logical contents of books, libraries, computer memories, and suchlike" ([18]: p. 74) and "our theories, conjectures, guesses (and, if we like, the logical content of our genetic code)" ([18]: p. 73), while the physical structure of the codified content remains always in W1. W2 mediates between W1 and W3.

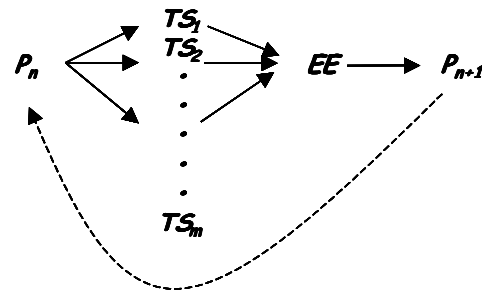


Figure 1. (after Popper 1972: pp. 243). P_n is a problem situation the living entity faces in the world, TS_m represent a range of tentative solutions (or theories in self-conscious, articulate individuals) the entity may embody or propose in W2 to solve the problem. EE represents a process of natural selection imposed by W1 on the entity or criticism and error elimination in W2 that selectively removes those solutions that don't work in practice. P_{n+1} represents the now changed problem situation remaining after the first one is solved. As the entity iterates the process, it constructs an increasingly accurate representation of external reality.

Donald T. Campbell [59],[60],[61],[62],[63] and Karl Popper [54],[18],[20],[21],[22] formulated evolutionary epistemology. According to Campbell, living things built knowledge through processes of "blind variation and selective retention". Popper called his most comprehensive explanation a "general theory of evolution" (Figure 1). In many places he abbreviated this to a "tetradic" schema: $P_1 \rightarrow TS \rightarrow EE \rightarrow P_2$, where TS referred to "tentative theories".

As Maturana noted, autopoietic entities are thermodynamically dissipative systems open to exchanges of matter and energy with their environments [12],[13] and must conserve their adaptation to their external environment "for living to occur at all" ([13]: p. 10). Popper's evolutionary epistemology explains the iterated process by which this adaptation evolves and is maintained. The process is cyclical and based on prior states of the autopoietic entity but it is not closed in a paradoxically vicious circle. Because cognition is a causally driven physical process, all references to the self and the self's environment relate to the state of the world in earlier times [64]. Thus, along the time axis, all references to internal or external states are open spiral processes (Figure 2) [52],[53]. Evolutionary epistemology also preserves and explains the nature of the structural coupling between the external environment and the autopoietic system (i.e., as the differences between P_n and P_{n+1}) that concerns second-order cybernetics.

¹ As interpreted by Hall [23],[24],[25].

Thus, Luhmann's elaborate and paradoxically convoluted explanations of autopoietic social systems are not needed.

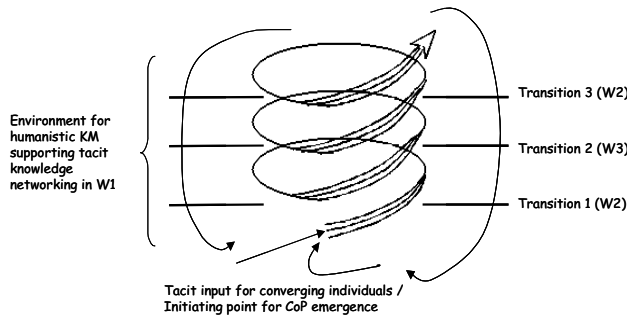


Figure 2. Nousala's virtuous spiral (from [52])

Many Human Organizations are Autopoietic

Using the theory of complex systems [28],[29],[30],[31] in a scalar hierarchy, contra [65],[66],[67], we have argued that many human organizations have the necessary properties to be considered autopoietic [23],[24],[25],[26]. The failure of many workers (i.e., external observers) to recognize the autopoietic nature of organizations is their failure to understand the importance of selecting an appropriate focal level for observing the system of interest (Figure 3).

We can easily see and recognize boundaries of systems at the human scale with our unaided eyes. We need powerful microscopes to see systems at the cellular level comprised of macromolecular subsystems, but through magnification we can still easily see and recognize system and subsystem boundaries with our eyes. It is much more of a conceptual leap for us to "see" the boundaries of the larger scale systems in which individual humans like ourselves form subsystem components.

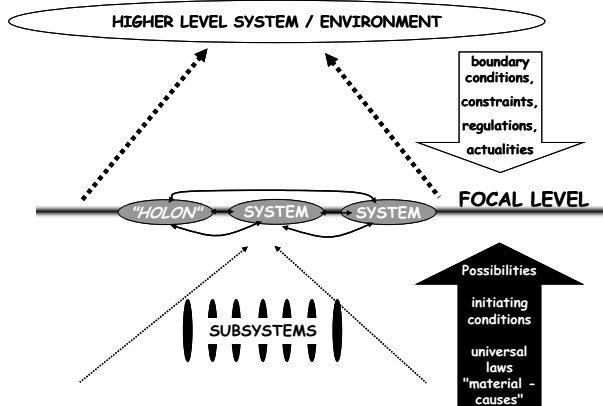


Figure 3. Establishing a level of focus on a system in a hierarchically complex world. (From [26]).

Hall argued that some human economic organizations are third order autopoietic entities in their own rights [23],[24],[25],[26]. The human and organizational economy abstracts real energy fluxes. Organizations sell products and procure energy and resources. Individuals belonging to organizations use organizational salaries to purchase their own requisites for living. Thus measurements and observations of cash flow are reasonable abstractions of these energy flows from source to sink as high value resources are used to produce products and dissipated in the form of labor and distribution. Thus, complex

dynamics may evolve at a level of complexity involving human economic interactions.

Large economic organizations certainly meet requirements to be considered autopoietic. They are:

- *Bounded.* The entity's components are self-identifiably tagged): Members of the organization are typically identified with badges, and sometimes even uniforms. "Human resource systems" in the organization track memberships, associations, etc. to identify members, with boundaries further identified by walls and fences, often monitored by receptionists and security guards.
- *Complex.* Individual people are certainly autopoietic entities in their own rights, but they can work together in networks of interaction to form and maintain the organizational structure of a higher order entity.
- *Mechanistic.* Money tokenizes power over energy and material resources needed for corporate existence. Cash accounting, payrolls, internal processes and procedures, etc. incentivize, measure and regulate the interactions of organization members to benefit the continued survival and growth of the organization.
- *Self differentiated.* System boundaries internally determined by rules of association, employment agreements, oaths of allegiance to organizational rules, deeds, etc., that determine who belongs to the organization and what property it owns.
- *Self producing.* Processes exist to recruit, induct and train new members and to build or procure plant, equipment or other resources the organization requires.
- *Autonomous.* As long as the organization maintains enough capital to avoid takeover or disintegration in the face of economic/environmental perturbations, well-established organizations survive independently of the membership of any particular individuals in the organization.

Discussion and Conclusions

If organizations are autopoietic, it is proper to consider the nature of organizational cognition and knowledge. Nelson and Winter [68] described several aspects of organizational structure they considered to be "organizational tacit knowledge" (i.e., W2 knowledge in Popper's sense) in economic competition, such as routines, formal procedures, plant and equipment layout, jargons, organizational networks, etc. [27],[69]. These conclusions have been reflected in studies of organizational knowledge management in practice [71],[72],[53],[73].

These studies only scratch the surface of what is possible using insights from studying organizations as autopoietic (or potentially) autopoietic entities. Such ease of applicability is not apparent from Luhmann's use of autopoietic ideas.

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THE EMERGENCE OF CYBERNETICS IN SEMIOTICS. CASE STUDY: ART, POETRY AND ABSURD THEATRE

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ABSTRACT

It is shown in this paper, some results on cybernetic modeling and Informational Statistics application who are presented for sustaining the perfect narrative love poem, Evening Star or Lucifer of Eminescu, the antenarrative of Eugène Ionesco and of critical visual aesthetics and antenarrative spectrality described by David Boje regarding Empire Reading of Manet's Execution of Maximilian.

Cybernetics concepts of feed-back and feed-before could reveal the narrative behind the antenarrative creating of a theatrical play.

It is shown in this paper, some results on fuzzy modeling and Informational Statistics application who are presented for sustaining of critical visual aesthetics and antenarrative spectrality described by David Boje regarding Empire Reading of Manet's Execution of Maximilian.

The combination with planning statistical experiments and Informational Statistics make fuzzy membership function a new approach for antenarrative analysis independent of initial conditions. This feature allows new arguments obtained by measuring the informational gains to be discussed in art, literature or conversation.

This approach can be used to obtain either complete or generalized synoptic ideograms. Several simulations or scenarios could be carried out to illustrate how the methods' combination clarify the „black box” of understanding complex processes in Art.

Keywords — Informational Statistics, Factorial Experiments 2^3 , Antenarrative, Informational chaos, Non-communication, Relationship.

NARRATIVE VERSUS ANTENARRATIVE ANALYSE OVER THE BEST LOVE POEM OF EMINESCU

There are many years since *Luceafarul* by Eminescu has excited us from a different point of view than has done it with those who are passionate of literature, of culture history, with philosophers or with those who have graduated high school. We were surprised by the inside symmetry, the balance between individual and general, analytic and holistic, making me to consider the Poem a model on which you can apply statistic instruments with the most subtle possible experiments

The love Poem is a perfect example of narratives as traditional written material meaning that take a more linear insights to information, whereby everyone moves sequentially through stanzas and distiches and providing a beginning, middle content and end reading [3].

Contrary, in our modern life, antenarratives appears on the Web, were the individuals will not be following the same structure or pattern of finding information in the same way. Because the Web is a wide-area hypermedia system aimed at universal access, we illustrate like that:

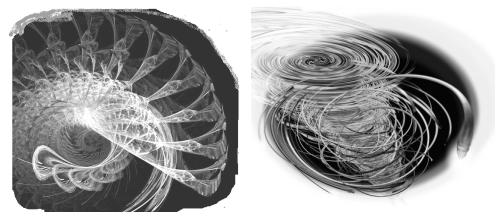


Figure 1 - narrative and antenarrative

A **narrative** is a concept, composed and delivered in any medium, which describes a sequence of real or unreal events.. The relations' functional durability is given by their **repeatability**. A major purpose in science is to allow natural phenomenal prediction. This goal is attained by discovering the systematic relations between predictive variables (independent, by cause, impulses) and external variables, obtained as a result (dependent, endogens, effect, reaction).

The "**Evening Star**" ("**Luceafarul**") by **Mihai Eminescu**, a 98 stanzas (102 originally) sets the world record for the **Longest Love Poem** appears on Web as "The Legend of the **Evening Star**" ("**Luceafarul**") **Lucifer, which** is a story about a young princess who prayed to the evening star each night. The Evening Star falls in love with her and is willing to give up his immortality, but realizes that the pure love he has for the young girl cannot be sustained in the mortal world".

If the predictive variables data variation corresponds in the same way or in the same time with the result variables data variation, it is a potentially functional relation and it is possible to predict the result that we haven't found out yet knowing only the independent variable value. Unfortunately, we are fighting with all kind of error sources which come from the environment from which we have extract the data, from the mistakes connected with the identification of some accidental relations, calculus errors or approximation, from the existence and the not including in calculating of many sources of simultaneous influence and others.

That's why, I propose the approaching by quantitative methods to be by statistic probabilities, algebra or mathematic analyzes. But how can we see that the relation is caused or not by chance (error)? Most of the time the method that the scientists use in a better-organized version of common sense.

What for example, is *Lucifer* relationship with his Demiurge? His love? His Catalina? His job? His parents? His life style? And his position? Each relationship existing on a continuum from mundane to crucial, and varying according to circumstances over time, „tells or recounts“ an aspect of his nature. What, to use an analogous situation is the Eminescu Genius's relationships with its drama Poem? Its characters? Its community? Its experiences? Its education? Its fantasies? And its communication abilities?

The question could be asked, „*Does each relationship „tell or recount“ a potentially significant and in many ways unique aspect of his (its) nature?*“ “The argument is extremely persuasive that it must. *As in management terms, the study of relationships, is preparation for understanding the implications of those threats or opportunities that affect individual or organizational success (survival).*

The operative word in analyzing the Poem is „**relationship**“. The relationship concept, albeit simplicity itself, has tested any manner of perspicacity to which many authors may previously have laid claim. What, for example, is a relationship? Where is it found? How and When does it occur? And why? Finally, what purpose does the investigation of such a nebulous concept serve? Classifying relationships challenges the imagination and exhausts the challenger. Relationships are political, economic and social or literally, existing without number in the environment. On the other hand, they can be physical or metaphysical, predictable or unpredictable, good or bad, progressing or regressing, mundane or crucial..., or just plain ornery. We will search for meaningful relationship in the jungle of the AP—HP Matrix, with only „defining attributes“ as our flimsy snare.

The concepts advanced suggest:

1. The importance of relationships,
2. A method of classification for management action-structural relationships, and
3. Application of this method for studying of management in systems.

We offer a number of axioms manipulated like parameters and useful for hypothesis testing affecting managerial relationships:

1. Some relationships become essential at given times (times of opportunity or threats)
2. All relationships are dynamic and vary in significance according to implicit (instinctual) or explicit (stated) goals.
3. There are too many potential relationships to closely consider all at once.
4. Some essential relationships can be identified based on their Defining Attributes vis-à-vis the stated goal.
5. All relationships are made up of at least two or more variables.

6. Complexity is a function of the number of variables and the understanding (i.e. knowledge and experience) of each.
7. Studying relationships assumes that observations take place at both levels of the specific relationships (how one variable affects all the others).

THE SHORT PIECE, FOURSOME OF EUGÈNE IONESCO ANOTHER APPROACH: INFORMATIONAL STATISTICS CHALLENGE

The Father of the Absurd Theatre, Eugène Ionesco's build the perfect antenarratives. Antenarrative shifts from "What's the story here?" meaning introduction, story and end incidents, to questions of "Why and how did this particular story emerge to dominate the stage?" meaning to "shift from linear, coherent narratives to emergent behavior of nonlinear, interactive, and fragmented antenarratives".

Referring at *The Chairs (Les Chaises)*, the Father of the Absurd Theatre said that the subject of the play „is not the message, nor the failures of life, nor the moral disaster of the two old people, but the chairs themselves. That is to say, the absence of people, the absence of the emperor, the absence of God, the absence of matter, the unreality of the world, metaphysical emptiness. The theme of the play is nothingness" But Ionesco knew there's more to nothing than meets the eye. So we see their unseen guests. The actors make the unreal real, and vice versa.

In the program for the original production, Ionesco writes, "As the world is incomprehensible to me, I am waiting for someone to explain it." As the idea of a theater of the absurd evolved it developed into a literary form that explored the futility of human existence. *The Chairs* came to be seen as a seminal example of the genre, highlighting the loneliness and futility of human existence.

Instead, the theme of the play *Foursome* we find out using Informational Statistics and other quantitative methods, is the Grand Illusion. Contrary as in *The Chairs*, on *Foursome* the actors make the Ionesco's concrete void, the visible invisible. We believe that they (players).

The short piece *Foursome (Scène à quatre)*, picks up the tragicomic send-up of language. Two foilfighters of words incessantly volley "But I said

yes"/"But I said no," seemingly oblivious of their point of contention, though locked ludicrously at loggerheads. Another foilfighter of words joins them, reminding them repeatedly to "mind the flowerpots," while expanding the disagreeing duo into a brawling trio. Finally, an unsuspecting woman enters and, after entreating the men to stop fighting, has her limbs ripped from her body by the foilfighters' competitive solicitations.

We define the Profile of Performer's stage behaviour as consisting of a number of states: (1) communicating with only one player (three states); (2) being on stage in silence; (3) communicating with two players; (4) communicating with three protagonists. Informational gains are obtained by measuring the influence of others presence or action (e.g., dialog) over the overall Profile of Performer's stage behaviour using Information Theory and Informational Statistics besides factorial experiments:

Results: One man walking around a table with a flowerpot on it, while making assertions and denying them, being simultaneously ego, an alternative ego and superego, fantasizing about Pretty Lady while he awaits her and she never appears. **Our opinion: FOURSOME is a vast metaphor for the multiple and conflicting elements within a single human character.**

Informational Statistics Outcome of the play Palimpsest? Short Piece, Foursome of Eugène Ionesco versus *The Chairs* - firstly, we develop an synthesis (Matrix) of Analytical Paradigm (actions in rows) and Holistic Paradigm (system components in columns) for looking "at a glance" over the core of the play, employing cybernetics and utilizing concepts such as: **environment, feedback, input, output, goal, information, entropy, energy and attributes** for example.

So, two performers, Dupont (we codify by **Dp**) and Durand (we codify it **Du**) incessantly (we codify **Rp** – repetition, replication) volley "But I said yes"/"But I said no," (we codify **Assertion/Denying**). Another foilfighter of words, Martin (codified **M**), joins them (we codify it as **two**, when they spoke or someone communicate with them simultaneously in the same scriptline) reminding them repeatedly (**Rp**) to "mind the flowerpots", (**attn**-attention, **Flowers**) while expanding the disagreeing duo (**two**) into a brawling trio (we codify it as **three**, when they spoke or someone communicate with them simultaneously in the same scriptline). Finally, an

unsuspecting woman, Pretty Lady (codified as **PL**) enters and, after entreating the men to stop fighting, has her limbs ripped from her body....and so.

Table1. Pseudo Matrix – cube of three level information

Primary Level		Generic Relationships				
		1	2	3	4	5
P	Activities	Author	Du	Du	M	PL
I	Communic.	I:1	I:2	I:3	I:4	I:5
II	Presence	II:1	II:2	II:3	II:4	II:5
III	Assertion	III:1	III:2	III:3	III:4	III:5
IV	Denying	IV:1	IV:2	IV:3	IV:4	IV:5
V	Questioning	V.1	V.2	V.3	V.4	V.5
Secondary Level						
Behavior' states, one way communication						
Dp - Du	Dp - M	Dp - PL	Dp with two	Dp with three		
Du - Dp	Du - M	Du - PL	Du with two	Du with three		
M - Dp	M - Du	M - PL	M with two	M with three		
PL - Dp	PL - Du	PL - M	PL with two	PL with three		
Third Level						
Informational energies		Confirmed weak relationship				
Conditioned informational energies		Confirmed strong relationship				
Informational correlation coefficient		Nonexistent relationship				
Association by Cramer'V coefficient		Hidden relationship by the third variable				
Fisher in 2^2 statistic experiment		Spurious relationship				
		Positive interaction				
		Negative interaction				

What we found? From the informational statistics and academic points of view, where studying and learning take place respectively, *that the need for a method by which the classification of script-system management-actions and structures RELATIONSHIPS can be shown and investigated, is very great.*

The situation could be like to two performers on a stage, management actions (analytically) on one side and structure (holistic) on the other side. There is a dialogue to be sure, but the substance of their lines leaves us wondering about their relationship. It is, after all the essence of the Play.

Arguments for being Dupont, Durand and Martin only One persons in the light of Informational Statistics:

The global importance of player’s behavior is given multiplying the intrinsic information (from the states’ of performers, the normalized information energy) and the extrinsic importance (given by the author’s number of scriptlines) and here are two extreme possibilities:

1. the energy of one state is great, maximum, and the information given is that one state exists for sure but the global importance is small because it is happened rarely (few lines);
2. the energy is dissipated in all states and the value is very small but some frequencies of states happened often.

Table 2.Global importance of *Foursome*’ s performers

name	en.	scriptlines	multiply	Inform.
Du	0,327	162	52,9	28 %
Du	0,315	162	51,0	28 %
M	0,470	112	52,6	28 %
PL	0,660	46	30,3	16 %
Sum	x	x	187,0	100 %

84 %

As we see in the last column of table 2, the importance of men is intriguing, it is identical and The Pretty Lady had the smallest importance. **If all are in One, his character receives 84% from the global importance of the play.** Taking into consideration that the Pretty Lady communicates very little and the important state of she is only to be present in 46 script lines (including 39 of silence!) the importance is small (only in the mind of **One**).

PROCEDURE FOR PLANNING FACTORIAL EXPERIMENTS 2³ - IN THE CASE STUDY OF MANET’S EXECUTION OF MAXIMILIAN

In the case study of Manet’s Execution of Maximilian we propose to look into WWW and find stories (narration) and take advantage that the web is nonlinear by nature and by design, meaning that you

can jump in time from topic to topic, document to document, and site to site

The most salient of fuzzy models are using (1) the intermediary value (common knowledge) and (2) not the intermediary value is important, but the extreme ones.

In the following we illustrate an application of one methodology based on: (a) planning statistical factorial experiments 2^3 , (b) using fuzzy membership function as *minimum*, *intermediary*, *not intermediary* but extreme values are important, (c) finding interactions of zero, one and two order between three attributes, (d) measuring relationships information gains with Informational Statistics, (e) identifying strong, weak, false, hidden or spurious relationships between the A, B, C attributes, some identified during step (a) procedure, planning statistical factorial experiments 2^3 . The challenge of this approach in this paper is that we try to illustrate the dynamics of narrative and antenarrative and their relation to stories told about *Empire Reading of Manet's Execution of Maximilian*, as aesthetic theoretists, David Boje [3], Georges Bataille [2], Neil Larsen [5], Wilson-Bareau [12] who argue different ways of viewing the aesthetics of Manet's *Execution of Maximilian*. In the first version, the firing squad is dressed in rebel republican army; in the second version the uniforms are French; a wall appears and remains from the 3rd version; in the 4th version sombrero appears and some saying that is a critique of Napoleon III's failed Mexico conquest.

Reviewing Stage of Attributes

The young Emperor of Mexico, Ferdinand Maximilian, was executed/assassinated at Queretaro, the June 19th 1867, alongside two of his generals, Tomas Mejia and Miguel Miramón. Manet based his historical painting *Execution of Maximilian* on eyewitness reports printed in European newspaper. This could be assimilated as antenarrative. In David Boje writings, the antenarrative is defined as “a bet and a prestory that can be told and theatrically performed to enroll stakeholders in ways that transform the world of action”. Antenarrative shifts from “What’s the story here?” meaning a beginning, middle and end incidents, to questions of “Why and how did this particular story emerge to dominate the stage?” meaning to “shift from linear, coherent narratives to emergent behavior of nonlinear, interactive, and fragmented antenarratives” [3] On the other hand,

fulfilling the traditional visual narrative of empire, more iconic images that appeared in the press and circulated as postcards presented Maximilian as a hero.

Narratives as traditional written materials take a more linear insights to information, whereby ones moves sequentially through a document meaning a beginning, middle and end reading. Antenarratives appears on the Web, individuals will not be following the same structure of finding information in the same way.

M6		fx = ((E6/80+60/E6)/2)*(-1)							
	A	B	C	D	E	F	G	H	I
1					THE FREQUENCES				The
2									
3									
4		Manet and Maximilian			Critics vs Manet				Information
5	base	Information	Maximilian	with Manet	against	Grand Total			
6	1	narrated	executed	70	90	160			
7			assassinated	10	40	50		Contingency coef.	
8		TOTAL	narrated	80	130	210		0,21	weak influe
9		antenarrate	executed	140	90	230		1	diag.princ.
10			assassinate	40	10	50			
11		TOTAL	antenarra	180	100	280		-0,15	weak influe
12	1 Total	Grand Total		260	230	490		-1	diag.secure
13	repetition	Information	executed	60	140	200			
14	2	narrated	assassinated	10	30	40			
15		TOTAL	narrated	70	170	240		0,04	non existing
16		antenarrate	executed	130	100	230		1	diag.princ.
17			assassinated	30	10	40			
18		TOTAL	antenarra	160	110	270		-0,13	weak influe
19	2 Total			230	280	510		-1	diag.secure
20	Grand Total			490	510	1000			
21	base	repetition							
22	1	1	2	Sum	influence	Sum of Squares			
23	1	70	60	130	1000	62500	correction		
24	Maximilian	10	10	20	-640	25600	SSA	121,49	Fa
25	tics vs Mar	90	140	230	20	25	SSB	0,12	Fb
26	Information	140	130	270	100	625	SSC	2,97	Fc
27	AB	40	30	70	-20	25	SSAB	0,12	Fab
28	AC	40	30	70	-100	625	SSAC	2,97	Fac
29	BC	90	100	190	-280	4900	SSBC	23,25	Fbc
30	ABC	10	10	20	80	400	SSABC	1,90	Fabc
31	T.rep	490	510	1000	62500	25	SSRep	0,12	Frep
32					correction	33700	SST		
33						1475	SSE	Ftab=5,59	

Figure 2- Frequencies

Results using factorial experiments 2^3

The Figure 2 represent the data arranged for using the factorial experiments 2^3 and the relationships of order zero, one and two, A, B, C, AB, AC, BC, ABC. As can be seen, Fisher coefficients shows that, no matter other variables, the common knowledge is that *Maximilian was executed* Fa equal to 121,19 is greater than Fisher (1,7) which is

5,59 and this collective knowledge is given by aestheticians with the *same views as Manet* in an *antenarrated* process, Fisher coefficient $F_{bc} = 23,25$ greater also than $F_{tab} = 5,59$.

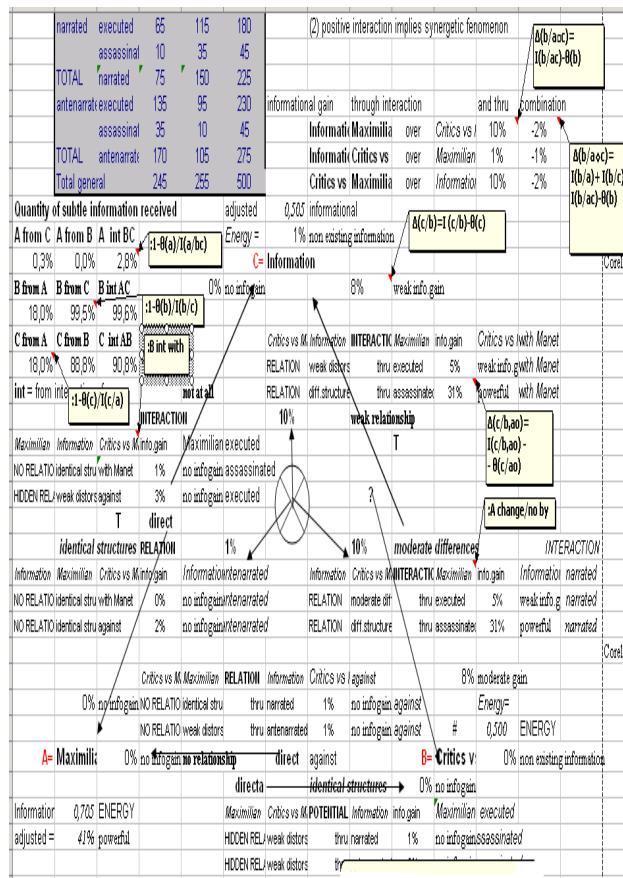


Figure 3 - Informational Statistics results

Results using Informational Statistics

If we follow, the only arrows with informational gains, between B-C, Critics - Information we see aestheticians with the same view as Manet are believing that Maximilian was assassinated and they received this information from stories narrated. The most interesting line in this ideogram with arrows is the last lines where it looks like there is no relationship between A- B but C (source of Information) has CHANGE POTENTIAL from *executed* to *assassinated*

In this article we hope to demonstrate that applying such interstitial methodology the obtained results are very promising for analyzing any communication, narrated or antenarrated that has a fo of a conversation and make statistics useful in

dealing with conversation analysis. Using it to map out other opinions, or real life situations, real life reports, other pieces of literature as Poetry or Absurd Theatre. Just to see what outcomes one gets

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Cybernetics and Consumer Behaviour: An Exploration of Theory of Messages

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ABSTRACT

Dr. Stuart Umpleby of the George Washington University claims that circularity is at the heart of cybernetics [8]. This same characteristic is also at the heart of business, particularly in marketing and especially in the study of consumer behaviour. This paper attempts to map marketing concepts, particularly those of communication, to cybernetics, particularly second-order cybernetics, where the principles are applied to organizations and societies as well as to machines. It will use Norbert Wiener's seminal work on cybernetics and society [8], Chris Miles' [4] article on Cybernetics and Advertising, and a textbook on principles of consumer behaviour [5].

Keywords: cybernetics, marketing, advertising communications, consumer behaviour, feedback

1. INTRODUCTION: TERMS AND THEORIES

Cybernetics can be defined most simply as the intersection of machines and human beings. Wiener describes the word *cybernetics*, which he is credited with inventing, as derived "from the Greek word *kubernetes*, or 'steersman', the same Greek word form which we eventually derive our word 'governor'" [8]. First-order cybernetics was the cybernetics of observed systems. Second-order cybernetics is the cybernetics of observing systems. Second-order cybernetics took up the theory of social systems, the theory of interactions between organization and society; we came to see the role of ideas in a changing social system and we came to regard the observer as important [7]. Wiener added social systems to the pool, focusing on form and pattern rather than

substance. He defined cybernetics as "the science of control and communication in animals, machines, and social systems" [8]. It is this definition that this paper will use for the term.

Wiener further added, "Since the end of World War II, I have been working on the many ramifications of the theory of messages. Besides the electrical engineering theory of the transmission of messages, there is a larger field which includes not only the study of language but the study of messages as a means of controlling machinery and society" [8]. Wiener in fact refers to cybernetics as "the theory of messages" [8].

The "control of machinery and society" is an important concept in the study of technology and society. We cannot separate technology and society. Even the invention of the arrowhead and spear as early technology meant that early humankind had to be able to communicate and strategize as it changed the way they hunted in groups [1]. We can envision, in advertising communication, the communication process as *technology* and customers as *society*. If marketers are going to control consumers, that is, convince consumers to buy their product, they will need to communicate and strategize and they do this using the principles of good marketing.

The Marketing Concept is a theory of marketing which became popular in the middle of the last century to explain a new way of conceptualizing the selling of products. Prior to the 1960s, *marketing* was seen essentially as meaning *sales*. It came out of the production concept whereby an organization made what it wanted to sell and people bought it because there was no other choice. Later marketing moved to the Selling Model where the company

employed especially talented people, salesmen, to sell the product to the customer. I deliberately do not degenderize; it was almost all men selling in those days and the model of sales was a salesman, someone who learned all about the product, its benefits and advantages, and took it out on the road and sold it. This worked well as long as there was barely enough supply to meet demand. After the second World War, however, America found its many factories that had been geared up for war production to be in need of something to do in peacetime. As companies produced more and more product, it became necessary to think in different ways about selling the product, since people had more choice. Thus was conceived the Marketing Concept – the idea that all areas of the firm would work together in order to produce and sell a product that met the needs of the consumer, at a profit to the firm.

As intellectual disciplines, second-order cybernetics and marketing came into being reasonably close to each other, in the middle of the last century. While first-order cybernetics had dealt mainly with biological systems and “man (sic) and machines”, second-order cybernetics would extend the discipline to the study of human systems, including organizations. The Marketing Concept makes reference to this system, encouraging the entirety of the organization to work together to meet the needs of its customers at a profit to the organization. Both disciplines are characterized by an intense interest in and dependency on communication, and yet a search of the literature revealed only one major article [4] linking the study of the human beings who make up a marketing firm and its customers – the study of consumer behaviour – to cybernetics.

Norbert Wiener's first book was titled simply *Cybernetics*, and had as its target audience those working in the field and familiar with Wiener's terminology and ideas. His second work, which forms the centerpiece of this paper, broadened the concept to its current emphasis on human beings as part of the communications equation and answered the demand for a book that would bring cybernetics to a level to be comprehended by the “lay

public”. Wiener's work focused on the “theory of messages” [8].

Consumer behaviour is the branch of marketing that explores the role of the human being in marketing's communications process, its “theory of messages” as it were, as encapsulated in the concept of consumer response to advertising. Consumer behaviour attempts to bring light to the so-called “Black Box” of marketing, what goes on in the head of the consumer approaching a buying decision of which we have little understanding. A large part of consumer behaviour deals with messages and communications, and has produced the communications model, the attempt of marketing scholars to decipher the codes that impel a customer to move from the reading of an advertisement to the purchase of a good or service. In a sense, marketing and cybernetics can be seen as evolving from the same kind of thinking at around the same time. Both have at their core an examination of messages and their effect on human beings.

2. THE LAW OF REQUISITE VARIETY

The first law of cybernetics is Ross Ashby's Law of Requisite Variety. Conceived in the early 1950s, this law states that “the amount of appropriate selection that can be performed is limited by the amount of information available” [2]. The need for information is at the base of all modern organizations involved in marketing a product of any kind. Of Borden's Four Ps of marketing, one of the models of marketing [3], it is the crucial term *Promotion*. One must have a Product (good or service), it must be available (Place), it must be sold at a Price that will attract buyers, and perhaps most important, the company needs to do Promotion to inform consumers of the availability of the product and information about it. How the consumer then processes the information provided is the main subject of the study of Consumer behaviour. Consumer behaviour is all about variety and choice. When supply began to outstrip demand, marketing increased and changed in order to, among other things, find out why consumers bought what they bought. How consumers went about choosing the products they purchased had everything to do with the

variety presented in the market. In order to make the right purchases, consumers needed information about those products, and hence came Advertising and other forms of Promotion.

3. FEEDBACK AND THE MARKETING CONCEPT

Cybernetics is about feedback and circularity in models. It is a major term in Wiener's works, "a method of controlling a system by reinserting into it the results of its past performance" [8]. It also is at the heart of marketing models. The Marketing Concept, which came into practice in the middle of the last century, dictates three pillars upon which good marketing is built:

*The Whole Firm Works Together to
Meet the Needs of the Consumer
At a Profit to the Organization*

These ideas, seemingly simplistic now in the twenty-first century, came at a time when in too many organizations information was carefully guarded in separate parts of the organization. An organization with separate cost centres would make this separation even more appealing. As organizations began, however, to examine the role of information in successful marketing, they found that in order for the organization to function more effectively, information needed to be available to all parts and areas of the organization. In order to know what the needs of the consumer are, information must pass from consumers to organizations. In the earning of a profit, information must be available to keep track of what is selling and what is not, of what works to increase sales and what does not. This is said with the understanding that it is generally accepted in marketing that we cannot link "successful" advertising directly to sales. Umpleby says that "we like trivial systems, controlled and predictable" [8]. The Marketing Concept, while not including the entirety of marketing, does a moderately good job of providing us with a relatively simple model in which we have some control over the first and third items (encouraging the whole firm to work together and knowing what makes for a profit in

any situation) and less control over knowing exactly what will make the consumer happy.

Adapting the words of Neil Wiener, "...control of a [n organization] on the basis of its actual performance rather than its expected performance is known as feedback" [8]. This feedback of information is supposed to control the natural tendency of any system or organization toward entropy. "...[J]ust as entropy is a measure of disorder, so information is a measure of order" [8].

We know when the organization is successfully working together by virtue of the feedback that management receives from different parts of the organization. Things run more smoothly when everyone knows what everyone else is doing. An organization, in Wiener's words, "will tend to dally longer in those modes of activity in which the different parts work together, according to more or less meaningful pattern" [8]. Feedback from production, sales, and accounting and from places of sale provides information on profit and loss. And feedback from consumers helps us approximate what will make them happy the next time.

It is important that upper management understand that feedback must come from those closest to what is happening and must flow both ways. "It follows that administrative officials, whether of a government or a university or a corporation, should take part in a two-way stream of communication, and not merely in one descending from the top". [8].

4. FEEDBACK AND THE COMMUNICATIONS MODEL

Feedback plays a major role in consumer behaviour models, especially the Communications Model. It is important to heed Wiener's warning that "...it is not the quantity of information sent that is important for action, but rather the quantity of information which can penetrate into a communication and storage apparatus sufficiently to serve as the trigger for action" [8]. Ultimately the marketer is concerned with the behaviour of consumers, not just what they say they will buy or how much they may like a particular advertisement.

Wiener's insight on language also fits the emphasis on the behaviour of consumers, "There is a third level of communication, which represents a translation partly from the semantic level and partly from the earlier phonetic level. This is the translation of the experiences of the individual, whether conscious or unconscious, into actions which may be observed externally. We may call this the behaviour level of language" [8]. "The

fundamental idea of communication", Wiener claims, "is that of the transmission of message..." [8]

Message plays a major role in the study of consumer behaviour. Indeed it is at the centre of the traditional model of communications, from the Frankfort School, and a circular model (see Figure 1):

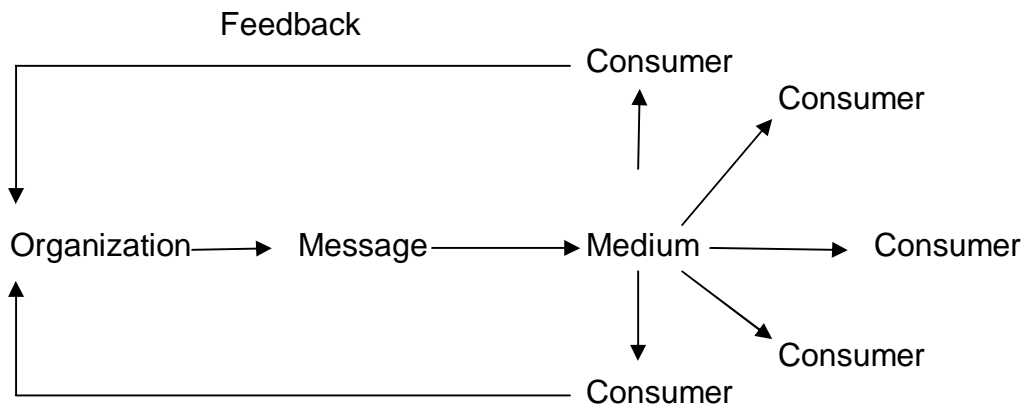


Figure 1 The Frankfort School Model of Communications [5]

In this model, consumers are seen as relatively passive recipients of information from marketers, with the message central to the model. There is some feedback from the consumer to the organization, which provides the circularity, but the main focus is on the message communicated from the organization to the consumer. The Uses and Gratification Theory which came later, moved us on to a model whereby the consumer interacts much more with the medium, as happens with the Internet for example, but the message still remains central to the process. In fact, much of all marketing centres around the message, from knowing what to put into an advertisement to describe a product to knowing how best to send out words that will convince the consumer s/he needs the product.

"We are," Wiener says, "immersed in a life in which the world as a whole obeys the second law of thermodynamics: confusion increases and order decreases". [8]. It is communication that provides a way to handle the "forces of confusion" [8]. The many and varied models of marketing all provide further ways to handle this

confusion. The more we can put into a model that can be drawn, the closer we are to understanding the process and Wiener claims that "information is more a matter of process than of storage" [8]. Wiener speaks of there being no reason why machines "may not resemble human beings in representing pockets of decreasing entropy in a framework in which the large entropy tends to increase" [8]. We can think of the pursuit of market niches as following this same pattern – the marketer looks for groups of human beings in the market who will all want something similar to meet a need (core product), be willing to pay more for an actual product which meets this need, and will enjoy, and therefore keep purchasing, a product which has valuable augmentation.

5. CYBERNETICS AND THE COMMUNICATIONS MODEL

The Communications Model, coming to us out of consumer behaviour, deals with how information is handled between the advertiser and the consumer. Miles cites Stern's Revised

Communication Model for Advertising (1994) which, despite its attempt to be all-inclusive, "is deficient in a complete depiction of the interactive relationships between core elements of the advertising message production process" [6]. These deficiencies can be handled, Miles argues, by the addition of cybernetics to the problem, building "on Stern's advances and fully address[ing] the complex character of interactivity and the implications of the phenomenal increase in message production by a multiplicity of consumer audiences" [4]. Miles thus envisions advertising "as an observing system", that is, adding second-order cybernetics to the simpler feedback loops, which come to us out of first-order cybernetics, where the item of interest is an observed system [4].

All of this makes cybernetics ideal for studying relationships and effects in considering how consumers react to advertising. In Miles' words, "Cybernetics is distinguishable from goal-predicated theories of psychology, behavioural theories of learning and information theory in that it seeks to elucidate the processes by which goals or reference states are reached by systems" [4]. We see again Wiener's insistence that information is a matter of process rather than storage. He cites Jay Forrester's note that "feedback processes govern all growth, fluctuation, and decay...[and are] the fundamental basis for all change [4].

There are other areas where cybernetics may contribute to our greater understanding of the communications process in advertising. Miles goes on to elucidate how eigenforms, attempts at "fixing or stabilizing continually evolving processes", are different in the model of advertising communications, tending to be "fixed in a more particular way" [4]. He also discusses the use of reference signals (first-order) and their relationship to the fixed eigenforms of cybernetics. He arrives at a model where interactivity is central to the advertising process, not just provided to the consumer by the advertiser. This has important ramifications for Internet marketing, where consumers expect to find interactivity.

Miles adds feedback loops throughout the model, which connect every part of the model

with every other part, indicating the amount of interactivity that is going on. In addition, he adds an additional player to the system, the sponsor whom the ad agency has as a client. He furthermore separates the role of the *actual consumer* from the *tested consumer*, pointing out the role of cybernetics in "making explicit the consequences of testing in the advertising communication system" [4], and indicates with lines of control how the *actual consumer* is today regarded as a co-creator of the message. This has important ramifications for Internet marketing where the consumer assume s/he has more input into the process.

6. CONCLUSION

In the final consideration, it is all about information and how we model its movement, whether it be in following the lines of relationship within the Marketing Concept, or in a system of advertising communications. Cybernetics gives us the tools with which to model exchange of information, or communication, as it is practiced in marketing. This exchange is always circular, and that circularity is much more prevalent than previous models have shown it to be. Miles provides a model that indicates how cybernetics can help us understand more about marketing, and advertising communications in particular.

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Efficient Market Theory – The Stock Market Versus the Electronic Market. Romania Case Study

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ABSTRACT

In a technological era, the volume of the transactions done through the Internet is growing continuously determining scientists to develop different studies to analyze the efficiency of electronic auction markets. Starting from this idea, we have analyzed in this paper the theoretical aspects related with the efficiency of online auction markets in Romania, as well as the informational efficiency of the national Capital Market. Using econometrical methods we have studied the *weak form* of the Romanian Capital Market efficiency and we have discovered that on this market available information fully reflect into prices, the possibility to speculate being out of the question. On the other hand, the online auction market passes through a process of development in Romania, this development being slowed down by factors of psychological, legislative and technological nature. So, we have concluded that at this point our national Capital Market is more efficient than the one of electronic auctions.

Keywords: Informational Efficiency, Electronic Market, Online Auctions, Romanian Capital Market, Random Walk and Market Efficiency.

1. INTRODUCTION

At the beginning of the *speed century*, the technological revolution has led to the intense development of Internet technologies. Nowadays, the access to information represents a necessity, the electronic platforms offering Internet users a favorable environment to make businesses, an environment considered efficient especially due to smaller transaction costs. In the last decade, different empirical studies regarding electronic auctions have been developed, this type of auctions being very important in the e-commerce field [8,13]. The volume of information available to buyers and sellers in online auctions, especially in the case of the developed countries, like the United States of America (the world's most popular online auctions site is Ebay.com inaugurated in September 1995, in San Jose, California by the programmer Pierre Omidyar) has brought into researchers' attention the efficiency of electronic markets. There are two different definitions that have been used to evaluate auctions efficiency in general and online auctions efficiency in particular.

The first type of market efficiency we are referring to is operational or allocative efficiency. This type of efficiency is defined as a percent of the maximum possible surplus extracted by a market institution at the encounter of supply and demand and it is more difficult to estimate using data available on the market, except for a few situations. The easiest way to estimate operational efficiency is with the help of laboratory experiments done using economically motivated human subjects, experiments where value and cost are directly induced by the person that carries out the experiment [13].

The second type of efficiency known in the empirical literature is the informational efficiency and it has been used to evaluate the performances of capital markets. A market is considered to be informationally efficient if prices fully reflect available information. This concept has been anticipated at the beginning of the XX-th century by Bachelier in his dissertation thesis. The young mathematician had come to the conclusion that the probability of a price to grow at a certain point equals the probability of a price to decrease, the mathematical expectation of a speculator being zero. The market was compared to a *fair game*, the trajectories of price changes following a Random Walk [2]. Bachelier's discoveries have not been valued until the '50s when MIT researchers subjected the Random Walk hypothesis to some tests, stating that if the hypothesis is viable there should be no evidence of empirical autocorrelation at the level of historical series of price changes. The success of empirical tests has led to the formalization of Bachelier's theory using modern quantitative methods and stochastic mathematics. These expectations have represented the foundation of brilliant analyses anticipating not only Albert Einstein's subsequent derivation of the Einstein-Wiener process of Brownian motion but also many analytical results discovered by finance academics in the second half of the XX-th century. Eugene F. Fama was the one that developed the *Efficient Market Hypothesis* succeeding a paper written by Paul Samuelson, and in his paper he stated that market prices fully reflect all available information on the market, future price changes being the result of news that by definition can not be predicted. Therefore, he considered that all efforts of analysts and fund managers that try to beat the market are futile and senseless [1,14].

Informational efficiency, as opposed to operational efficiency, reveals the fact that all market participants have the same access to information. So, operational efficiency does not concentrate on the transfer of information between all market participants. In the present paper we focus on the second type of market

efficiency. Kauffman, Spaulding and Wood [8], have evaluated the informational efficiency of online auctions for collectibles (coins and stamps) using the concepts of capital market efficiency. Starting from their research, we want to evaluate online auctions efficiency compared to the informational efficiency of the Romanian Capital Market. Unlike the study undergone by Kauffman, Spaulding and Wood [8] we concentrate especially on the informational efficiency of the Capital Market, the efficiency of online auctions being analyzed only theoretically.

In Section 2 of the paper we describe the level of e-commerce in Romania, referring mainly to electronic auctions, in Section 3 we review the literature regarding market efficiency, Section 4 focuses on testing the *weak form* of market efficiency on the Romanian Capital Market and Section 5 discusses the results obtained and the comparative efficiency of the two markets analyzed. We conclude with limitations of the present study and future research.

2. THE ROMANIAN ELECTRONIC MARKET

Along with the development of Internet technologies, online auctions have become an important component of the world's e-commerce. More and more people prefer to direct their savings towards goods and services available on the Internet, online transactioning having the capacity to connect individuals from different geographic regions and cultures. Various facilities offered by online auction platforms have determined researchers to concentrate their attention on this domain, being posed the question whether in a technological era the online auctions market won't become more profitable and more efficient than the Capital Market. Certain studies have theoretically underlined the fact that auctions can not be seen as efficient markets because the information flow between market participants can be faulty from certain points of view [8]. An uninformed buyer can make the price for a good grow up unreasonably and in the end the good is bought at a higher price than its worth. On the other hand an uninformed seller can end up selling a good at a lower price than its worth. This type of inefficiencies can transform the online auctions market in a market very attractive for investors that seek to profit from them.

On the background of a knowledge-based society, the technological developments of the last decade have put a print also on the Romanian economic environment. Along with the increase in the accessibility to the Internet services, the e-commerce has evolved in the last ten years in our country. Nowadays, the spreadest form of e-commerce is represented by online auctions. The main reasons that determine more and more online users to orientate towards virtual businesses are the vast range of goods, symbolic prices for opening an auction, the possibility to communicate with sellers and the possibility to participate at various auctions through a short period of time. However, there are a few major drawbacks of the Romanian electronic bidding system. One of these deficiencies is related to online payments, to be more precise we are referring to the heavy commissions involved in interbankary payments. Another major drawback would be the lack of trust of Romanian users and Romanian comerciants in the electronic system, the main cause being the absence of information regarding this field. The rumors referring to Internet frauds determine Romanian citizens to be very reluctant towards this domain.

One of the most accessed sites of online auctions is the portal Okazii.ro, launched on the 15th of April 2000 by the company netBridge Investments, allowing end consumers to access the

virtual environment and to bid for the chosen product, being the first electronic auctions site initiated in Romania. The catalog of Okazii.ro provides a vast range of products, the persons interested in bidding being able to choose from numerous categories like: Businesses and Industry, Antiquities and Art, Jewelries and Watches, Collectibles, Health and Beauty etc. This site is accessed monthly by 1 700 000 unique visitors, having 690 561 sellers carrying trades. Okazii.ro is considered to be the most important electronic auctions platform (95% of the Romanian online auctions are held on this site). Compared with the developed countries like the United States of America, the number of Romanian bidders on online auctions sites is smaller. The most popular online auctions site in the world is Ebay.com. In 2008 Ebay had a gross merchandise volume of 80 billion dollars (2000 dollars for each second) and 88 million active users. These facts lead us to the conclusion that in Romania we are at the beginning of the "*road*" in the e-commerce field and this is the reason why an empirical analysis of the informational efficiency of the market for online auctions will have greater value and will be more pertinent in a few years.

3. EFFICIENT MARKET THEORY

Kendall [1,7,12] was the one who discovered markets follow a Random Walk, emphasizing that when historical prices are observed at fairly close intervals, the random changes from a moment to another are very large, therefore any systematic effect that may be present is eliminated. Starting from Kendall's research, Roberts [11,12] demonstrated that a time series generated from a sequence of random numbers can not be distinguished from a record of American stock prices. Osborne [10,12] analyzed American stock prices from purely academical reasons, showing that stock prices have analogical properties with molecule movements. He applied mechanic statistical methods to the stock market, carrying out an analysis of price fluctuations from a physicist's point of view. In the '60s it was found that autocorrelation could be induced in return series as a result of time dependent stock prices. In the case that return series are based on end of period prices, the returns seem to fluctuate randomly. Summarizing the literature closely related to the Random Walk Theory, Eugene Fama was the one that distinguished three forms of market efficiency: the *weak form* that stated stock prices already reflect all information that can be derived from the examination of past prices, the *semi-strong form* that stated all information available publicly regarding firm perspectives must already be reflected in stock prices and the *strong form* of the efficiency hypothesis that stated stock prices reflect all public and private information available on the market. More recently, Lo and Mackinlay [6] rejected the Random Walk Hypothesis, affirming that their conclusion had no implications on the Efficient Market Theory. On the other hand, Daniel and Titman [5] reject the Efficient Market Theory, developing an alternative theory that states prices are influenced by the overconfidence of investors, discussing also a weaker efficiency entitled adaptive-efficiency. This type of efficiency recognizes the behavioral variations of market participants and affirms there are investors who can identify these variations, profiting from them through the examination of the trend of historical prices. Due to the risk aversion of investors and their limited capital, behavioral variations of less rational participants are difficult to eliminate. However, if a significant number of investors are rational, then the profits generated by the chosen strategies should dissipate. Malkiel [9] has made a review of the studies that sustain and reject the Efficient Market Hypothesis.

He considers that regardless of the technological development and regardless how documented market efficiency and the so called elements that lead to the prediction of stock prices will be, the conclusion will always be the one that the capital market has a remarkable capacity to use information. In the present study we focus only on the *weak form* of Market Efficiency, testing whether the series of historical prices follows a Random Walk [4].

4. TESTING MARKET EFFICIENCY ON THE ROMANIAN CAPITAL MARKET

Methodology

Let Y_t be the series of stock historical prices quoted on the Bucharest Stock Exchange. This series is assumed to follow a Random Walk Model being a nonstationary series. Let u_t be a white noise with zero mean and constant variance σ^2 . There are two types of Random Walk: (1) Random Walk without drift (no intercept) and (2) Random Walk with drift.

(1) The Y_t series is assumed to be a Random Walk without drift if:

$$Y_t = Y_{t-1} + u_t \quad (1)$$

If the difference operator is applied to the series, meaning that the first difference of the series is calculated, the series will become stationary:

$$(Y_t - Y_{t-1}) = \Delta Y_t = u_t \quad (2)$$

As previously mentioned, the u_t term has constant mean and variance and it is known that a stochastic process is said to be stationary if the mean and variance are time invariant and the covariance value depends only on the lag between the two time periods and not on the moment when the covariance was computed. Such a stochastic process is known in literature as *weakly stationary*, or *covariance stationary*, or *second order stationary* [3].

(2) The Y_t series is said to be a Random Walk with drift if:

$$Y_t = \beta + Y_{t-1} + u_t \quad (3)$$

If the difference operator is applied:

$$(Y_t - Y_{t-1}) = \Delta Y_t = \beta + u_t \quad (4)$$

The series obtained is also stationary and depending on the sign of the drift parameter the upward or downward trend of the series can be seen.

In order to test whether a series is stationary or not various tests can be used. In this article we will refer only to some of them, such as: correlogram analysis and the unit root test.

Autocorrelation Function (ACF) and Correlogram: The autocorrelation function represents a simple test for stationarity. The ACF function for lag k denoted ρ_k is defined in the following way:

$$\rho_k = \frac{\gamma_k}{\gamma_0} = \frac{Cov_{lag_k}}{Var} \quad (5)$$

Since both variance and covariance are measured in the same measurement units, ρ_k can take values between -1 and +1. If ρ_k is plotted against k the population correlogram will be obtained. In practice, only the realization of a stochastic process is available. So, only the sample autocorrelation function (SACF) can be computed $\hat{\rho}_k$. In order to calculate it, first the sample covariance at lag k , $\hat{\gamma}_k$, and sample variance $\hat{\gamma}_0$ must be calculated, which are defined as:

$$\hat{\gamma}_k = \frac{\sum (Y_t - \bar{Y})(Y_{t+k} - \bar{Y})}{n} \quad (6)$$

$$\hat{\gamma}_0 = \frac{\sum (Y_t - \bar{Y})^2}{n} \quad (7)$$

where n represents the sample size, and \bar{Y} represents the sample mean. So the sample autocorrelation function for lag k

$$\text{is: } \hat{\rho}_k = \frac{\hat{\gamma}_k}{\hat{\gamma}_0} \quad (8)$$

A plot of $\hat{\rho}_k$ against k is known as the sample correlogram. The statistical significance of any correlation coefficient can be judged by its standard error. Bartlett [3] has shown that if a time series is purely random, the sample autocorrelation coefficients are approximately $\hat{\rho}_k \sim N(0, 1/n)$, meaning that in large samples the sample autocorrelation coefficients are normally distributed with zero mean and variance equal to one over the sample size.

The Unit Root Test: Eq. (1) can be rewritten in the following way:

$$Y_t = \rho Y_{t-1} + u_t, \quad -1 \leq \rho \leq 1 \quad (9)$$

where u_t is white noise. When $\rho = 1$ it means there is a unit root, meaning that this is the case of a Random Walk Model without drift, which is a nonstationary stochastic process. Subtracting from both terms of Eq. (9) Y_{t-1} , the following equation is obtained:

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + u_t \Leftrightarrow \Delta Y_t = \delta Y_{t-1} + u_t \quad (10)$$

where $\delta = \rho - 1$. It is estimated and tested whether $\delta = 0$, having the following hypotheses:

H_0 : $\delta = 0$, meaning there is a unit root at the level of the series (the series is nonstationary);

H_1 : $\delta < 0$, (the series is stationary).

Dickey-Fuller have shown that under the null hypothesis $\delta = 0$, the estimated t value of the coefficient of Y_{t-1} follows a τ (tau) statistic. The authors have computed critical values for this statistic based on Monte Carlo simulations. In the

speciality literature this test is known under the name of the Dickey-Fuller Test (DF). Dickey-Fuller have also developed a test entitled the Augmented Dickey-Fuller (ADF). This test consists of the following regression estimation, in the case there is a Random Walk without drift:

$$\Delta Y_t = \delta Y_{t-1} + \sum \alpha_i \Delta Y_{t-i} + \varepsilon_t \tag{11}$$

and

$$\Delta Y_t = \beta + \delta Y_{t-1} + \sum \alpha_i \Delta Y_{t-i} + \varepsilon_t \tag{12}$$

when there is a Random Walk with drift. ε_t is a pure white noise and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$ etc. The number of lagged difference terms to include is often determined empirically, the idea being to include sufficient terms so that the error term is serially uncorrelated. In ADF is tested if $\delta = 0$ and the distribution used is the same as in the case of the DF statistic, so the same critical values can be used [3].

Data

We have started from the evolution of the reference index of the Bucharest Stock Exchange (BET), a price index weighted with the free float capitalization of the most liquid 10 companies listed on the regulated market, in order to test the *weak form* of market efficiency on the Romanian Capital Market. So, we have computed a data base for the period 22/09/1997-24/12/2009, the data being collected using Reuters 3000Xtra [15], and the analysis being done with the help of the econometric software Eviews 5.0.

Results

According to the plot of the series of historical prices of the BET index, the series is nonstationary:

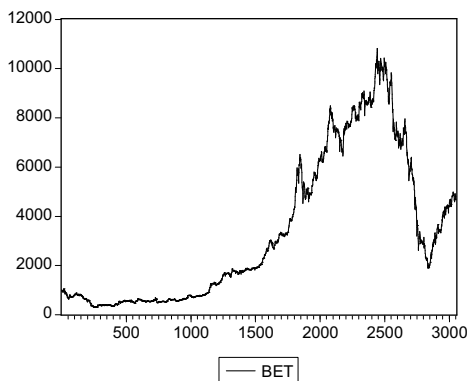


Figure1. BET series (initial data series)

In order to validate this hypothesis we have analyzed the correlogram of the series and we have observed that the first realization of the partial autocorrelation function (PAC) differs from zero, meaning that the analyzed process has an autoregressive component of order one AR(1). The coefficients of the autocorrelation function (AC) start from a very high value and decrease slowly towards zero, meaning that the series possess a moving average component (MA) of an order that will be determined later in the analysis.

We have subjected the series to the Augmented Dickey-Fuller test (ADF) to test whether the series has a unit root. We have computed for the test's *t* statistic a bigger value than all the critical values of 1%, 5% and 10%. So we have accepted the null hypothesis according to which the series is nonstationary. To stationarize it we have calculated the first difference.

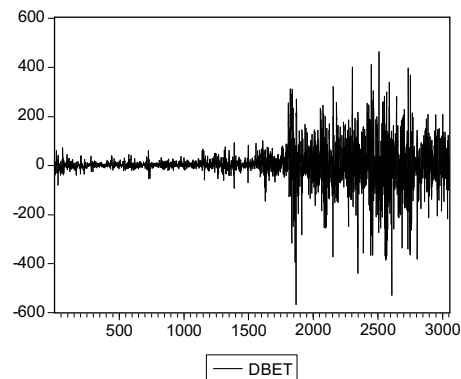


Figure2. First difference of BET (DBET)

According to the plot of the first difference it seems the series is stationary. In order to validate this assumption we have used the correlogram and the ADF test. The correlogram shows that the coefficients of the autocorrelation function (AC) move around zero, and this type of output is specific for a stationary series. The results obtained for the ADF test confirm the fact that the series is stationary, the test's statistic having a smaller value than all critical values computed.

Data Series	Augmented Dickey-Fuller Test Results				
	t-Statistic	Prob.*	Critical Values		
			1%	5%	10%
BET	-0.901583	0.7883	-3.432306	-2.86229	-2.56721
DBET	-22.26283	0.0000	-3.432318	-2.862295	-2.56722

Table1. ADF test results

We have applied the Box-Jenkins procedure to the stationary series seeking to identify an analytical form of an Autoregressive Integrated Moving Average Model ARIMA(p,d,q). The objective of this procedure is to identify and estimate a statistical model which can be interpreted as having generated the sample analyzed. If this estimated model will be used for forecasting it can be considered that the model has characteristics constant through time, and particularly over future time periods. This is the reason why it is necessary to have a stationary series, because any model developed from such a series can be interpreted as a stable or stationary model, therefore providing a solid base for forecasting [3]. We have estimated the following models using the Ordinary Least Squares estimation method: AR(1), AR(2), AR(3), AR(4), AR(5), AR(6), AR(7). The coefficients that differ significantly from zero for the most restrictive significance level of 1% have been found in the case of the models AR(1) and AR(7). We have also estimated the following moving average models: MA(1), MA(2), MA(3), MA(4), MA(5), MA(6), MA(7). The models MA(1) and MA(7) have been validated. Therefore we have estimated the following models: ARIMA(1,1,1), ARIMA(1,1,7), ARIMA(7,1,1) and ARIMA(7,1,7). Comparing the significance of the estimated coefficients and using the Akaike and Schwarz criterions we have concluded that the ARIMA(1,1,7) model satisfies all the robustness tests. To validate this model we have verified three fundamental hypotheses: serial correlation in the residuals,

homoscedasticity/heteroscedasticity in the residuals and the normal distribution of the residuals. With the help of the correlogram and the Breusch-Godfrey test we have found significant serial correlation in the residual series. To verify if the residuals have constant variance we used the ARCH test and concluded there is strong evidence of autoregressive conditional heteroskedasticity in the residuals. Using the Jarque-Bera test we tested the normal distribution of the residual series and we have concluded the series is not normally distributed.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.720219	Probability	0.486729
Obs*R-squared	1.442122	Probability	0.486236

ARCH Test:

F-statistic	360.8845	Probability	0.000000
Obs*R-squared	322.8574	Probability	0.000000

Table2. The results of the Breusch-Godfrey and the ARCH tests

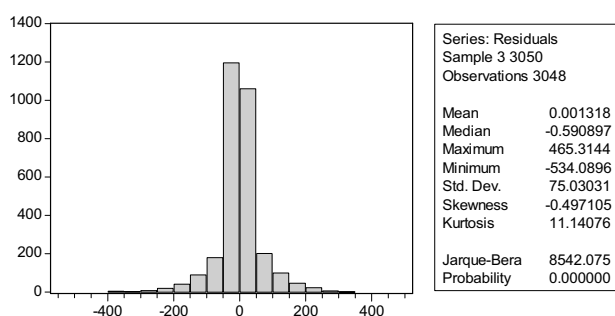


Figure3. The results of the Jarque-Bera test

Taking into consideration these findings we have concluded that the ARIMA(1,1,7) model can not be validated, because the above hypotheses have been refuted. Therefore, the series of the reference index of the Bucharest Stock Exchange follows a Random Walk so the Romanian Capital Market is informationally efficient according to the results obtained after testing the *weak form* of Market Efficiency.

5. CONCLUSIONS

The Romanian online auctions market is passing through a development phase, being slowed down by the reluctance shown towards electronic auctions due to the fraud rumors regarding this domain. So, the psychological factor and other technical and legislative problems lead to the deceleration of the development process. Bearing in mind these aspects we considered inappropriate an empirical analysis of the informational efficiency of the Romanian online auctions market, restricting our study only to the theoretical aspects related with this subject. In comparison with the electronic market, the Romanian Capital Market is more developed, the investors seeking to place their funds on this market precisely because is informationally efficient, all the information available on the market being fully reflected into prices. The sintetization of the aspects approached in this paper leads to the conclusion that at this point the Romanian Capital Market is more efficient than the electronic market, but we want to underline the fact that the Romanian online auctions market can become in time „an efficient market where regular people could compete with big business...” (Pierre Omidyar).

Limitations and Future Research

The idea that generated the formalization of this paper’s subject was to compare the informational efficiency of the Romanian electronic and Capital Market. The reduced volume of transactions on the electronic market, our citizen’s reluctance towards this market and the problems of technical and legislative nature, as well as the absence of specialized software agents that collect data from online auctions sites have led to a theoretical analysis of this market and an empirical analysis of the Capital Market. We seek in the future to extend our research and study the informational efficiency of the online auctions market for antiquities and art.

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Recent Trends in Marketing Research in Turkey

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ABSTRACT

The aim of this research is to gain insights in the methodological issues and problems of marketing research in Turkey. This research provides information and recommendations for the research methodology of marketing papers published in Turkish National Marketing Congresses' Proceedings between 2007 and 2009. The evaluation of marketing papers is done with content analyses method, in terms of methodological process such as research type, research modeling and hypothesis development, sampling, data collection and data analysis.

The study indicates that there are significant problems regarding modeling and hypothesis development, sampling and data analysis stages of research process. The findings also show that, analyses are chosen on the basis of their popularity in most of the studies.

Keywords: Marketing, Research Methodology, Marketing Articles, Content Analysis.

1. INTRODUCTION

For the proper progress and development in science the methodology also has an important role. This research aims to understand the current situation in marketing research in Turkey and gain an understating about the methodological problems and recommend solutions for them.

The discussion of research methodology used in marketing publications has been going on for last three years [1] [2] [3] The outcome of reviews and evaluations of marketing publications varies due to the period it covers and are only limited with the proceedings which have been evaluated. Within the same context, marketing papers published in last three Turkish National Marketing Congresses' Proceedings are examined in the study. The sample consisted of 159 papers from 12th [4], 13th (there has been two different Turkish National Marketing Congresses in 2008 in Adana and Nevşehir) [5] [6] and the 14th [7] Turkish National Marketing Congresses.

The content analysis is used as a research technique to evaluate these 159 proceedings, for understanding, determining and analyzing the growth of the marketing discipline. Thus, the research aimed to determine methodological problems by analyzing marketing publications, in terms of content categories, research type, modeling and hypothesis, sampling, data collection and data analysis. Kurtuluş and Kurtuluş [2] have evaluated 236 marketing publications between 2003-2006 using similar methodological criteria [2] and research also continued in 2009 [3].

2. CONTENT CATEGORIES

In the first step of the content analysis, the proceedings are classified with the study subjects.

Table 1: Number of Publications by Content Categories (2007-2009)

Content Categories	Number	Frequency (%)
Consumer Behavior	44	27.67
Marketing Management	23	14.47
Tourism Management	22	13.84
Retailing	19	11.95
Product & Brand Management	11	6.92
Marketing Strategies	7	4.40
International Marketing	6	3.77
Marketing Ethics	6	3.77
Logistics Management	5	3.14
e-Marketing	4	2.52
Sales Management	3	1.89
Marketing Communication	2	1.26
Social Marketing	2	1.26
Services Marketing	2	1.26
Industrial Marketing	2	1.26
Marketing Research	1	0.63
Total	159	100.00

The research results show (Table 1.) that consumer behavior (44 proceedings, 27.67%) and marketing management (23 proceedings, 14.47%) are the main

categories for proceedings in this period. With general titles, there are; consumer behavior, marketing management, retailing, brand management, social marketing, services marketing, international marketing, marketing strategies, product management and logistics management categories.

3. RESEARCH TYPE

For the Turkish National Marketing Congresses, researchers are asked to classify their studies according to their research type. Table 2 shows the proportions of papers according to their research types for the period between 2007 and 2009. The papers are also classified by their research methodology as quantitative or qualitative (Table 3).

Table 2: Research versus Theory Based Papers (2007-2009)

	Number	Frequency (%)
Research based	123	77.35
Theory based	36	22.65
Total	159	100.00

Table 2 shows that the number of research based marketing publications is higher than the number of theory based ones. In theoretical papers, there is no significant contribution to the existing literature, only the current literature analysis and adaptation was made. It is also observed that, there is also some confusion in theoretical concepts translated from the literature.

Table 3: Quantitative versus Qualitative Research (2007-2009)

	Number	Frequency (%)
Quantitative Research	109	77.22
Qualitative Research	34	22.78
Total	143	100.00

Table 3 shows the research types namely quantitative research and qualitative research. There are 123 research papers in total and there are 20 proceedings paper using both of quantitative and qualitative research methods. It is obvious that, quantitative research dominates qualitative research in numbers. Lack of knowledge and expertise about qualitative research among marketing academicians may be the reason for quantitative research to be chosen.

4. RESEARCH MODELING and HYPOTHESIS

As it can be seen in Table 4, research models in proceeding papers between the years of 2007 to 2009 have shown different types of research models; exploratory (21.05%), descriptive-predictive (55.64%) and causal models (23.31%). 10 of the proceeding paper has both of exploratory and descriptive-predictive research models.

Table 4: Research Models (2007-2009)

	Number	Frequency (%)
Exploratory Model	28	21.05
Descriptive - Predictive Model	74	55.64
Causal Model	31	23.31
Total	133	100.00

Specific research design models are very important for a research paper. In order to understand the objective, hypothesis and relations between the variables, researchers are strongly recommended to design a proper research model for descriptive-predictive and causal researches. With this research it is observed that in most of the studies there is no specific research design based on the research purposes, showing the variables sets and their relations. Only 33.57 % of marketing publications had appropriate research designs while 41.08% of the papers do not have a research design even though it is needed.

Table 5: Specific Research Design Usage (2007-2009)

	Number	Frequency (%)
Design used	49	33.57
No design used	37	25.35
No design used although it must be used	60	41.08
Total	146	100.00

Table 6: Hypotheses Usage (2007-2009)

	Number	Frequency (%)
Hypotheses developed	55	34.60
No hypotheses developed	47	29.56
No hypotheses developed but they must be.	57	35.84
Total	159	100.00

In 34.60% of the studies, researchers have developed research hypotheses and tested these hypotheses. Even though the research model is descriptive-predictive and causal, some of the studies do not have any research hypothesis. Also it is observed that in some studies research hypotheses are developed incorrectly (null hypotheses versus alternative hypotheses) and in some cases wrong hypotheses are tested.

5. SAMPLING

Sampling is also a very critical issue in marketing research. It is observed that the convenience sampling is

the most preferred method with 88.89%. The other methods are very rare while in some of the papers sampling method or sample size is not even mentioned.

Table 7: Data Collection Methods (2007-2009)

	Number	Frequency (%)
Convenience Sampling	104	88.89
Systematic Sampling	7	5.99
Simple Random Sampling	4	3.41
Cluster Sampling	2	1.71
Total	117	100.00

Table 8: Sample Size (2007-2009)

	Number	Frequency (%)
200 or less	43	35.54
201 - 400	40	33.05
401 - 600	22	18.18
601 - 800	6	4.97
801- 1000	5	4.13
1001 or more	5	4.13
Total	121	100.00

In a very large amount of the papers the sample size is not calculated, set by the researcher. Proceeding papers have sample size greater than 600 are very rare.

6. DATA COLLECTION

When the data collection processes are examined, it is seen that questionnaires are the mostly preferred ones, while focus groups are the most preferred qualitative method. Researches also sometimes use face-to-face interview, scenario and simulation techniques.

7. DATA ANALYSES

The proceeding papers are also evaluated by the data analyses. As it is shown on Table 9, the most commonly used statistical analyses are reliability–validity tests (16.83%), factor analysis (16.35%), regression analysis (12.50%), ANOVA (12.02%) and t test (10.58%).

The match between the research purpose, data structure and the used analyses were evaluated and noted that some researchers choose more popular analyses instead of the appropriate ones. Reliability and validity tests, factor and regression analyses seemed to be popular statistical analyses among Turkish marketing academicians. In some of the studies, the reliability of scales are lower than the generally agreed upon lower limit for Cronbach’s Alpha, 70% [8]. Some of these analyses, the researchers have wrong applications. Data requirement assumptions are not commonly checked before applying

the analyses. It is also observed that the researchers do not use non-parametric analyses where they were appropriate.

Inappropriate or insufficient statistical analyses usage is another problem with the National Marketing Congresses’ Proceeding papers. One of the example of this wrong usage is using t test, testing the differences between the mean values of two groups, testing the differences between the mean values of more than two groups instead of Anova [9]. There is also some serious problems in using factor, regression and discriminant analyses such as improper naming of factors, problems in selecting the appropriate method of regression analysis and in applying Morrison test in discriminant analysis.

Table 9: Data Analyses (2007-2009)

	Number	Frequency (%)
Reliability – Validity Tests	35	16.83
Factor Analysis	34	16.35
Regression Analysis	26	12.50
ANOVA	25	12.02
T test	22	10.58
Correlation Analysis	20	9.62
Chi-Square Test	16	7.69
Structural Equation Modeling	10	4.81
Content Analysis	6	2.88
Cluster Analysis	4	1.92
Discriminant Analysis	3	1.44
Analytical Hierarchy Process	2	0.96
Multi-Dimensional Scaling	2	0.96
Kruskal Wallis	2	0.96
META Analysis	1	0.48
Total	208	100.00

8. CONCLUSION

As a conclusion, even with the positive trend in methodology there are some serious methodological problems in Turkish marketing researches. The most serious problem seems to be modeling, followed by hypothesis development, sampling and data analyses.

Although this sample is too small and specific with Turkish Marketing Congresses between the years of 2007 and 2009 to generalize, it would be a good start to discover the main problems. And hopefully could give a solid base for further research.

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Redefining Information as a Strategic Resource

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ABSTRACT

This paper presents information as a strategic resource. Systems theory can explain the predictability – but also the inevitability – of our current economic crisis. In parallel to explaining the current financial and structural impasse, systems theory also introduces a new paradigm and a new era where information reflects the true potential of individuals as converter of expertise. With efficiency, interoperability, innovation, and growth, individuals survive the crisis of our economic system, and actively participate to its rebirth: our economic crisis offers an opportunity to position human expertise rather than financial variables in the center of our ecosystem.

Keywords: information, knowledge, expertise, efficiency, interoperability, innovation, growth, open information systems.

No crisis can bring the world to a standstill. It is its natural state to be in perpetual motion. Our current economic crisis is not a costly dead end, but rather an illustration of our previous limited comprehension of data, information, knowledge, and expertise as strategic resource. Our biased perception of economic systems as closed systems gave individuals (users and consumers), as well as institutions, the illusion that economic systems were easily controllable and could be regulated. However, the Internet creates a new relationship between the economy and the individuals and offers enough leverage to the open information ecosystem to create a necessary redefinition of our paradigm.

The Economic System as Open System

Living systems can only be sustainable if they are open to other systems, and “import new resources in the form of inputs” (Littlejohn & Foss, 2008, p. 40). Control comes from the capacity of the systems to auto-regulate themselves. “Systems monitor, regulate, and control their outputs in order to remain stable and achieve goals” (p. 40). Economic systems include goods, people, and institutions. Goods are non-living systems, but institutions and people *are* living systems. Therefore the sustainability and the control of

economic systems are interdependent with institutions, people, and goods management.

Economic systems are not to be mistaken as closed systems. Indeed, in analogy with the human personality containing both, a part oriented toward the self and a part oriented toward society (Marks, 1989), “most social organizations and their subsystems are partially open and partially closed” (Kast & Rosenzweig, 1972, p. 453). Therefore even if our economic system deals mainly with goods, it involves also environments, society, and people. Consequently, each subsystem influences and transforms one another.

Economic systems are then open-systems, interdependent, and submitted to transformation. They are influenced by people and institutions, in the same way that they influence people and institutions. Chronologically, our economic system was conceived before systems theory had come to its apogee. Therefore, the regulations rules that we know now necessary to the sustainability of any systems could not have been put in place when our economic system took its central position. In other words, our current economic crisis can be explained as a need for a redefinition and a rebirth of our economic system itself. This need would be born from societal and environmental changes that were not – and could not have been - integrated in its original design. Witnessing the collapse of our economy was then predictable and inevitable. It was expected mainly because the feedbacks from society and individuals were not originally included. Paradoxically, it is the connections between our economy (illusionary perceived as closed) and social systems (open systems) that, despite its collapse, guarantees sustainability to our economy.

Information, Knowledge, and Expertise

The terabytes of data stored in the servers of administration have vast potential, provided that they are viewed from a broad perspective. Our current technology is remarkable when it comes to transporting information. Human condition has the tradition to adapt creating new meaning to new information by assimilation and accommodation (Piaget, 1971) and build thus valuable knowledge. While contextualizing these data, information, and knowledge, expertise then emerges.

Information is not only the path to expertise, but is also a very lucrative resource. Government data constitute the basis of economic activity worth GBP 100 billion per year. The revenue generated would be in the order of 1 billion per year. The revenue generated by the sale of this information represents just GBP 340 million while the profits generated would be in the order of GBP 1 billion per year if the data were made freely available (Mayo & Steinberg, 2007).

The arrival of the internet, often heralded as the instrument providing access to a wide range of information, has highlighted a new relationship between the economy and the individual. Taking it to the extreme, everyone can have his or her own business, provided that he or she is able to participate in the conversion of information into knowledge and expertise. The technologies associated with the management of information systems are the essential drivers of the processing of this new raw material and also contribute to the definition of new economic models. The Google business model is focused entirely on the valorization of information (generated by its search engine, the millions of YouTube videos, the millions of Flickr images and the user-enhanced geographical data provided by Google Maps and Google Earth). However, for the time being advertising is clearly the core source of income for Google (because it does not sell its services, Google sells the accompanying advertising).

Toward an Open Information Ecosystem

Technology is not an end in itself; it must be placed at the service of society. In order to be able to contribute to the creation of these new models, as the user and generator of information, the individual must be the focal point of all considerations. This entire approach to information transformation is based on existing information systems which must respect the principles of interoperability, collaborative development and transparency and, by doing so, create an open information ecosystem. An open information ecosystem can be defined as a set of human, software and material resources that enable information to be acquired, retained, and networked, thereby empowering users to decide and act. The fundamental principles of open information ecosystem are interoperability, user-centered, collaboration, sustainability, and flexibility. The three major dimensions are efficiency, innovation and growth.

Efficiency. Organizations that opt for an open information ecosystem gain efficiency by improving the relationship between the results obtained and the resources used. Greater competition between suppliers, products and services, for example, helps administrations to optimize the use of their resources. An open approach strengthens the buyer's position in the negotiations by giving him or her greater choice and also enables the seller to access a wider potential customer base.

Interoperability. Accessibility is vital if we are to bridge the digital divide which our societies often continue to widen. Systems must be mutually interoperable: this is vital to making this accessibility real. With interoperability, open ecosystems allow greater control of information systems with a renewed focus on the users and governments rather than the suppliers alone, on whom we cease to be dependent.

As a result, more direct control is obtained over the evolution, functions, components and maintainability of the systems. With interoperable systems, transparency and security are two crucial elements of an open information ecosystem. Administrations, citizens, companies and common interest communities must be able to find the balance between protection, openness, risks and costs. Security is not just a matter of IT codes. A balanced security framework, transparent processes and management are more important than the choice of technical models. The challenge is clearly that of ensuring the security of the process involved in responding to the question rather than security of the information as such.

Innovation. Innovation is crucial for governments and companies which must contend with a globalized economic environment today. This dimension must be promoted to establish a robust local industrial base. Innovation must not only concern the search for process efficiency, it must also participate in the exploitation of information as a strategic resource. The fact that the American government is increasingly laying open its databases (in particular through the Data.gov initiative, www.data.gov) is no mere coincidence; it has understood the benefits to be gained both, in the public and private sectors. For the time being, however, no figures are available on the progress of this initiative.

The choice of an open information ecosystem provides a new terrain in which the end users – citizens, companies and public administrations – can create new activities.

To the extent that innovation and cooperation between entities generate a wider selection of products and services, each of the parties involved gain from this at their own particular level.

Partnerships are more easily born in the context of an open information ecosystem than in a closed proprietary world. Collaboration becomes essential and an open system allows users to strengthen their skills and build communities which facilitate the exchange of expertise.

Growth. For a great many governments, an open information ecosystem is becoming a key factor of local economic development. It can be seen as a driver of growth in a cycle that creates easier access to companies and to the public sector, thus generating, in turn, opportunities for businesses on the local market.

Suppliers still play an important role in such an ecosystem; however the cards are no longer all in the hands of the same people. Access to and control of specifications, protocols, formats and processes

remain open to interested actors and, in particular, to technology users.

Space for Individual Expression

Open information ecosystems help to place information technologies at the service of society because they take education and training into account and enable the development of the social assets of information and the underlying processes. They turn the spotlight back directly on the individual by giving him or her an opportunity to play new roles as a coauthor, co-participant or co-creator. All this is part of an evolutionary dynamic.

The current economic crisis forces individuals to redefine strategic resources to adapt, auto-regulate, and maintain sustainability. Economic systems as part of the open information ecosystems are new information to assimilate, and the importance of open information systems is a necessary understanding to accommodate to a new era.

Finally our current financial and structural challenge can be used as leverage to position human expertise (based on living and auto-regulated systems) rather than financial variables (based on goods) in the center of open information systems.

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The Transformation of East Africa's Economy Using Mobile Phone Money Services: A Pragmatist Account of ICT Use.

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Abstract

A pragmatic approach is employed to account for the unique responses to the Mobile Money Transfer Services in four of the five East African Countries; Kenya, Uganda, Tanzania, and Rwanda that are forging a regional common market ahead of a political federation by 2015. While different outcomes to the introduction of Mobile money transfer services are highlighted in the narratives on each country, similarities that are typical of developing countries with their populations struggling to cope with the various uses of new information and communication technologies (ICTs) are also underlined. The paper underscores the radical transformation the Mobile Money Transfer Services is having on the social and economic lives of the people of East Africa especially in the rural areas where formal banking services have been absent. The paper notes that the cut throat competition among the telecom companies to fill the banking void in the rural areas of the prospective East African Community, and to tap into the lucrative international business of foreign currency remittance by East African citizens in the Diaspora, local populations have become the unintended beneficiaries from the ICT innovations.

East-Africa, Pragmatist Approach, Money Transfer, Mobile Phone, ICT

1. INTRODUCTION

The introduction and proliferation of Mobile Phone Services in the East-African region is steeped in a long and well established history of money transfers by immigrant workers (Cerstin & Maimbo, 2005 [1]). During colonial times, many family breadwinners in rural areas migrated to urban areas in search of greener pastures to be able pay colonial taxes. They also had to find means of sending money back to their loved ones left behind in the countryside. Since that time, scores of East-Africans have continued to flock destinations within Africa (e.g., South Africa) but especially to the West in search of better economic opportunities. These fortune seekers have had to seek money transfer services to enable the sharing of their spoils with loved ones back home. For example, Cerstin and Maimbo indicate that "Kyeyo" is a popular local term in Uganda that refers to this migrant practice of sending back home to one's family for their welfare. Until recently, the choices that these

migrant workers and others had for conducting these money transfers precluded services via mobile phones. In fact, the rather swift adoption of money transfer services in several African countries including those in the prospective East African Community has defied predictions by scholars (e.g., Cerstin & Maimbo) who anticipated a lukewarm response to this innovation on the part of African governments because they tend to be quite "conservative" on such matters.

While five East African countries recently signed a Common Market Treaty (CMT) that will facilitate the free movement of people, goods, and services by July 2010, the use of mobile phone services in money transactions across the region to boost trade and enhance the establishment of the common market have not been systematically examined. Several leading telecommunication providers in four of the five countries of East Africa; Uganda, Kenya, Tanzania, Rwanda, have, since 2008, entered into partnerships with major banks and sometimes are going it alone to avail mobile money transfers services in these countries. The money transactions are undertaken within their respective country's borders, in the East African region, and overseas where many of the countries' elites live and work. In rural East Africa, where the formal banking sector had previously not ventured, the money transfer services are transforming the economic and social lives of populations in quite a significant way.

However, there are varying patterns of use and degrees of success associated with the Information and Communication (ICT) experiences of these organizations and their clients in each of the five countries. Therefore, the overarching question addressed by this study is, why use of the same ICT platform; the mobile phone for the same function achieve different levels of success. This will help enhance some understanding of the unique macro-social and cultural environments that surround the implementation of the new technological innovation in each of the four East African member countries seeking to integrate their economies ahead of the political federation in 2015. This study takes a pragmatist approach that posits a necessity for using multiple theories to account for the similarities and differences found in the ICT experiences across these countries. Therefore, the study explores the relevance of selected aspects of five theories of ICT use in informing and explaining the similarities and variations in these experiences: the media

richness model, the social information processing model, the dual-capacity model, and stakeholder theory, and diffusion of innovations theory. First, a narrative including highlights of the mobile money transfer services experience in each East-African country as reported in various newspapers and some scholarly sources is presented. Then discussion of these highlights using selected aspects of the five theories ensues.

THE EAST-AFRICAN SAGA OF MOBILE PHONE MONEY TRANSFER SERVICES

Kenya

The mobile money transfer services were first launched in Kenya, East Africa's largest economy, by Safaricom, an affiliate of the United Kingdom-based Vodafone group Plc, the world's largest telecommunication company in March 2007 (Safaricom, 2007 [2]; Hughes & Lonie, 2007 [3]). The mobile money transfer service was code-named M-PESA--M representing mobile while Pesa is a Swahili word for money (Safaricom, 2007, 2008 [4]). The service was developed by Sagentia, a UK firm, before the operation was outsourced to IBM in September 2009 (British Broadcasting Corporation, 2008 [5]; Adero, 2009 [6]).

According to Safaricom (2007), the M-Pesa service affords their Kenyan mobile phone subscribers to transfer money fast, safely and affordably deposit and withdraw money from a network of agents that includes airtime resellers and retail outlets acting as banking agents across the country. In a country where banking services are the privilege of urbanites, the growth of M-PESA service was spectacular; it quickly captured a significant market share for digital cash transfers; notching a 6.7 million subscriber base by the end of 2009 with 2 million daily transactions totaling 152 billion shillings in less than two years (Adero, 2009). Adero observes that M-Pesa, an acclaimed global first, continues to register steady growth with more than 10,000 new users signing up daily.

M-PESA is a branchless banking service that is designed to enable users to complete basic banking transactions without the need to visit a bank. A customer can send money to another mobile phone user, withdraw cash, buy airtime for him/herself or another prepaid subscriber, pay bills and make loan repayments (Mwakugu, 2008 [7]; Ivatury & Mas, 2008 [8]). The authors add that an M-PESA enabled mobile phone can also function as an electronic wallet and can hold up to 50,000 Kenyan shillings.

Safaricom uses a SIM toolkit to provide its subscribers handset menus to access the M-Pesa service using software developed and donated by Microsoft Incorporated through its philanthropic affiliate; Bill & Melinda Gates Foundation (Vodafone UK/Global, 2007 [9]). With a customer base of 13 million subscribers in Kenya, Safaricom Kenya Ltd. is now the leading mobile network operator in East Africa. Founded in 1997, two years after Celtel Uganda was launched in 1995, Safaricom plunged, in 2009, into the lucrative international money transfer in the UK through its M-Pesa service to tap into the burgeoning remittance flows of hard currencies from Kenyans in the Diaspora to their families back home (Mwakugu, 2008; Adero, 2009).

Mwakugu and Adero state that recent surveys in Kenya indicate that 52 percent of all money transfers were being conducted

through M-Pesa. A substantial majority of the people surveyed (93%) were enamored by the system because it offered them convenience, security, speed, and had removed so many bottlenecks such as the limit to amounts one could send or receive. In recognition of the impact of the innovative IT solutions for sustainable urbanization demonstrated through the M-PESA service, the United Nations Human Settlements Program (UN-HABITAT awarded Safaricom a global Habitat Business Award last year (Adero, 2009).

However, the phenomenal growth of the M-Pesa service was not taken lightly by the formal banking institutions who viewed it as a real threat to their monopoly and before the end of 2008; they successfully lobbied the Kenyan government to audit the activities of the new venture to purposefully derail their national outreach, appeal, and popularity (Mwakugu, 2008; Adero, 2009). However, according to Adero and Mwakugu, the maneuver flopped because the M-Pesa audit found the service not only robust but also transformative of the economic and social lives of rural Kenyans.

But the monopoly of mobile money transfer through M-Pesa by Safaricom was soon challenged by the entry of Zain Telecoms, a Middle East based company that took over Celtel networks in 24 African countries including Uganda, Kenya, and Tanzania in 2006 (Kisambira, 2008 [10]; Zain, 2009 [11]). With a new Zain brand and a huge capital injection, Zain Kenya also launched the mobile money transfer services in 2009. Operating in the three of the five East African Community countries; Kenya, Uganda, and Tanzania under the ZAP Money transfer service, Zain has since announced a partnership with Western Union, an international money transfer agency to tap into the most lucrative foreign remittance business of hard currencies from Kenyans in the Diaspora to their families back home (Zain, 2009).

Other competitors to the M-Pesa service include Orange Wireless of France, which will launch its Orange Money transfer service this year in Kenya and Uganda simultaneously following their acquisition of HITS Telecoms of Uganda (Bohnstedt, 2008 [12]). Bohnstedt adds that the competitor Econet, in cooperation with India's Essar is due to roll out its mobile money transfer services in Kenya and Uganda later this year.

Sector analysts have welcomed the competition observing that in all this scramble to fill the banking void in rural East Africa, the subscriber, and ultimately the rural economy in the region, will be the greatest beneficiaries. Money transfer charges will drop, the entire region will be covered, security of money transfer assured, highway robbers will be eliminated, and economic transformation will move closer to becoming reality; and indeed the change for the better is already here (Bohnstedt, 2008; British Broadcasting Corporation, 2009 [3]).

Uganda

A pioneer of the mobile money transfer services in Uganda, MTN Uganda, with its roots in South Africa, was opened in the country in 1998, three years after the launch of the first ever mobile phone service provider in East Africa, Celtel Uganda, in 1995. Celtel has since 2006, re-branded as Zain (Kisambira, 2008). However, despite Zain's first footprints in the country, MTN Uganda, pioneered the Mobile money transfer services that were launched in March 2009 (Mugabe, 2009 [14]), two

years behind its counterpart, Safaricom of Kenya, which launched M-Pesa service in 2007 (Safaricom, 2007; Hughes & Lonie, 2007).

After only three months, the MTN mobile money transfer service had moved over 5 billion shillings in about 180,000 transactions since its launch and had so far built a customer base of over 40,000 that mostly conducts businesses upcountry (Mugabe, 2009). In a country where less than 20% of the entire population is involved in the formal banking sector, the over 7000 MTN mobile money outlets countrywide found a huge banking void to fill, according to Richard Mwami, the MTN head of mobile money, who also indicated to the media that the subscriber numbers for the service were steadily growing (Mugabe, 2009).

MTN Money provides a fast, affordable and convenient way to send money to any mobile phone anywhere in Uganda by all subscribers to the MTN network. According to MTN Uganda (2009 [15]), to activate the MTN MOBILE MONEY, a subscriber has to upgrade the MTN sim card to one that is Mobile Money enabled at any MTN Service Centre or authorized Mobile Money agent for free registration for a subscriber to open a Mobile Money account without a fixed minimum amount of money (MTN Uganda, 2009). All MTN Mobile Money Agents are registered limited companies and process cash payments for registered and non registered customers and deposit cash into registered customers accounts (MTN Uganda, 2009).

But the service has not been without far-reaching challenges to MTN. According to Mugabe, MTN Uganda faced technical problems that were manifested through a sagging network under a fast-growing subscriber base which greatly affected the quality of its services during the initial stages of the launch. According to MTN Uganda, the challenges necessitated a fresh investment to drastically upgrade the network (MTN Uganda, 2009).

Although it was the first to set up shop in Uganda, Celtel Uganda, now Zain, launched its money service months after MTN Uganda. Zain, the company that took over Celtel Uganda in 2006, launched a mobile money transfer service dubbed ZAP (Baguma, 2009; Nakaweesi, 2009 [16]). The ZAP money transfer service relieved Zain customers of the hassle of moving with huge sums of money because the ZAP service will enable Zain subscribers to use their phone handsets to transfer money, pay their bills, top up airtime and buy goods without physically using cash.

According to Baguma and Nakaweesi, the service provides customers with increased security and flexibility, thereby reducing the need to carry cash and ensuring security and elimination of highway robbers. Bank of Uganda cleared Zain, according to Yesse Oenga, Zain managing director, to use the full suite of mobile commerce services prompting the telecom company to partner with Standard Chartered Bank to hold a settlement account insuring all ZAP money transferred by the over 600 Zain ZAP registered agents countrywide to serve its over two million Ugandan subscribers. The ZAP money transfer service is accessed any time through phone handset menus offered to most Zain customers with transactions over the phone secured with a password to protect customers against fraud (Kasita, 2009 [17]).

According to ITNewsAfrica (2009 [18]), MTN and Zain have moved over 40 billion shillings in mobile money transactions since they started the service--just a small fraction of the global trade that the telecoms are now likely to tap into.

Indeed, ITNewsAfrica (2009) reported recently that MTN is to start international money transfer services, a prospect that will shift the local rivalry with ZAIN to international level and usher the telecoms into one of the most capitalized industries—foreign remittances by Ugandans in the Diaspora that now stands at over 700 million dollars, now the largest foreign exchange earner for the country since coffee prices plummeted.

Not to be outdone and left out from the lucrative business, Warid Telecom announced that it would unveil its mobile phone money transfer service in Uganda this year (Lyatuu, 2010 [19]). George Shine, Warid Telecom's head of marketing, told the media in Kampala recently, that work on the service that will be rolled out to the entire country is in its final stages. Warid's entry will bring to three the number of mobile money service providers in the country after MTN's Mobile Money and Zain's ZAP money transfer services, which were launched last year (Lyatuu, 2010). According to Lyatuu, Warid Telecom currently has a customer base of two million subscribers.

Tanzania

Although launch of the mobile phone money transfer services in Tanzania occurred in mid 2008, the groundwork for it can be traced to December 1999 when Vodacom Tanzania Limited was granted its operating license by the government. The company is a joint venture between South African based Vodacom (with 65% shares) and Caspian Construction and Planetal communications which are two Tanzanian based companies (with 35% shares) (Taka, 2001 [20]). In command of an estimated 15 million subscribers, Vodacom Tanzania dwarfs its six competitors in the mobile phone services market (Kamndaya, 2009 [21]).

Beyond attracting the majority of mobile phone subscribers, a Vodacom Tanzania representative suggests that the company's most notable accomplishment is, perhaps, its ability to enlist over one million customers into M-Pesa, its mobile phone money transfer service in just 18 months since launch. This is the equivalent of a volume of 17 billion Shillings in just one month (Kamndaya).

The service includes the opportunity to send and receive between 2000 and 500,000 shillings all over the country including remote areas that are otherwise beyond the reach of commercial banks. In a country where only 11 percent have bank accounts, the service fills a void that has existed for long. Over 500 M-Pesa agents are spread throughout the country to facilitate the transactions (Kamndaya).

Although it has been the ambition of Vodacom Tanzanian to replicate this adoption success story in virgin areas of the country, a dearth of disposable funds available to agents throughout the company network has been a bottleneck for a while. Thanks to the generosity and good investment sense of the GSM Association Foundation, Inc. both Vodacom Tanzania and MTN Uganda have been facilitated "from the Mobile Money for the Unbanked Fund (Ngunjiri, 2009 [22]). Ngunjiri further asserts that the goal of this initiative is to link up to 86 percent of the rural population (mostly peasants and traders in

agricultural produce and livestock) to the banking sector. This population includes not only the unbanked but also the underbanked.

Vodacom Tanzania is particularly sensitive to any allegations that the service may be vulnerable to fraudsters. When Tanzanian deputy minister for Communications, Science and Technology deputy minister voiced concerns about possible theft of money from people's accounts as happened with Automated Teller Machine (ATM) cards, the M-Pesa product manager was quick to offer assurances of the proven security record of the service offering the legendary success story of the Kenyan M-Pesa experience as proof (Kamndaya, 2008 [23]).

Rwanda

In Rwanda, South African-based MTN Rwanda which has been operating in the country since April 1998 is the pioneer provider of Mobile Money Transfer services. The official launch date was early February 3 2010, but even before then some clients were already utilizing the service (Rwanda: 'Mobile Banking' a Welcome Addition to Financial Sector, 2010 [24]). Just like in Kenya, Tanzania, and Uganda MTN clients would be able to use the service to send, receive, and withdraw cash via a network of authorized MTN representatives. Access to this service has been long overdue in Rwanda where it is estimated that only 14 percent of the population engage banking services yet 20 percent use telephones (Rwanda: MTN Launches Mobile Money Transfer, 2010 [25]). Unlike Kenya where the service is both domestic and international and Uganda where the domestic service is soon to be augmented by international service, the Rwanda Mobile Money Transfer services are a purely domestic affair at the current time. But if the pattern of adoption in both Kenya and Uganda is an indication, it is just a matter of time for the Rwandan services to expand into the international sphere. A vibrant Rwandan community in the diaspora is eagerly waiting to be seduced into the pleasures of remitting monetary support to their loved ones via the mobile phone.

As with all countries above, government concerns about money laundering and exploitation of the system by terrorist organizations has necessitated regulations such as full registration of clients by company representatives and formal official identification (e.g., passport) of service users. While MTN Rwanda at the moment is the sole provider of mobile money transfer services in the country, if the experience of Kenya and Uganda is a guide competition from other providers (Rwandatel and Tigo are the other two major Telecom providers) is just around the corner. And it does not help matters that the Rwandan government has had several spats with MTN Rwanda for not fulfilling phone service quality expectations which have resulted in hefty fines imposed on the company (Kezio-Musoke, 2009 [26]).

Burundi

With a phone penetration rate below one percent (Carmony, 2009 [27]), it appears that Burundi's rendezvous with mobile money transfer services will have to wait till mobile phone use and access accelerates to levels that are comparable with those when the mobile money transfer innovation took root in its peer countries in the community. At the moment, it is not clear what moves Celtel Burundi, the dominant mobile phone player in the country, or its competitors are contemplating in this regard.

THEORETICAL DISCUSSION

Social Information Processing Model

The social information processing model (Fulk, Schmitz, & Steinfield, 1990 [28]) argues that a prospective user's adoption and use of a new communication technology is facilitated by the perceptions about the technology that arise from interaction with other people. Recognition of this point may explain the decisiveness with which the above telecommunication providers act to manage how they are talked about and therefore perceived by the public. For example, a Vodacom Tanzania official mentioned earlier was quick to allay any fears among the public about any security concerns about using the M-Pesa service.

Media Richness Model and Dual Capacity Model

The media richness model (Daft & Langel, 1984 [29]) and the dual capacity model (Sitkin, Sutcliffe, & Barrios-Choplin, 1992 [30]) share an emphasis of adopters/users rationally selecting from a range of available options the most appropriate or efficacious technological means (in their judgment) of accomplishing a task at hand. But the dual capacity model goes a step further by positing that users' adoption and application of technology also carries symbolic significance for the user and his/her observers in that it portrays him/her in a certain light.

These two theories together can explain the rising popularity and use of the mobile money transfer services noted in each of the East African countries (except Burundi). Prior to the introduction of the services, users primarily employed other means of sending, receiving, withdrawing and depositing their cash. For example, workers in Kenya who did not have bank accounts often resorted to entrusting their wages to bus drivers plying home routes for delivery to dependents (Wray, 2008 [31], Sanders, n.d. [32]). Wray adds that even the few workers that had bank accounts could not use them to send money to their relatives in remote areas of the country where banks do not operate. Other options involved using the postal service or seeking the assistance of a friend or relative heading where the workers' relatives stay. Consistent with both the media richness model and the dual capacity model, these workers and many other users are finding the mobile money transfer services more efficacious to manage their money than these alternative methods. Also, in line with the dual capacity model it can be argued that users regard utilizing these services as a status symbol. According to Carmody (2009), use or possession of mobile phones makes people to "feel more important" because it "represents a form of high-tech connection to the global information society and domestic social peers" (p. 17). Carmody, therefore concludes that the mobile phone accrues its import via not only its instrumentality but also its symbolism of inclusion and development.

Stakeholder Theory

Stakeholder theory (e.g. Freeman, 1984 [33]) provides a functional and inclusive definition of stakeholders who are referred to as individuals or organizations that can affect or are affected by a project. Primary stakeholders include members of the coalition who tend to support the project and secondary stakeholders are those whose environment is affected by a project but who may or may not receive direct benefit from it. Stakeholder theory also offers a mechanism through which

stakeholders are identified, categorized, and analyzed based on their respective salience or attributes such as power, influence, interests and roles.

The respective governments in the four countries mentioned above are key stakeholders concerned with the smooth operations of the money service without defrauding its citizens their power to enforce the regulatory regimes to ensure compliance from all the other stakeholders. Also, the telecommunications companies, as primary stakeholders reflect interest and commitment to their services by ensuring that funds are secured to invest in the development of the infrastructure, availability of money at all centers to process transactions to satisfy their customers, and use their leverage to publicize the services to attract more customers in the tightly competitive environment. For the customers or subscribers, and mobile money agents that are spread all over the four countries, the success of the money transfer operations is, like it is to the telecommunications companies, a kind of lifeline in which they are deeply staked. Any disruption of the service would, at any rate, negatively affect them while its smooth operation, positively impacts them. For external stakeholders, actions by the United Nations agency (Habitat for Humanity) that recognized M-Pesa of Kenya for its excellence and the scheme by some Kenyan banks to derail the spectacular performance of M-Pesa service illustrate the positive and negative forces by external stakeholders respectively.

Diffusion of Innovation Theory

The diffusion of innovations theory suggests that the diffusion of an innovation occurs when the adoption of an idea, practice, or object spreads by communication through a social system (e.g., Rogers, 1995 [34]). The theory explains the communication flow of new ideas into a community and how targeted communities respond positively or negatively to the ideas disseminated to them through both formal and informal communication networks by pioneers and champions of the innovations. Pioneers frame the meaning of the new idea, use existing formal and informal communication networks to talk to other people about the innovation, articulate its relevance, simplicity, adaptability, and usefulness. Gradually, some people are persuaded to become early adopters and then more people adopt the innovation when they start observing its benefits to early adapters until the rate of adaptation increases and a critical mass is achieved before the process levels out. According to the theory, laggards are those who fail to adopt the innovations for one reason or another.

All the telecom companies referred to above used the available formal and informal communication networks to vigorously market their services to the citizens of the respective countries and managed to successfully diffuse their innovation of using the mobile phone to transfer money where it had never existed before. Indeed, the rate of adoption, although not uniform in all the four countries, indicates that the service was embraced and continues to grow both spectacularly and steadily—a manifestation that the pioneers (the telecom companies) diligently and effectively framed the money transfer service, demonstrated its usefulness, simplicity to adopt, and when the benefits to early adopters became evident, more and more people signed up for the services. In Kenya, for example, users of the M-Pesa service has grown to 6.7 million while in Uganda and Tanzania, signs are that the services have equally attracted a sizeable number of adopters from the millions of subscribers to

the several companies. In a couple of years, a forecast could be made here, that, a critical mass will be realized in the three countries before the rate levels out. For the state in which Burundi finds itself in, nothing could better reflect the label of laggards in the adoption of innovations.

CONCLUSION

The telecommunication sector in East Africa is the most competitive, a situation that has led to innovation and creativity, resulting in deeper telephone penetration in rural areas, improved communication services, and a gradual transformation of the social and economic lives of the rural people in the East African region. The Mobile Money transfer narratives from all the five countries in the East African region indeed indicate how the mobile phone use has achieved different rates and levels of success in each country. While all the telecommunications companies introduced the mobile money transfer services in the four countries with the aim of reaching all their subscribers, figures cited in the narratives show that not all the subscribers registered to use the service. That could be explained by the fact while it is easy to operate a cell phone and make a call, navigating the menus on the hand set requires a certain level of education which most of the rural people in all the four countries may lack. Also, the rate of success attained by M-Pesa by Safaricom in Kenya, is unrivaled by her counterparts in Uganda, Tanzania, and Rwanda largely because Kenya is the most urbanized and largest economy in the region with possibly a bigger number of its citizens in the Diaspora compared with the other three countries.

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A Study of the Manufacturing Process Knowledge Management System (KMS) - Taiwanese Flexible Display Industry as An Example

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ABSTRACT

Knowledge Management System (KMS) plays an important role on today's industries. A lot of documents are generated by daily affairs. A R&D department of laboratory within a company always has plenty of data and un-treat information. How to collect, identify, classify and retrieve data from the process flow becomes important due to consuming an enormous amount of manpower and time by manual ways. This study picked up a company which was in the flexible display industry as an example. Flexible Displays (FD) are light, thin, rollable, rugged and easy to carry. The great potential of flexible display had attracted many global institutions to devote time and resources to the improvement of this technological process flow. The aim of this research is to provide the appropriate knowledge of R&D processes through knowledge management and help the flexible display industries proceed with a good

plan of quality control in accordance with the significant knowledge of process. In this study, we try to identify a prototype KM system through literature review and expert's interview processes. The KM system we proposed include the classification framework of knowledge, the attribute selections for each type of knowledge we identified in this research and the architecture of this KM system which includes each module of the system and the management tools for each type of knowledge. This research would help the flexible display industries proceed with a good plan of quality control in accordance with the significant knowledge of process, and also reduce the time from developing to diffusion when they proceed to mass production stage.

Keywords: Knowledge Management System, Flexible Display, R&D, Process Flow, Information Classification.

Study on Information and Communication Technology (ICT) Models of Adoption and Use in the Kingdom of Saudi Arabian SMEs

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Keywords—ICT, complex systems, systemics, SMEs, factors for ICT adoption and utilisation.

Abstract

There has been no research done on how SMEs are adopting and use ICT in the Kingdom of Saudi Arabia (KSA). In particular, which factors are influencing the implementation and use of ICT and how those factors impact a firm's performance. The aim of this study is to address this gap through an exploration of the sufficient and necessary factors associated with adoption and use of ICT in the Kingdom of Saudi Arabia's SMEs.

Significance of the project is founded on premises that SMEs are the main developing and an economy's diversifying factor and that adoption and use of ICT represents the fundamental source of competitiveness and the basis for SMEs survival in the world market. In many countries, small-and-medium-sized enterprises (SMEs) have played a crucial role in creating jobs and providing economic stability.

Following its significance, the authors set the following general objectives:

- To develop the ICT adoption model for the KSA SMEs,
- To evaluate intensity of factors influencing the ICT use,
- To design the Map of Interactions of the Performance influencing factors

In this study authors are applying the original two-stage multidisciplinary qualitative-comparative analysis and the systems theory methods to achieve the objectives:

- The first phase using the QCA will be to develop the ICT adoption model for the KSA SMEs.
- The System Theory Methods (STM), applied in the second stage, have the capacity to evaluate the complex and dynamic interactions between organisational context, users, ICT and the environment.

Outcomes of this study are comprehensive arrays of recommendations for policy makers, economic development, a firm's performance improvement, increased profitability, market share, and increased use of ICT in a company.

I. INTRODUCTION

In this article authors analyse factors for ICT adoption in Saudi Arabian SME, their empirical validity and relevance for the firms' performance in the post-adoption period. We recognise that ICT is not a value per se, but only becomes a value in the interaction with the users of ICT. Therefore, many aspects of ICT

need to be assessed in interaction with other parts and the organisation itself to fully understand its utilisation that influences firms' overall performance and profitability. Thus, using a case study research method and applying holistic/systemic approach we will try to answer the following questions:

- How does interaction of ICT factors impact company's overall performance measured by the relative advantage in the market by adopting and fully utilising ICT?

- What are the factors in the company that influence the extent of ICT utilisation?

The units of analysis for this Saudi Arabian – based study were small to medium enterprises (SMEs). Criteria for choosing the company for this study were the levels of ICT adoption. In the first stage we approached and worked on five Saudi Arabian SMEs which adopted ICT. Those companies were part of an earlier investigation about models of ICT adoption [1]. However, results presented here are those from analysing one case study only.

II. BACKGROUND

There are enormous investments in ICT - over \$316 billion is spent annually on ICT in the US alone, and the world's IT spending now exceeds US \$2 trillion annually. In 1999, the share of ICT investment was 4.54% of GDP in the US, up from 2.60% in 1992. For the EU as a whole, the corresponding estimated GDP share is 2.42% in 1999, up from 1.81% in 1992 [2]. In 2000, the share of the ICT investment was particularly high in the US, Finland and Australia.

Intangible effects of ICT found in the literature are an increased variety and quality of products/services, improved timelines of delivery, personalised customer service, improved employee' expectations and motivation. All of these benefits are poorly represented in productivity statistics because it is hard to measure the intangible and indirect costs and benefits of ICT [3]. Studies done so far mainly applied traditional statistical methods to establish the correlation between the investment in ICT and the productivity or profit growth, in order to determine the value of ICT. However, correlations between IT/ICT investment and organisational performance and productivity do not necessarily imply causation, according to [4]. Those applied methods did not take into account most of the intangible effects and/or contexts of ICT. Therefore, using 'hard numbers' only is not capturing all the effects and values brought about by the ICT investment, which as a consequence has appeared to lower revenue, increase production time, and reduce the firm's productivity and overall performance. Hence, the values of investment in ICT fall short of profitable investment creating the "productivity paradox".

In this study we will try to explain those multiple aspects of ICT not taken into account in the literature (together with taken ones) in order to understand the whole, dynamic picture and relations between ICT, its stakeholders and organisation.

III. CONCEPTUAL FRAMEWORK

There is replete of literature available on the adoption of information technology in small business ([5]-[9]). Most recent literature which looked into the necessary and sufficient factors leading to adoption of IS/IT by SMEs formed the basis for the empirical component of this study (see Fig. 1).

ICT can impact a company on three different levels: individualistic or user level, organisational level and external or environmental level. In addition, technological and economical contexts are of great importance in facilitating organisational decision regarding which ICT to adopt, how to use it, and should be taken into account as well. Therefore, influencing factors for ICT adoption examined across a range of contexts suggested by the literature ([1],[10]) can be organised within five contexts: technological, organisational, environmental, individualistic, and economic context.

Similarly to the previous conceptual framework, [1] developed an adoption model of ICT by applying the Qualitative Comparative Analysis (QCA) and its formal language - Boolean algebra. Using that as a departure point in this study we are extending the investigation process of finding the necessary and sufficient factors for ICT adoption in the post-adoption period and argue that adopted ICT itself is not a guarantee for the improved performance of a company. It has to be evaluated and considered as a dynamic part of a complex system, which can be characterised as non-linear, co-evolving, self-organising and which is on the edge of chaos. Considering a company as a complex adaptive system requires mixed, multidimensional, multi-stakeholder, explicitly value-based assessments approaches. ICT depends on many factors and its effects are different for every organisation, since technological systems are socially constructed [13]. As a result ICT needs to be taken into account together with its interactions with people, organisation and processes. Hence many authors are arguing that the only way to consider ICT effects on a company is to use systems theory method (systemic approach) [14]. Following that lead we employed that approach with its tools as outlined in the following sections.

IV. SYSTEMS THEORY METHODS

This section describes the systemic approach and its tools, which will be used in this study. According to [15], the five-stage systemic approach consists of five stages each with two sub - stages as listed in Table 1 ().

Tools of the five-stage systemic approach used in this study are explained in the next table (2). Those tools, i.e. tests will be used to check the relevance of the ICT adoption factors in influencing the company's performance, as well as the interaction of the factors. Following the systemic approach rules and its tools, as well as applying systemic data gathering strategies [focus group meetings, the landscape of the mind (LoM), reflect back workshops, in-depth semi-structured interviews, mapping of email connectivity (NetMap), and participant observation] we have changed factors developed in the conceptual framework to accommodate participants observations. With adjusted factors we have finally constructed the stimulating and inhibiting interrelations (respectively) impact matrices of factors for ICT adoption as presented in Figures 3 and 4.

After constructing those matrices in the following section

results are interpreted.

V. RESULTS AND THEIR INTERPRETATION

The results of the systemic analysis are presented in the 'Map of interaction'. This map's goal is to transform the highly concentrated knowledge of the 'Double-cross-impact analysis' to the *right brain-hemisphere* way of thinking, in order to create a picture of different dimensions of the system.

Horizontal axe of the map of interactions (fig. 4) represents the degree of activity of factors of ICT in the system while the vertical axe represents the degree of dynamics (interactions). This map can be also divided into four quadrants.

In our double cross impact analysis factors in the top circle (see Fig. 4) of the map of interaction [(16) *Fast developing new IT solutions*, (4) *Adoption costs*, (1) *Relative advantage in the market by adopting ICT* and (5) *Perception of company image*] are the components that are the most connected factors in the system. The factors in the middle circle [(7) *Quality of IS & capabilities*, (15) *Managers knowledge of ICT* and (2) *Attitude toward adopting ICT*] are less strongly interacting factors within the system, followed by factors (14) *Managers innovativeness*, and (10) *Top management support* and (3) *Technological compatibility in the company*. The rest of the analysed factors are much less interacting. They have still roles in the system, although they are moving slower.

The striking characteristic of the double-cross-impact analysis is that there is actually the only one real activator for positive dynamic in the system – factor (16) *Fast developing new IT solutions* – which should be given priority in a constructive and innovative way in order to easy the problem solving process.

An innovative approach to the system – for instance if the company is to define the new contents, then factor (14) *Managers' innovativeness*, combined with factor (9) *Specialization within the company* should be of interest to management. To achieve that goal, one would have to find solutions to influence the activities of factor (14). So, the degree of interaction would be reduced and the system gets more passive, and in that case factor (14) would 'move' into the field of 'goals'. In reality that means that the influence of innovation through management could become less intensive, e.g. managers could become subject to 'the other influences'. Similarly, factor (14) would change from a 'transformation key player' that company relay on to a 'quality indicator' which can be steered and supported.

In the figure 4 we can look at different areas of interactions of factors of ICT, which can be summarised in the following six points (which correspond to the numbers in the figure 4).

Number 1 describes the system as a whole which is well differentiated by the degree of interaction. However, it is less differentiated in the degree of transformation. It means that we have identified the key factors in the system. Apparently, the system has only small negative feedback, meaning the system is a dynamic one – it can be influenced either by enforcing the positive development or lowering the negative one.

The most recognised factors in the system – passive outcome or symptom – are factors (4) *Adoption costs* and (2) *Attitude toward adopting ICT*. Both could be fields of actions for the fast solutions and achieving results. However, both would be only an indication of success, since they do not really change the system as whole. We can use those factors for 'symptomatic solutions' that is, only in the case of 'crisis management' or if the company

needs to get recognition in order to continue to operate and to survive. Therefore, we should not be tempted to act upon those kinds of factors. Instead, the company should focus on factors that are stable in the active part in the system. However, those two factors should be measured and controlled regularly, as the best indicators of transformation processes.

Factors that are maintaining processes of transformation are: (1) *Relative advantage in the market by adopting ICT*, (5) *Perception of company image*, (7) *Quality of IS & capabilities*, (15) *Managers' knowledge of ICT*, (14) *Managers' innovativeness* and (3) *Technological compatibility in the company*. Having them in the system, the firm would have troubles to transform new ideas into a new solution. However, without that transformation area the investments would not succeed in the way it is expected. So, if there are problems in this area, the firm should discuss the risks, and make the plans for improvements.

The only fast driver within the system is factor (16) *Fast developing new IT solutions*. This factor is absolutely crucial and has to be part of the solutions in all scenarios. However, as with all dominant factors, factor (16) could foster good, as well as bad developments. Fortunately for the company it is possible to find other factors in the system that can be acted upon for long term solutions, like factors (11) *Competitive pressure from other firms*, (12) *Competitive pressure (costumer, suppliers)*, (8) *Information intensity* and (13) *Public policy and governments roles*. The challenge to develop sustainable solutions is therefore to put factor (16) in a creative and adaptive interaction with (11), (12), (8) and (13) in order to get more successful solutions of the project.

The actual identified structure – without changing factors and interactions – is focused on the goals or results of the ICT adoption process to foster (9) *Specialization within the company*, lower (12) *Competitive pressure (costumer, suppliers)*, (11) *Competitive pressure form other firms* and increase (8) *Information intensity*. So, if the company was 'happy with this result', which would mean more specialization within the company, less pressure from costumers, suppliers and other firms, and the current level of intensity of information, then, the firm can use the existing structure to succeed working on solution as discussed above under the point 3. However, if a company was not 'happy', then in would be necessary to reorganize the structure which discussed in the following point.

The final reflection on the system is almost as 'painting of dynamical information'. For example, if the firm wants to change the 'field of goals' by accomplishing successful ICT adoption and utilisation, then the firm would have to change the structure in the both active and the passive parts of the system. Or, if the firm would want to make the system more sensitive to changes then they must find new ways of interactions of factor (3) with other factors in the system. The final principal participant observations and recommendations would be to the company to build a high commitment with all involved in the project in this company. ICT adoption is an innovative part of the process of developing solutions for the full utilisation. So, the firm should be creative and not fixed on the 'actual structure' of the system. It is necessary to understand the wholeness and decide on what to keep and what to change in the actual situation.

VI. CONCLUDING REMARKS

In this article authors by analysing factors of ICT in the post

adoption period tried to answer the question how interaction of ICT factors on firm's overall performance. By applying the systemic approach and its tools they identified the key factors and their interaction and influence on the system. The results of the double cross impact analysis revealed six dimensions that can influence the performance of the system. Although they were kept at a very general level, they still can be very instructive for the company wanting to utilise adopted ICT to the full and consequently increase the performance.

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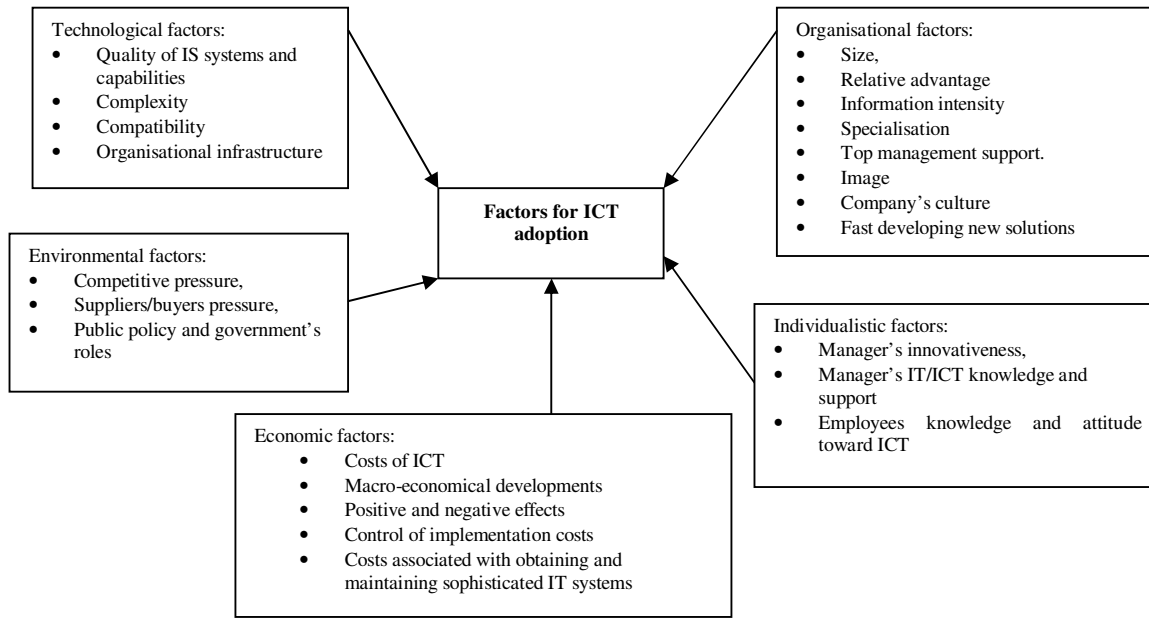


Figure 1: Factors and contexts for ICT adoption

TABLE 1. METHODS FOR EACH STAGE USED FOR THE FIVE-STAGE SYSTEMS THEORY METHODS

Stages	Methods	Description
Stage 1 A	Brainstorming, brain writing, method 635, rich picture, PAT-mirror, Synectic, progressive abstraction	Stage 1 (a and b): Discover and identify opportunities and problems The first contact with a complex phenomenon is done by first describing fuzzy statements or set of factors (1a and b). In this stage different roles and different key players are identified. There are no solutions or interpretations in this stage.
Stage 1 B	Concentrate data to cluster and clear statements: Mindmap, set of factor, role settings, synte-gration, dialoguing	
Stage 2 A	Holistic test, holistic potential test, holistic environmental turbulence score, gap-analysis	Stage 2 (a and b): Reflect wholeness, analyse interactions and tensions The goal in this stage is to test the data on wholeness (2a), and then to define and analyse the interactions between the factors (2b). Different tests (from holistic test to double-cross-impact analysis) are completed in order to find the interactions which are normally not seen and therefore left out.
Stage 2 B	Double-cross-impact analysis, loop diagrams, family constellations	
Stage 3 A	Interpretation of systems dynamic, critical systems heuristics, systemics goal definition, Presencing	Stage 3 (a and b): Work out possibilities of design and steering, understand dynamics In this stage information that transforms into knowledge is reflected. Double-cross-impact analysis is interpreted, results are reflected and the goal is (re)defined (3a). From dynamic interpretation to four drive method we achieve a generic playground for new solutions. It is important to stay open for new information in this stage and to ask in order to make statements.
Stage 3 B	10 points for viability, sensitivity analysis, risk analysis, Neuro-Linguistic programming (NLP), four drive method	
Stage 4 A	Synectic, morphology, the six thinking Hats method, precise destroying, Osborn-Checklist	Stage 4 (a and b): Develop causal solutions and sustainable decisions In this stage new knowledge is produced for solutions (4a) and making decisions (4b). These insights are crucial for recognising that all scientific concepts and theories are limited and approximate. Solutions are seen as emerging opportunities.
Stage 4 B	Simulation, scenario technique, holistic value-benefit analysis, four force field reflection	
Stage 5 A	Project management, process coaching, balanced scorecard, consultancy, coaching, portfolio of activities	Stage 5 (a and b): Consolidate commitment and realise viable processes In this stage action is being taken (5a), followed by the feedback from the environment. Shift from isolated positions to networks as a metaphor for sustainable solutions: there is no signal "right thing to do", as the strategy includes a network of parallel processing.
Stage 5 B	Micro-article, knowledge management, Network, Lessons learned, EFQM quality model, reflecting groups	

Adopted from [15]

TABLE 2. TOOLS OF SYSTEMS THEORY METHOD

Tool	Description
<i>Holistic structure test</i>	Using the holistic structure test enables a quick holistic check of any description or analysis by pointing out the blind spots. The distribution of the factors gives valuable information about the structure of the system and reveals the blind spots.
<i>Holistic potential test – four basic drives</i>	Following [16], factors are tested by four drives: drive to acquire; to bond; to learn; and to defend. This test is basically grouping the factors under appropriate drivers, according to the content of the factor that strengthens specific drives (D1, D2, D3 or D4).
<i>Holistic environmental turbulence score</i>	This test measures turbulence in the relevant environment to indicate how fast and how much the system needs to change its strategy or products.
<i>Systemic gap-analysis</i>	At this stage, factors should be described in relation to the real situation in the company. Then they are evaluated on a scale from 1–5 and the variation from the line which present the holistic environmental turbulence score is measured

<p>Double-cross-impact analysis</p>	<p>After factors for ICT adoption are established from the literature, and tested with holistic tests, their impact on the company in the post-adoption period will be evaluated. The tool for evaluation of those factors on company's goals and performance is called the double-cross-impact analysis. It was developed by Vester and Hesler ([17] order to analyse dynamic systems, and was successful in evaluating key factors for explaining and improving all variety of systems. Double-cross-impact analysis consists of assessing all interrelations between the different factors for ICT adoption. It is based on ADVIAN (Advanced Input Analysis) method developed by [18], were the impact factors are identified and connected. The impact strength of each factor on each other factor is estimated. (see fig. 2)</p>	
	<p>The basic steps of the Double-cross-impact analysis are</p>	<p>Firstly, the system was reduced to a set of relevant key factors for ICT adoption (conceptual framework), An assessment of interrelations between selected key factors was carried out by means of matrices in order to understand the influence exerted and received by each key factor, and Interpretation and discussion of each key factor to identify its potential to influence the entire system. In fact the double-cross-impact analysis is a matrix that facilitates systematic assessment of every single interrelation and of its intensity. In order to take into account the positive and negative interrelations, two matrices are used - one for all the stimulating interrelations and one for the inhibiting interrelations. The interrelations are assessed qualitatively.</p>
	<p>In addition, double-cross-impact analysis provides other important information</p>	<p>The <i>active sum</i> - the sum of each line of each key factor. It represents the total influence the factor exerts on the system (stimulation or inhibition). The <i>passive sum</i> - the sum of each column of each key factor. It represents the total influence of the system on the factor (stimulation or inhibition). The <i>degree of interrelation</i> which is the product of the active sum multiplied by the passive sum. The higher the value, the more the factor is interrelated within the system. The <i>degree of activity</i> of each factor - the quotient that is the result of dividing the active sum by the passive sum. A small quotient means that the influence the factor undergoes is greater than the influence the factor exerts on other components. The opposite applies for high quotients. (see fig. 2).</p>

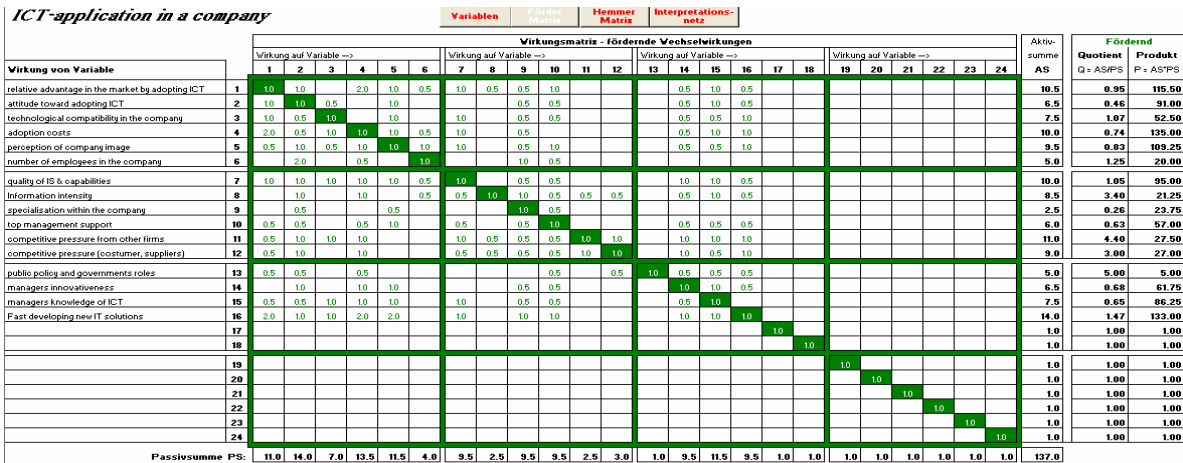


Figure 2. Impact matrices of stimulating interrelationships

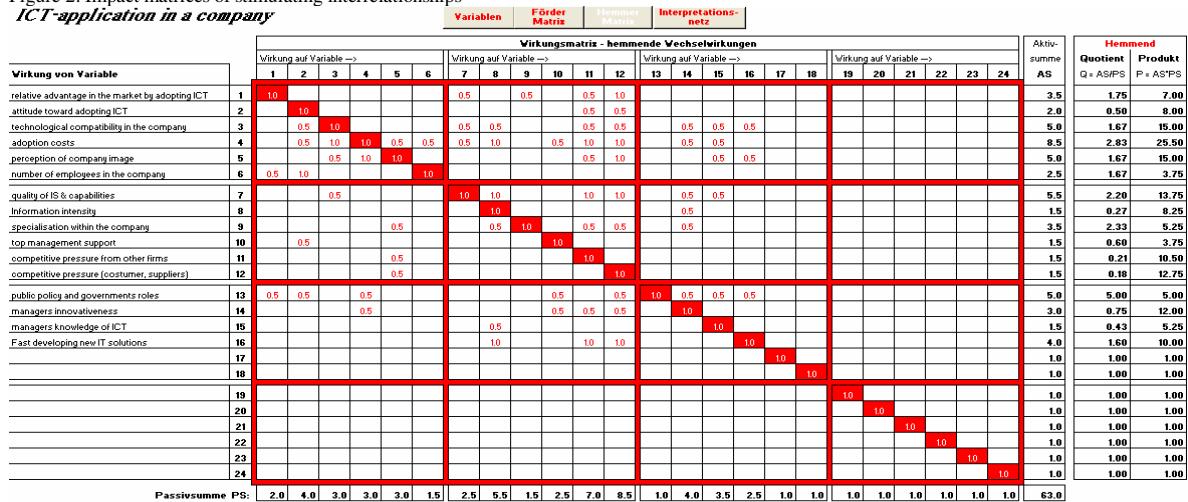


Figure 3. Impact matrices of inhibiting interrelationships

TABLE 3. QUADRANTS OF THE MAP OF INTERACTION

<p>Passive and highly interactive factors These factors are influenced by and interact with the rest of the system</p>	<p>Active and highly interactive factors These factors influence and interact with the rest of the system</p>
<p>Passive and less interactive factors</p>	<p>Active and less interactive factors</p>

These factors are influenced by and are less interactive with the rest of the system

These factors influence but less interact with the rest of the system

ICT-application in a company

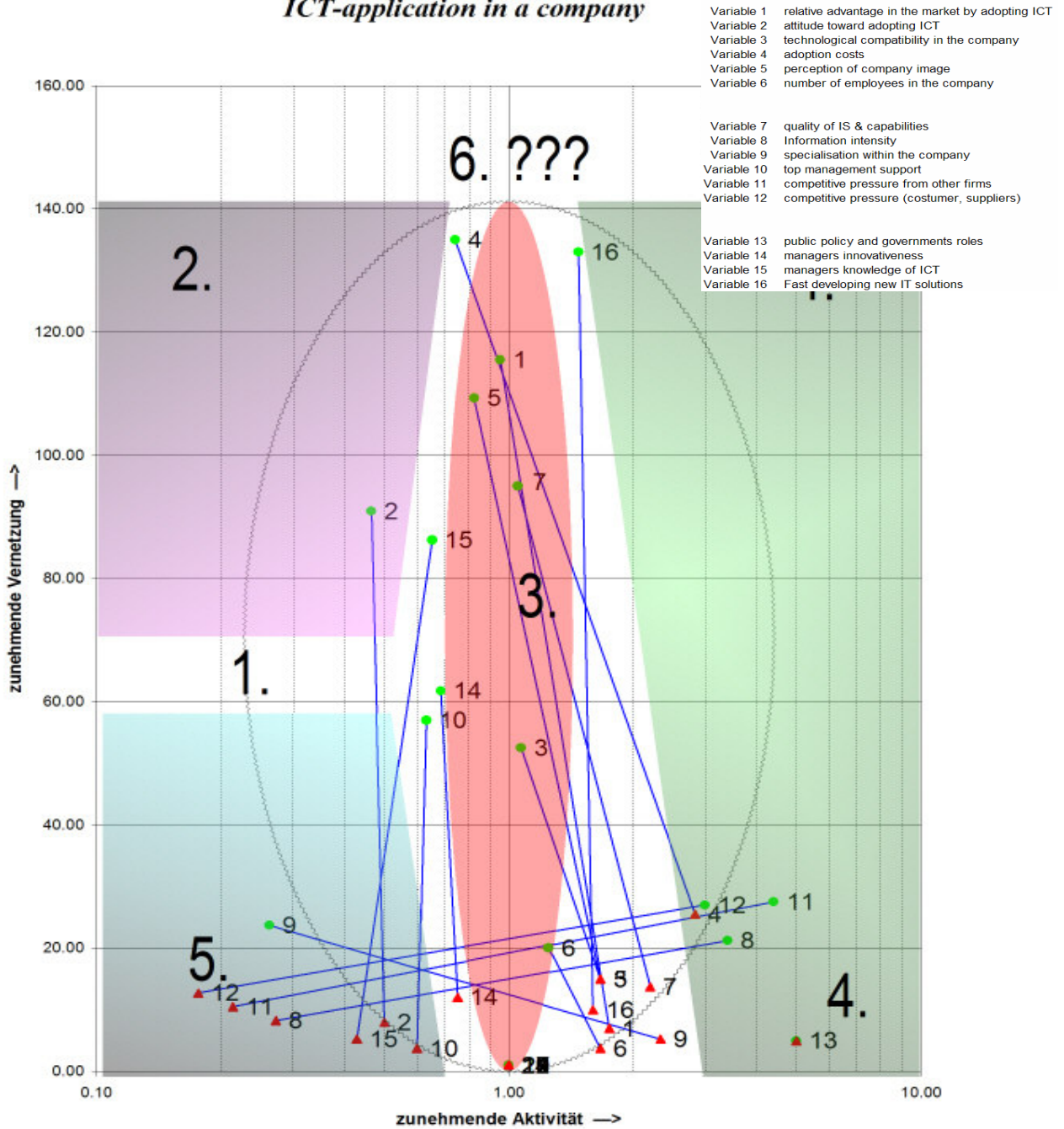


Figure 4: Map of interactions

Principles for IT Praxiography

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ABSTRACT

As information technologies become increasingly distributed, assembled and evolving through use, new conceptualizations of IT-as-artifact are pertinent. This theoretical paper compares two different analytical approaches that explicitly attempt to move beyond our commonplace conceptions of information technologies as single, fixed, and stable objects. The paper starts by outlining a structural practice approach, an influential line of research in the Information Systems field. Secondly, a more radical practice approach is borrowed from the field of Science and Technology Studies and discussed as a promising path for bringing the complexities of contemporary IT into view. Building on the latter practice approach, the paper concludes with a set of principles for conducting IT praxiography that can improve our understanding of how IT emerges through a range of differing sites, practices and concerns.

Keywords: Emergence, Assemblage, Design-in-use, Enactment, Praxiography, Structuration theory, Actor-network theory

1. THE VANISHING ARTIFACT

Entering into a debate on the links between sociology and information systems development, Button (1992) suggests that the research preoccupation with the social practiced side of technology has caused technology to ‘vanish from view’ [1]. He refers to this as the curious case of the vanishing technology. Monteiro and Hanseth (1995) similarly criticize a tendency in IS research to black box the specificities of technology by applying monolithic terms such as information system, information technology, or computer system [2]. They call for research on IT in organizations to be more specific about technology, the level of granularity at which it is studied, and technical details of the particular technology in question.

Orlikowski and Iacono (2001) follow up on this curious disappearance of the IT-artifact in a research commentary entitled *Desperately Seeking the “IT” in IT Research – A Call to Theorizing the IT Artifact*. In a literature survey of articles from the journal *Information Systems Research (ISR)*, Orlikowski and Iacono (2001) find that the “IT artifact tends to disappear from view, be taken for granted, or is presumed to be unproblematic once it is built and installed” (p. 121)[3]. In this literature survey they delineate different ways in which technology is understood. These are by means of a tool view, a proxy view, an ensemble view, a computational view, and a nominal view of technology, each with a number of subcategories.¹ They thus found *many* conceptualizations of technology and discuss how most of these take the technology for granted

as a universal object. Orlikowski and Iacono note that such simplifications make it easy to talk and write about technology, but render it difficult to see how technologies must be held together, fall apart, and are altered at different times and places. They consider this unclarity a serious problem for the field: “[T]he tendency to take IT artifacts for granted in IS studies has limited our ability as researchers to understand many of their critical implications – both intended and unintended – for individuals, groups, organizations, and society. We believe that to understand these implications we must theorize about the meanings, capabilities, and uses of IT artifacts, their multiple, emergent, and dynamic properties, as well as the recursive transformations occurring in the various social worlds in which they are embedded. We believe that the lack of theories about IT artifacts, the ways in which they emerge and evolve over time, and how they become interdependent with socio-economic contexts and practices, are key unresolved issues for our field...” (p. 133)[3].

Orlikowski and Iacono suggest five premises for a research agenda that could adequately re-theorize IT artifacts. These five premises are ways of working against the tendency to view and talk about IT artifacts as universals, as single, stable entities that remain the same every time and everywhere. Orlikowski and Iacono’s five research premises [3]:

- IT artifacts are not natural, neutral, universal, or given. They are never “just objects” but always already implicated in actions and effects.
- IT artifacts are always somewhere – embedded in particular times, places, discourses, and communities. “Their materiality is bound up with historical and cultural aspects of their ongoing development and use, and these conditions, both material and cultural, cannot be ignored, abstracted, or assumed away” (p. 131).
- IT artifacts are made up of multiple fragile and fragmentary components “whose interconnections are often partial, provisional and which require bridging, integration, and articulation in order for them to work together” (p. 131).
- IT artifacts are not fixed or independent, but emerge from ongoing social and economic practices. They both undergo transitions over time and may co-evolve in multiple ways.
- IT artifacts are dynamic, and their stability is always conditional. It thus becomes important to understand why and how artifacts are stabilized in certain ways at certain times.

These five premises question the tendency to take IT-artifacts for granted as stable and fixed entities. These premises all abandon any notion of IT-artifacts as universals and call for attending to the practices in which they are implicated, assembled, transformed, and held stable. Turning to the social one way of realizing these premises. Yet as Button notes, in attending to social and human issues, practice-oriented studies of technology have tended to push the technological artifact out of view [1]. How can we conduct research based on these premises without technology vanishing from view? In the light of this discussion, I will present two approaches to the study of technology and practice that work this tightrope.

2. TECHNOLOGY IN PRACTICE

In the article *Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations* (2000), Orlikowski proposes what she calls a practice lens that can allow us to focus on the use of technology as a process of enactment [4]. Enactment is defined with reference to a dictionary definition: to constitute, actuate, perform, or to represent in or translate into action (p. 425n2). The term indicates an activity or an event through which something is done or acted out. Orlikowski uses the term to extend a structuralist understanding of technology design and use.

In structuralist models, technologies are approached as embodying social structures, which have previously been built into technology - most often by designers. This is a process of construction through which designers' intentions, or, social, political, and moral structures such as hierarchies, procedures, and knowledge become written into material artifacts. Once embedded with properties, technologies work back in shaping the social, structuring organizations, work practices, and use activities in particular ways. This way of thinking the relation of technology and social practice is quite common in both IS literature [5, 6] - and in social studies of technology [7, 8]. The image is recursive. The social shapes technology, and technology shapes the social. This is a perpetual interplay, and over time the social and technical are increasingly enmeshed and entangled in one another through this process of recursive structuring. This is a useful way of thinking about how information technology and social practice co-evolve through a dynamic interplay. Yet, this view presumes that a technology's physical properties are in place and stay in place after being constructed. This view falls into the universalizing trap of treating the properties as fixed, stable, and the same everywhere and at all times that Orlikowski and Iacono warns against [3].

Orlikowski points out problems with this perspective and with the very notion of design as construction. Firstly, the notion of technology as a fixed and stable entity does not align with empirical evidence and contemporary circumstances where technologies are modified, continually evolve in use, and do all sorts of things neither anticipated nor planned by designers. Orlikowski posits the following critique of existing structuralist models: "[T]heir presumption that technologies embody specific stable structures is nevertheless problematic because it depicts technologies as static and settled artifacts with

built-in arrays of fixed and determinate structures that are (always and readily) available to users. Such assumptions of technological stability, completeness, and predictability break down in the face of empirical research that shows people modifying technologies and their conceptions of technology long after design and development" (p. 406) [4].

Orlikowski refers to a range of studies of how use evolves in ways unanticipated by designers [4,9,10,11]. Examples include misunderstandings of designer intentions, inadequacy of user skills and competencies, or, that users deliberately resist, alter, or work around the technological design perhaps by adding, modifying, or substituting procedures or elements. Orlikowski implies that we need to be more attentive to this excess - the actions, outcomes, and detours that cannot be explained by the technology or design as source. This shifts focus away from the interior stable properties of technologies to that which is enacted and emerges. Orlikowski suggests that the dilemmas of the field derive in part from *starting with the artifact rather than starting with practice*. Orlikowski argues that technologies can only be seen to structure action when routinely mobilized in use, when linked to and made part of specific practices and settings. If a new technology does not get off the shelf, what does it structure? What emerges depends upon particular practice.

Orlikowski elaborates upon her practice lens with a critique of more traditional sociological ways of thinking about structures, rules, and resources as existing either external to and independently of human action (out there), or, as internal schemas built into people as programmed rules of thumb, skills and judgments, or cognitive abilities (in our heads). This view is criticized as *objectivist reification* - rules exist out there prior to and independently of our action - and as *subjectivist reduction* - that rules and procedures reside internally in individual subjects (p. 406). The problem with both of these views is that they assume that rules and procedures exist outside and separate from practice, be this in individuals, in communicative structures, or in material objects.

Ongoing enactments

The concept of enactment is brought in by Orlikowski as a resource for thinking about the world as dynamically in the making [4]. She stresses that it allows us to study how that which we might think about as structure is always constituted *in practice* and only gains its existence through performative events or moments. This view takes practice as its starting point, and always looks for structures, rules, and procedures as outcomes or effects of practices. Social structures are embodied in instantiations, not in the materials of the technology.

Orlikowski argues that by studying enactment we are better equipped to acknowledge and account for the processes through which technologies are used - both in line with the designer's expectations, but also in new and different ways that may be different from or perhaps contradict or exceed the intended use foreseen by the designers [1]. This view allows us to explore, as Orlikowski moves on to do in the article, the differences in use - different versions of the artifact that evolve through use. Technologies-in-use are

thus continually enacted and through long spirals of repetitive enactments they *come to look like* sameness and stability. Yet, stability is always provisional.

In this discussion of technology and practice, Orlikowski distinguishes between a technology-as-artifact and a technology-as-practice. Technology-as-artifact is described as the “bundle of material and symbol properties” and technology-in-practice is “what people actually do with the technological artifact in their recurrent, situated practices” (p. 408). This paper suggests that Orlikowski does not press her own critique far enough. What starts out as a critique of the construction view (artifacts as designed by designers and thereafter the same and stable every time and every where) ends up as another version of this view by maintaining the IT-as-artifact as an object existing ‘outside’ of practice and discourse. The IT-as-artifact stays in tact. Before returning to this point of disagreement I will first present a second approach to the study of technology practice.

3. TECHNOLOGY AS PRACTICE

To introduce a way of studying technology *as* practice I will turn to STS researchers de Laet and Mol and their way of thinking through the concept of enactment [12,13]. Unlike Orlikowski, de Laet and Mol are less interested in developing a robust theory, but they use the term enactment to bring a number of empirical questions and problems into focus. Their work represents a very different way of doing research and producing new knowledge. And I will therefore present their work as providing a conceptual framework for investigating material objects empirically. The conceptual framework suggests a number of analytical tricks that can guide empirical investigations and knowledge production more than providing a grand explanatory theory such as structural theory.

De Laet and Mol’s work forms part of a wider field of STS research concerned with shifting social science away from dealing only with social structures, communicative layers, symbols, and meaning, and with moving sociological theorizing into the physical realm of material objects, nature, bodies. These aims entail new ways of thinking about relations of the social and the material as ‘mutually constituted’ and not belonging to different ontological domains [14,15]. The work of de Laet and Mol can thus be grouped together with other STS work that is particularly preoccupied with materiality (for example, how materialities appear and vanish) and socio-material hybrid phenomena. Both these preoccupations resonate with concerns of IS research and have provided a theoretical resource for the field as seen, for example, in the work of Aunestad and Hanseth (2000), Monteiro (2000), Büscher et al. (2001) [16, 17, 18].

This orientation furthermore foregrounds the very practices, events, and situations in which objects are handled, made, and re-made. Similar to Orlikowski’s suggestion to start with practice and not the object, de Laet and Mol’s study implies *never* viewing objects as given beforehand, but as always brought into being through practice. They illustrate how technological objects can be investigated through the practices in which they are made, used, adjusted, become localized, framed, visible, or

invisible[12]. Again similar to Orlikowski, de Laet and Mol aim to move away from the notion of construction that posits that objects, once constructed, are stable and fixed entities: Maintaining identity and stability of any object requires continuing efforts. Things fall apart, need to be used, maintained, and valued. In short, they *are* through all sorts of practices. This turns the focus of study around and renders technology not what one begins with, but what gets constituted [13,14,15].

I will give an example to illustrate the conceptual framework proposed. The example is from a study by de Laet and Mol of a water pump in Africa [12]. They analyze this bush pump, a technological object, as adaptable, flexible, and ‘fluid technology’. I will outline their arguments and then contrast these with the proposals of Orlikowski [4].

Studying appearances and boundaries empirically

De Laet and Mol explore different ways of describing what the bush pump is and explore the different practices in which it is located [12]. On the one hand, the pump has a history. An inventor and an engineering company have developed it in different versions. Secondly, it has a certain look and feel. They describe what it looks like as well as a number of invisible parts that are under the ground, e.g. the mechanisms that pump water out of a well. Next, it can be compared and described as different from other pumps, for example by way of its effective hydraulic system, its durability, and specific functionalities. There is thus a range of possible descriptions, each of which enacts particular properties of the pump (p. 237)[12].

The bush pump also appears differently from one village to the next. It is set up in slightly different ways. Parts and pieces have been removed, renewed, added, or tinkered with from one village to the next. De Laet and Mol describe how, in the villages, the pump has to enter into a collaborative relationship with other technologies, such as a drilling device for boring well holes for the pump. And the local villagers need to be engaged and to collaborate for the pump to start working and keep working. So the pump is also closely tied together with the local communities and family relationships. Another appearance thus includes these people that make it work, their collaborative efforts and organization, their use of instructions, and their collective tinkering about.

Lastly, de Laet and Mol look at the practices of the Zimbabwean state and how the pump is part of a national strategy for building an infrastructure for clean water. Distant actors can also be seen as forming a part of the pumps, for example governmental agencies, NGO’s, and the engineering companies that continually are supplying new parts. The pump is also a national health promoter and a way of encouraging units of collective action in the villages, thereby building a stronger nation. In applying this strategy of analysis, de Laet and Mol question what it means that the pump “works”. They look at the different and continual practices of villagers repairing parts, adding new parts developed by the engineering company, or experimenting with their own solutions for solving problems that come up with the pump. New bits and pieces are continually added over time for the pump to work. It is taken apart and put back together in new ways.

The analysis of Laet and Mol is useful because it opens for a way of thinking about grades and shades of working. Workability is, on the one hand, defined by the measurements of cleanliness and official, standardized health indicators. Whether the pump works is dependent upon whether it produces clean water. What defines clean water is dependent upon international criteria for measuring the count of E.coli bacteria in one liter of water, for which one needs specific measurement instruments. Some pumps meet these criteria. Some do not. Some pumps are not tested at all. And when tested, the measurements can also be tinkered with and handled in ways that sometimes make the count fit and the pump work a bit better. Success or failure is thus variable and dependent upon a range of other elements such as water, bacteria, instruments, and calculation procedures. Working is a matter of tinkering and assistance and is also related to other elements such as the size of the well, the organization or conflicts of the village people, national health committees, and engineering companies.

De Laet and Mol suggest thinking about the pump's existence as *co-extensive* with this whole line of other things, people, and activities. In this way, they unravel a set of different descriptions and practices that *frame* the Pump in different ways. "[I]ts boundaries are not solid and sharp. The pump is a mechanical object, it is a hydraulic system, but it is also a device installed by a community, a health promoter, and a nation-building apparatus. It has each of these identities – and each comes with its own boundaries. To write about the Bush Pump in this fashion means that we do not mobilize the arid trope of describing a small technological artifact as if surrounded by large social environments – to which it inevitably remains alien. In each of its identities the Bush Pump contains a *variant* of its environment." (p. 254). Their article unpacks these different identities and explores the different enactments of the technology [12]. It is, however, not completely random and cannot be just anything at all: "...the Bush Pump's various boundaries define a limited set of configurations. They each, one might say, *enact* a different Bush Pump" (p. 237)[12].

Multiple enactments co-exist and assemble

Different enactments assemble together and produce consequences, such as the pump being successful or providing better health in Zimbabwe [12]. De Laet and Mol suggest that the pump holds together precisely because of the many differing local enactments, distributed action, and surprises (p. 253). They therefore suggest thinking and talking about the pump as a fluid technology, a flowing object that does not have a fixed pattern or boundary, but may alter shape as it flows or meets with other elements. Also, the very configurations of which the pump is a part are not stable either. Villagers and families may fail to cooperate around drilling holes and maintaining the pump, and spare parts may be unavailable at different times and places. The configurations and relations the pump is part of gradually shift and change. The central point here is that these subtle changes in the relations that sustain the pump, and a series of different enactments and gradual adaptations, allow for the pump to hold together as an overall successful, working, and continuous technology. The analysis moves across different levels of abstraction

and combines these in the analysis. For example, national strategies, water bacteria, screws and bolts, and village communities are analyzed in similar terms as elements that form part of the configuration that shapes the pump as a working technology. They illustrate that boundaries between technology and context may be drawn in different ways. The authors thereby suggest that the very distinction of what is defined as technology or context – properties of the pump or the community – is also an enactment, a boundary continually drawn through particular practices [12].

This approach moves away from treating technology or practices as surrounded by context and concentric circles, but instead uses imagery of extended networks and network configurations. De Laet and Mol extend this way of thinking by arguing that nothing in particular holds the pump in place and that the pump gradually incorporates (and transforms) its surroundings. Here I would like to emphasize the analytical move de Laet and Mol make in that they let go of talking about the artifact *outside any description or practice*. Instead they make parallel many different descriptions and practices and study how the line between artifact and context blurs and shifts.

4. LOCATING 'IT-AS-ARTIFACT'

I will now compare this analytical trick to Orlikowski's practice lens [4]. Orlikowski launches the practice lens to say something new about how technology's structuring capabilities emerge through use. And it is her way of working towards the five premises for how we should re-theorize technology [3]. I have suggested, however, that Orlikowski falls short of her target in that she retains the notion of IT-as-artifact as something that lies outside of practice, outside of any discussion and debate. Orlikowski separates the material properties embodied from instantiations through her distinction between technology-as-artifact (stays stable) and technology-in-use (as instantiations). She describes the "symbolic and material properties" that are embedded, prior to use – that users then misunderstand, ignore, react to, or respond to [4]. The vocabulary she applies is one of humans choosing, adapting, and inventing ways of engaging with technology to accomplish various ends (in a humanistic resistance sense). With Orlikowski, use and instantiations unfold above or outside the artifact.

A more radical practice commitment, exemplified by a study of de Laet and Mol, is to always ask *where* the IT-as-artifact can be found [12]. In a footnote from Orlikowski's enactment article (which quotes Grint and Woolgar, 1995, p. 298) Orlikowski seems to be in line with the radical practice way of thinking about the object [4,19]: "As Grint and Woolgar 1995, p. 298 remind us '[Technology] exists only in and through our descriptions and practices, and hence it is never available in raw, untainted state'. Thus, even the description and observation of 'technologies' and their 'properties' including their designation as artifacts, is a kind of *use* of that technology." (p. 425). However, Orlikowski (2000) continues to maintain the distinction between technologies as artifacts and the use of such artifacts as an analytical distinction "useful in both empirical research and everyday usage" (p. 425).

In contrast, I suggest that questioning the IT-as-artifact *as a particular* enactment can open for new lines of inquiry. A more radical commitment to practice presses us to rethink and accept technology as a phenomenon of which there can be no self-evident or transparent account. In recognition of this theoretical dilemma de Laet and Mol avoid talking about the pump's properties *a priori*, but work towards understanding properties in relation to specific descriptions and practices. Properties are thought of as something to be examined as co-extensive and dependent upon a range of elements and practices.

To emphasize the parallel drawn in this paper from the bush pump example to IT phenomenon, the work of Bloomfield and Vurdubakis is relevant [20]. IS researchers Bloomfield and Vurdubakis similarly point out how we tend to ignore the question of how technology becomes recognized as such: "Technological objects do not speak for themselves, we posit such objects in our accounts of the technical and then speak on their behalf. For example, in seeking to describe the material or physical properties of technology one does not leave the social behind and cross, as it were, a boundary into the realm of the technical: for such description is inherently social. It implies that certain objects and practices can be demarcated and distinguished from others on the basis of an agreed set of properties." (p. 9) Upon empirical scrutiny, IT can implode into an array of distributed elements and practices. Bloomfield and Vurdubakis point out that locating technological artifacts as single and coherent entities thus requires work [20].

With this line of thinking, we can understand 'IT-as-artifact' as a *particular* enactment - that is enacted recursively in so many places and times that it appears self-evident and becomes taken-for-granted. Bloomfield and Vurdubakis suggest constantly being aware of *how* technology is recognized as such and to think about how "... any account that takes the "properties" of a particular technology as its starting point, is from the beginning caught up in those practices that generate and sustain the objectively given quality of those properties" (p. 10) [20].

Following these authors, this paper suggests that it is not so much a matter of eliminating accounts of IT-as-artifact as a question of *locating* these accounts and continuously working back to investigate the practice in which something is distinguished as either social or material. Technology-as-artifact is *also* achieved in practice, and as Bloomfield and Vurdubakis suggest, we may benefit from being more attentive to the particularity of these enactments. If we are not, technological artifacts slip into being "everywhere and the same again" as Orlikowski and Iacono warns us against [3].

Juxtaposing different appearances and descriptions as de Laet and Mol do in their study of the bush pump, is one way of problematizing the fixity and boundaries of technological artifacts. Orlikowski and Iacono also make this very move in their call for re-theorizing the IT artifact, presented at the start of this paper [3]. In their survey of IS literature and conceptualizations of technology they find a whole list of different versions of technology: as tool, proxy, ensemble, and nominal.¹ Upon scrutiny, the IT-artifact differentiates and multiplies. For Orlikowski the lack of a clear theory or account is a theoretical problem. But what if these differences are turned into an opening

rather than a dead end? De Laet and Mol's approach can be a useful analytical trick for circumventing the problem of the vanishing technology by working empirically and studying the practices in which a technology appears and is framed as such. This provides empirical answers to a theoretical problem and provides guidance for analyzing IT *as* practice, thus viewing the way in which IT comes into being as an emergent effect of a set of more or less related practices. Such an 'IT praxiography' starts with these practices, situations, and particular moments of enactment rather than starting with the technology.

5. CONCLUSION

In conclusion, IT praxiography is suggested as a set of principles that may relieve some of the desperation in the search for IT in IS research [3]. The principles are proposed as an analytical resource for sensitizing research to the situated practices and events of which IT is a part. The principles thereby follows the premises as suggested by Orlikowski and Iacono, but expands these with four additional premises listed below[12].

IT praxiography refrains from starting with a fixed definition of IT (or the expectation that we might find it once and for all if we keep working on it), but instead starts with practices, situations, and events in which information technologies appear, asking openly what occurs and what emerges. This implies:

- Never isolating information technology from the specific settings, situations, and relations in which it is made, made to work, and re-made
- Tracing in detail the different network arrangements and configurations through which information technology is framed, assembled, localized, manipulated, brought into being locally
- Scrutinizing how enactments of IT-as-artifact, its properties and boundaries, alter and fluctuate with different practices
- Not looking for explanations or determinants for what information technology *is*, but describing the process – how it came to be that way through distributed, ongoing, and collective achievement
- Including in analysis related academic networks: how researchers' activities, analysis and recommendations meet with and transform other enactments and framings [23]

These principles can qualify how people involved in the fields we study (including ourselves as researchers) continuously are engaged in processes of defining technology, aligning it with here and now practices and orientations. Such practices seem to be always ongoing, often unfinished, and more than merely matters of interpretation. IT praxiography is a relevant resource that can further analytical work on how IT emerges through multiple and differing practices that crisscross traditional divides of design-use or research-practice.

6. FOOTNOTES

1. In a tool view, technology is an engineered artifact expected to do what it is designed to do. Here technology is black boxed and assumed to be an individual and stable entity that can be transferred from site to site and used as is [3]. In this view technology is the independent variable left stable and unexamined while studies focus on dependent variables – that which is affected, transformed, and altered by the tool (p. 123). A proxy view “focuses on one or a few key elements in common that are understood to represent or stand for the essential aspect, property, or value of information technology” such as ease of use, intentions of use, measures of diffusion or cost-benefit. An ensemble view, in contrast, looks at technology as one element in a wider ensemble and at the dynamic interplay of social and technical entities [21,22]. Lastly, articles where technology is omitted and absent from the article are categorized as a nominal view [3].

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An Analysis of Poverty - A Ridge Regression Approach

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ABSTRACT

A High-Level Panel of the UN Secretary General identified the economic and social threats, in particular, poverty, infectious diseases, and environmental degradation as one of the six clusters of existing or anticipated threats to peace and security. This paper attempts to identify the socioeconomic determinants of the poverty component of the threat mentioned above by analyzing national level data of 68 countries collected from the World Population Data Sheet, 2006, and other international sources.

The dependent variable is the level of poverty, measured as the percentage of population living below US \$2 per day. The technique used to analyze data is the multiple regression, while variance inflation factors and the ridge regression technique have been used to detect interrelation among the internal components of the regression model.

The analysis shows that the gross national income is the most influential variable in lowering the level of poverty, followed by the percentage of urban population, and the percentage of females enrolled in secondary school in that order.

The need for an even distribution of resources is emphasized and other policy implications are discussed. The paper suggests additional research before implementing policy based on the intuitively appealing formula: more resources = less poverty.

Keywords: Poverty, Ridge Estimator, OLS Regression, Multicollinearity, Variance Inflation Factors

1. INTRODUCTION

The September 2005 World Summit of the United Nations General Assembly had in its consideration, among other documents, the report of the Secretary General's High-Level Panel of Threats, Challenges, and Change [12]. The panel identified the economic and social threats, in particular, poverty, infectious diseases, and environmental degradation as one of the six clusters of existing or anticipated threats to peace and security. In their report the panel of experts mentioned that although the per capita income of the developing countries witnessed an increase of an average of 3 percent annually since 1990, there has

been an increase in the number of people living in extreme poverty by more than 100 million people in some regions, the average per capita income decreased in at least 54 countries over the same period, and global inequality and income inequality in many poor countries increased concomitantly along with the increasing poverty. As an example, they also wrote that the richest twenty percent of the households in some parts of Latin America have their income which is thirty times greater than the poorest twenty percent of the households.

In this paper we are concerned with the poverty component of the threat mentioned above. There is a considerable variability in the poverty level across countries of different socioeconomic levels. The intent is to identify the socioeconomic correlates of poverty that contribute towards the variations in poverty level across a number of countries by analyzing aggregate level data. The importance of this study derives from the fact that it is necessary to identify these correlates so that efforts can be made for the reduction of poverty through changes in government policies and redistribution of resources.

2. DATA AND METHODS

Data and Variables

The source of data in this analysis is the 2006 World Population Data Sheet and the individual country information [22], as well as, the Corruption Perception Index, 2005 [23].

The dependent variable to be analyzed is the poverty level (PL:Y) measured as percentage of population living below US \$2 per day. The World Bank uses a common unit across countries: \$1 per day (extreme poverty) and \$2 per day (poverty) to estimate poverty level worldwide, and this measure has been used in the World Population Data Sheet. The percentage of population living below \$2 per day varies from lows of less than 2 in Azerbaijan, South Korea, Belarus, Czech Republic, Hungary, Poland, Croatia, Macedonia, Portugal, and Slovenia to highs of 90 in Tanzania, 91 in Mali, 92 in Nigeria, and 94 in Zambia among the countries for which data on this variable and other relevant variables are available. The explanatory variables used are: Gross national income per capita (GNI: X1) which is based on the amount of goods and services one could buy in the United States with a given amount of

money; Energy use per capita 2002 (kg oil equivalent) (ENG: X2); Total fertility rate defined as the number of children a woman would have if she survived to the end of her reproductive period and experienced a given set of age-specific birth rates (TFR: X3); Percentage of the total population living in urban areas (URBAN: X4); Population density per square mile (DEN: X5); Percentage of the dependent population defined as the sum of the percentages of population aged less than 15 years and more than 65 years (DEP: X6); Percentage of the economically active females aged more than 15 years (EAF: X7); Females enrolled in secondary school as percentage of school-age enrollment (SSF: X8); and Corruption Perception Index, 2005 which relates to perceptions of the degree of corruption as seen by business people and country analysts, and ranges from 0 (most corrupt) to 1 (least corrupt) (CPI: X9). Details of the variables and their measures can be found in their sources mentioned above. Data for all the above ten variables are available only for 68 countries which form the basis of this analysis.

Theoretical reasoning and the availability of data are the guiding principles for selecting the explanatory variables. One common measure of general standards of living is the per capita income which may be used as a measure of income growth and has been found to be strongly negatively related to poverty [15, 18]. The link between poverty and income growth has garnered a great deal of research attention over the years [1, 2, 5, 6, 8]. However, if the benefit of income growth does not reach the low-income group, the overall positive impact of the income growth can well be mitigated by the income inequality which affects the pattern of poverty. Poverty in a society is likely to increase if only a select few can derive the benefits of income growth.

Energy consumption is another factor associated with poverty. The region of the world that includes the poverty-stricken countries has the lowest per capita energy consumption [14]. In this paper the author has divided the world into five regions – A (U.S., Canada, Australia, New Zealand), B (Soviet Union, Eastern Europe), C (European members of OECD (excluding Turkey and Japan), D (China excluding Taiwan), and E (all other countries), and calculated the per capita energy consumption for each region. The per capita energy consumption in region A is more than sixteen times higher than that in region E (7.51 versus 0.46) while the world per capita energy consumption (1.54) is more than three times higher than that in region E. The Gini index also shows the degree of inequality in per capita energy consumption between the world regions. If all regions of the World’s population had the same per capita energy consumption the index would be zero; the index would be almost one if a few percent of the world’s population consumed practically all the energy. The value of the Gini index was 0.55 in 1985 and is projected to decline to 0.45 in 2020. Whether the decline will continue until the development gap between industrialized and agrarian regions disappears is yet to be seen.

In a high-fertility society, a family is more likely to use a given income on a larger number of members than in a low-fertility society. This may cause economic strains on low-income families that may eventually lead to poverty. A similar argument might show that the variable – dependent population – may also influence poverty. Urban areas are usually centers of political and economic power and offer more sources to earn better incomes compared to the rural areas. As a consequence, people in urban areas are generally economically better off than their rural counterparts, and hence are less likely to face poverty. Another factor that may influence poverty is the population density [7]. For example, in China, the highest-income area is the most densely populated (the coastal region) and the lowest-income area is the western region which is the least densely populated [19]. One reason may be that in a densely populated area people can run their businesses and other activities with a desirably greater number of potential consumers in a relatively smaller area and hence can earn better with less investment than in a sparsely populated area.

A female’s involvement in income generation raises the total income of the family and consequently the probability that the family may face material deprivation is lessened. Education plays a very important role in the reduction of poverty. A higher level of education enhances the probability of a higher level of knowledge that eventually leads to higher economic gains. As Johnson aptly states that if people are to be pulled out of poverty, the most appropriate way is to increase the level of their education [19]. Since the higher the level of education of the females the higher the likelihood that more females will be economically active, both variables – SSF and EAF are expected to contribute negatively to poverty.

In a society, people who are corrupt usually possess more wealth earned through illegal means at the expense of those who are not corrupt. When the scale of corruption is massive, it corrodes the economic vitality of a society and may entail poverty. Understandably, the scenario is more dismal for a low-income society.

Based on the above arguments we hypothesize negative relationships between PL and each of the variables GNI, ENG, URB, DEN, EAF, and SSF, and positive relationships between PL and each of the variables TFR, DEP, and CPI.

3. ANALYSIS

Fitting OLS Regression Model

The results of fitting the ordinary least squares (OLS) regression model

$$Y = \beta_0 + \sum_{i=1}^9 \beta_i X_i + U \quad (1)$$

(where β_0 is the intercept and β_i s are the regression coefficients) connecting the poverty level and the nine explanatory variables X_1, X_2, \dots, X_9 are shown in table 1.

The significance of the F value at a very low probability level shows that the variables chosen to explain poverty are valid explanatory variables [9]. Although the value of R^2 is large (0.795), it is not a guarantee of a good fit [3], nor that the model assumptions have not been violated [9]. However, the residual analysis did not show any evidence of model misspecification nor of any serious violations of model assumptions.

After properly specifying the model it is necessary to investigate the theoretically desirable but methodologically arduous presence of multicollinearity. The problem with interdependency or multicollinearity is that, as the multicollinearity increases the variances of the OLS estimates also increase rendering the estimates unstable. It is, therefore, important to judge whether the internal components of the regression model are themselves interrelated or not, and if they are, difficulties inherent in collinear systems must somehow be dealt with.

TABLE I. UNSTANDARDIZED AND STANDARDIZED COEFFICIENTS OF REGRESSION OF POVERTY LEVEL ON THE NINE

Variable	Unstandardized Coefficients	T Value	Standardized Coefficients
INTERCEPT	-18.090	-.647	
GNI: X_1	-.001	-1.892	-.226
ENG: X_2	-.001	-.487	-.039
TFR: X_3	-2.933	-.634	-.145
URB: X_4	-.303	-2.403	-.198
DEN : X_5	.010	1.983	.130
DEP: X_6	2.060	2.254	.443
EAF: X_7	.422	3.828	.240
SSF: X_8	-.185	-1.462	-.188
CPI: X_9	-.555	-.279	-.025
N= 68 $R^2 = 0.795$ F = 25.005			

Detection of Multicollinearity

To this end, first the bivariate correlation table is examined. Two of the nine explanatory variables – total fertility rate and the percentage of the dependent population – are highly correlated (correlation coefficient $r = -0.840$). Also two of the nine possible R^2 s from the regressions of each explanatory variable on all other explanatory variables – one from the regression of TFR (X_3), and the other from the regression of DEP (X_6) – are very large – 0.93 and 0.91 respectively. These values of r and R^2 indicate the presence of multicollinearity in the data.

In order to gauge how precise an OLS estimated regression coefficient is, we need to consider its variance which is proportional to the variance σ^2 of the residual term in the regression model, the constant of proportionality being termed variance inflation factor (VIF). The VIF for the coefficient b_i is given by $\frac{1}{R_i^2}$

where R_i^2 is the square of the multiple correlation coefficient obtained from the regression of the i th explanatory variable on all other explanatory variables. As R_i^2 approaches 1, indicating the presence of a linear

relationship among the explanatory variables, the VIF for b_i tends to infinity. Usually, a VIF in excess of 10 is considered as an indication that multicollinearity may cause problems in estimating the parameters.

If there are p explanatory variables, the expected squared distance of the OLS estimators from their true values is given by [9]

$$L^2 = \sigma^2 \sum_{i=1}^p VIF_i \tag{2}$$

The smaller the distance, the more accurate are the OLS estimates. In case the explanatory variables are orthogonal, each VIF will be equal to 1 and $L^2 = p\sigma^2$. Hence the ratio

$$Q = \frac{\sigma^2 \sum VIF_i}{p\sigma^2} = \frac{\sum VIF_i}{p} \tag{3}$$

can also be used as a measure of multicollinearity – a large value of Q indicating the presence of multicollinearity. Table 3 shows the variance inflation factors for the OLS regression coefficients.

TABLE II. VARIANCE INFLATION FACTORS

X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
4.025	1.783	14.788	1.929	1.220	10.918	1.110	4.666	2.206

As can be seen from table 2, the VIFs for the coefficients of X_3 and X_6 are both greater than 10 (14.788 and 10.918 respectively) indicating that the multicollinearity may be present. Also,

$$Q = \frac{42.645}{3} = 14.215$$

implies that the distance of the

OLS estimators from their true values as measured by Q is over 14 times greater than what would be if the explanatory variables were orthogonal. All the above values also point to the presence of multicollinearity.

Application of Ridge Regression

When multicollinearity is present, a technique called Ridge regression is used to estimate the parameters. It is an estimation technique [16, 17] which produces estimates in the face of multicollinearity that are closer, on the average, to the true population parameter than are the OLS estimates [13]. The OLS estimator is given by $\hat{\beta} = (X'X)^{-1} X'Y$ while the ridge estimator for a given value of k is obtained as $\hat{\beta}(k) = (X'X + kI)^{-1} X'Y$ where k is the bias parameter which takes values in the interval from 0 to 1 [17]. This is because the problem stems from the inflated values in the diagonal of the inverse matrix, and the addition of kI to $X'X$ counters this tendency [20].

The ridge estimates obtained for small values of k may be viewed as resulting from a set of data that have been

slightly changed. If multicollinearity is a problem, the ridge estimates will show large fluctuations for small values of k , demonstrating instability. In other words, multicollinearity is detected by observing the instability in the estimated coefficients resulting from slight changes in the estimation data. We are concerned with those values of k for which stability is achieved. Since the size of k is directly related to the amount of bias introduced, it is desirable to select the smallest value of k for which stability occurs. Obviously for $k = 0$, the ridge estimates are also the OLS estimates.

In our analysis a significant instability is not warranted among the ridge estimates, that is, the estimated coefficients did not show large fluctuations for small values of k . This is also evident from the fact that the VIFs are in excess of 10 for the coefficients of X_3 and X_6 only by 4.788 and 0.918 respectively (table 3). These small excess values, although indicate the presence of multicollinearity, show that the multicollinearity is not large enough to plague the results severely. Hence, the OLS estimates may well be used to describe the relation between Y and the explanatory variables. The model is, therefore,

$$Y = -18.090 - 0.001X_1 - 0.001X_2 - 2.933X_3 - 0.303X_4 + 0.010X_5 + 2.060X_6 + 0.422X_7 - 0.185X_8 - 0.555X_9$$

$$\text{Or, POVERTY} = -18.090 - 0.001 \text{ GNI} - 0.001 \text{ ENG} - 2.933 \text{ TFR} - 0.303 \text{ URB} + 0.010 \text{ DEN} + 2.060 \text{ DEP} + 0.422 \text{ EAF} - 0.185 \text{ SSF} - 0.555 \text{ CPI} \quad (4)$$

The coefficients show that a one unit increase in total fertility rate, corruption index, percentage of urban population, gross national income per capita, energy use per capita, and percentage of females in secondary education decrease the poverty level, i.e., the percentage of people living below \$2 a day, by 2.933, 0.555, 0.303, 0.001, 0.001 and 0.185 respectively, while a one percent increase in the dependent population, a one percent increase in the economically active females, and a one unit increase in density increase the poverty level by 2.060, 0.422, and 0.010 respectively.

In order to evaluate the relative importance of the explanatory variables in determining the level of poverty the standardized coefficients are also examined (table 1). The table shows that the percentage of dependent population has the largest positive impact on the poverty level - the higher the percentage of dependent population, as measured in standard deviation units, the higher the poverty level (0.443), followed by the percentage of economically active female, (0.240), and population density (0.130). The largest contribution for lowering the poverty level is the gross national income per capita (-0.226), followed by the percentage of urban population (-0.198), percentage of females in secondary school (-0.188), and total fertility rate (-0.145) in that order.

It is to be noted that five of the nine explanatory variables have demonstrated the hypothesized directions of the relationships with poverty. It is difficult to interpret the negative relationships of the variables - corruption index and total fertility rate, and the positive relationships of the

variables - density and the percentage of economically active female with poverty. The directions of such relationships are counter to our expectations, and whether these directions will persist after inclusion of other variables and more data from other countries into the analysis remains to be seen.

4. SUMMARY AND CONCLUSIONS

Although the per capita income of the developing countries has increased annually by an average of 3 percent since 1990, the number of people living in extreme poverty has also increased considerably in some regions. Given that the aim of all governments is to reduce poverty to its minimum possible level, it is important to analyze the correlates of poverty to identify their relative weights necessary for ascertaining priorities while formulating social and economic policies.

This paper analyzed the cross-national variations in poverty level measured as the percentage of population living below US \$2 per day with national level data for 68 countries for which data on all the relevant variables are available. The analysis shows that the gross national income per capita contributes most in lowering poverty level, followed by the percentage of urban population, percentage of females enrolled in secondary school, and total fertility rate, in that order.

The study has a number of policy implications. The gross national income appears to be the most important contributor to the reduction of poverty. It is rational to think that the poverty level will decrease with the increase in the income growth since such an increase generally generates employments as well as raises wages [18]. This is supportive of the contention that the economic growth is strongly negatively related to poverty [15, 18]. The second most important variable that contributes negatively to the poverty level is urbanization - the higher the percentage of the urban population the lower the poverty. The next important factor that contributes in the reduction of poverty is the female education at the secondary level.

The study has a number of limitations as well. Due to a lack of availability of data a number of important variables could not be included. For example, family structure is known to influence poverty [18, 21]. Also, the level of unemployment may be construed to be associated with poverty. Unfortunately, none of these variables could be included in the analysis. Moreover, data from only 68 countries have been used in this paper. It is difficult to interpret as to how the total fertility rate and corruption index negatively impact poverty, and percentage of economically active female, and population density impact poverty positively.

Efforts made by many governments to reduce poverty level, particularly in the developing countries, are usually guided by the equation: more resources = less poverty. Although this basic formula is consistent with conventional wisdom, there is a growing literature [4, 10, 11] to suggest that empirically it does not work, unless the distribution of resources is even. The poor may not be able to escape the vicious circle of poverty without targeted

assistance. The rich are reaping more benefits while the others are paying a greater cost.

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APPENDIX

Country	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉
Algeria	15	6770	773	2.4	49	36	36	7	74	2.8
Egypt	44	4440	985	3.1	43	195	40	20	85	3.4
Morocco	14	4360	3433	2.5	55	184	35	27	36	3.2
Tunisia	7	7900	483	2	65	160	34	24	81	4.9
Benin	74	1110	340	5.6	40	200	47	69	16	2.9
Cote d'I	49	1490	397	5.1	47	158	44	44	16	1.9
Ghana	79	2370	411	4.4	44	245	43	73	34	3.5
Senegal	63	1770	319	5.3	45	157	47	61	15	3.2
Kenya	58	1170	489	4.9	36	155	45	74	30	2.1
Mozambiq	78	1170	436	5.4	32	64	46	83	10	2.8
Tanzania	90	730	408	5.7	32	104	48	87	5	2.9
Zambia	94	950	639	5.7	35	41	48	66	21	2.6
Zimbabwe	83	1940	751	3.6	34	87	44	65	38	2.6
Cameroon	51	2150	417	4.9	53	94	46	29	48	2.2
Namibia	56	7910	599	3.9	33	6	46	54	65	4.3
South Af	34	12120	2502	2.8	53	100	37	48	90	4.5
Costa Ri	8	9680	904	1.9	59	217	34	42	68	4.2
El Salva	41	5120	670	3	59	862	41	46	56	4.2

Country	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
Guatemala	32	4410	616	4.4	39	310	47	23	38	2.5
Mexico	20	10030	1560	2.4	75	143	37	38	78	3.5
Nicaragu	80	3650	544	3.3	59	112	43	36	61	2.6
Panama	17	7310	1028	2.7	62	113	36	46	72	3.5
Dom.Repu	11	7150	948	2.8	64	479	38	38	75	3
Jamaica	13	4110	1493	2.3	52	628	38	53	85	3.6
Argentin	23	13920	1543	2.4	89	36	37	46	103	2.8
Bolivia	42	2740	499	3.8	63	21	43	60	83	2.5
Brazil	21	8230	1093	2.3	81	57	34	54	113	3.7
Chile	10	11470	1585	2	87	56	33	36	90	7.3
Colombia	18	7420	625	2.4	75	106	36	58	69	4
Ecuador	37	4070	706	3.2	61	121	39	54	59	2.5
Paraguay	33	4970	709	2.9	57	40	36	35	64	2.1
Peru	32	5830	450	2.4	73	57	37	56	86	3.5
Uruguay	6	9810	747	2.2	93	48	37	49	108	5.9
Venezual	28	6440	2141	2.7	88	77	36	55	74	2.3
Armenia	31	5060	7943	1.7	64	262	33	60	92	2.9
Azerbaij	1	4890	1435	2	52	254	31	43	79	2.2
Jordan	7	5280	1036	3.7	82	164	41	22	87	5.7
Yemen	45	920	221	6.2	26	106	50	29	27	2.7
Banglade	83	2090	155	3	23	2637	38	56	49	1.7
India	80	3460	513	2.9	29	884	40	41	42	2.9
Iran	7	8050	2044	2	67	112	34	11	75	2.9
Kazaksta	16	7730	3123	2.2	57	15	35	65	88	2.6
Nepal	69	1530	353	3.7	14	457	45	57	37	2.5
Pakistan	74	2350	454	4.6	34	539	45	16	19	2.1
Sri Lank	42	4520	430	2	20	784	33	36	89	3.2
Tajikist	43	1260	518	3.8	26	127	35	55	74	2.1
Indonesi	52	3720	737	2.4	42	307	34	52	58	2.2
Malaysia	9	10320	2129	2.6	62	211	37	44	73	5.1
phlillip	48	5300	525	3.4	48	745	39	53	86	2.5
Thailand	25	8440	1353	1.7	33	329	30	65	81	3.8
China	47	6600	960	1.6	37	355	28	74	62	3.2
South Ko	1	21850	4272	1.1	82	1265	29	49	90	5
Estonia	8	15420	3324	1.5	69	77	32	52	97	6.4
Latvia	5	13480	1825	1.3	68	92	32	50	95	4.2
Lithuani	8	14220	2476	1.3	67	135	32	53	100	4.8
Belarus	1	7890	2496	1.2	72	121	30	53	88	2.6
Bulgaria	6	8630	2417	1.3	70	180	31	44	93	4
Hungary	1	16940	2505	1.3	65	280	32	47	104	5
Moldova	64	2150	703	1.3	45	306	30	54	73	2.9
Poland	1	13490	2333	1.3	62	306	30	48	100	3.4
Romania	13	8940	1696	1.3	55	234	30	48	85	3
Russia	12	10640	4288	1.3	73	22	29	53	92	2.4
Slovakia	3	15760	3448	1.3	56	285	29	53	90	4.3
Ukraine	5	6720	2684	1.2	68	201	30	58	97	2.6
Albania	12	5420	617	1.9	45	284	35	49	80	2.4
Croati Ia	1	12750	1852	1.4	56	204	32	45	89	3.4
Portugal	1	19730	2546	1.4	53	299	33	55	117	6.5
Slovenia	1	22160	3486	1.2	49	256	29	50	108	6.1

The Ethics of the Ethics of Belief

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Abstract

For all of the progress in informatics, there remains a related, fundamental, and age-old topic: the ethics of belief. Belief often has moral consequences, especially if one acts on that belief. Whether we can choose what to believe is a matter of long standing controversy. Together these observations offer a chance to explore the ethics of belief and its implications for informatics. This paper suggests a way to engage in this exploration, starting with a pair of seminal essays: W. K. Clifford's "The ethics of belief" and William James's "The will to believe." Three areas of philosophy inform a complete exploration of this sort: logic, epistemology, and ethics. This paper develops the ethics component, which relies primarily on virtue theory.

Keywords: Belief, Ethics, Moral, Evidence, Decision-making,

Introduction

A commercial airliner's crew, bound for Reagan National Airport fails to respond to ground control 15 minutes outside of DC. The airliner could be heading for the U. S. Capitol or the airport. Ground control notifies the U. S. Capitol Police command center, which notifies the appropriate liaison, Major Cortez. Major Cortez sends two F-15s to investigate. One F-15 pilot reports that the airliner's windows are fogged over, so he cannot tell whether anyone is in the cockpit. Major Cortez requests and receives confirmation that no name on the passenger list is suspicious. On Major Cortez's orders the F-15s fire warning flares in front of the airliner, but to no avail. Major Cortez must decide whether the F-15s should shoot down the airliner. It has 150 passengers and several crew members any or all of whom may be dead. Because it is Sunday, the Capitol is fairly empty and thus easy to evacuate. There are, however, many people on the Capitol campus.

Major Cortez faces two immediate moral problems: what to do and how to decide what to do. It would be irresponsible, for example, to decide by flipping a coin. He should be able to defend his decision by demonstrating that his premises support his decision well. But if he constructs his argument only after the fact, then he has acted as capriciously as if he flipped the coin. In other words, he has a moral responsibility to construct a good argument for his decision before making it. Since this is no time to study the means for making such a decision, Major Cortez should already be able to make it.

This ability requires understanding the interplay among ethics, logic, and epistemology, which allows identifying and applying rules and techniques for morally proper gathering, analysis, and evaluation of intelligence data. To foster this ability, cases such as the above, along with, for example, the more general problem of global terrorism and the concomitant allegations of intelligence failures, raise moral

questions about handling intelligence data. How much evidence should someone consider before drawing a conclusion? How should someone draw a conclusion from sufficient evidence? How much of this conclusion is volitional and how much is forced by the data? Should an analyst who makes a decision based on sound logical principles be held morally accountable for undesirable consequences of that decision?

Ethically, what should concern the analyst most? Satisfying consequences? Obeying rules? Fulfilling a duty? Some combination of these three?

Logically, the gathering, analysis, and evaluation of evidence are inductive processes that could commit any of three fallacies if done poorly. First is the Fallacy of Forgetful Induction--drawing an illogical conclusion because of failure to consider relevant details. Second is the Fallacy of Hasty Induction--jumping to a conclusion based on insufficient evidence. Third is the Fallacy of Slothful Induction--refusing to accept the conclusion that overwhelming evidence suggests.

To avoid such fallacies is properly to apply logical rules of induction--rules that govern inductive generalization and analogy, numerical probability, hypotheses about causes, and explanatory hypotheses. To apply these rules properly is to understand the nature of evidence and its relationship to good belief. This understanding reflects a link between logic and epistemology.

Epistemologically, fundamental questions include the following. Can we have knowledge? If not, why not? If so, does it come from sense experience, reason, or both? What is the difference between belief and knowledge? Is knowledge justified true belief or is knowledge, in its demand for certainty, beyond the scope of belief, which settles for probability? If the former, when is a belief justified? What is evidence? Is it hard empirical data? Mental interpretation of those data? Should an analyst ever rely on intuition or apparent revelation?

This paper summarizes the ethical elements of a Master's-level course, The Ethics of Belief, which I have taught for the U. S. Secret Service Executive Development Program and Johns Hopkins University's Intelligence Analysis program. This course has no philosophy pre-requisite, yet it must get to the philosophical point quickly by identifying basic theories and demonstrating their usefulness in dealing with moral problems in intelligence gathering, analysis, and evaluation.

The course begins by setting up the problem of the ethics of belief. What does the phrase mean and what are reasonable parameters within which to discuss the problem? Then comes a discussion of ethics, including the basic theories along with their strengths and weakness. Next is an examination of logic, with an emphasis on induction and evidence. Finally the class evaluates and seeks to apply epistemological theories. This paper examines the ethical elements of the course.

The Ethics of Belief

A pair of essays grounds and frames the course: "The Ethics of Belief" by W. K. Clifford [1] and "The Will to Believe" by William James [2]. Clifford's position is "it is wrong always, everywhere, and for anyone, to believe anything upon insufficient evidence" (p. 518). James offers a contrary position: "we have a right to believe at our own risk any hypothesis that is live enough to tempt our will" (p.525).

While Clifford and James disagree on this point, they stand on the same side of a larger disagreement: volitionalism vs. non-volitionalism. Volitionalism holds that belief is a matter of free will. The non-volitionist holds that belief happens to us rather than being something we choose, and therefore Clifford and James are both wrong.

Non-volitionalism has two forms: strong and weak. The strong form holds that it is impossible to choose what to believe; the weak form holds that it is possible, but ill-advised to choose what to believe rather than letting the evidence choose for you.

John Locke [3] defends the weak version, "anti-enthusiasm." Locke posits three possible grounds for believing a proposition: reason, revelation, and enthusiasm (the mere will to believe). To search for truth, he says, is to love it. To love truth is not to "accept any propositions with greater assurance than the proofs it is built upon warrant" (p. 510). To accept something enthusiastically is to accept it with greater assurance than its proofs warrant. So, to love truth is to avoid enthusiasm as a ground for assent. To accept a claim of revelation without rational assessment of the claim is to accept a proposition with greater assurance than the proof warrants. Therefore, reason should be the primary ground for assent.

Locke's position resembles Clifford's position. But for Locke, while we may choose whether to give ourselves over to reason, once we do, we no longer have a choice of belief but must obey the dictates of reason. For Clifford, every belief is a matter of choice in the face of evidence specific to that choice. At the same time, says Clifford, one ought to bring reason to bear. Locke's weak volitionalism poses little challenge to Clifford and James since Locke is conceding the possibility of choice and thus granting a volitionalist assumption.

Louis Pojman [4] defends strong non-volitionalism, which is a greater challenge to Clifford and James. For Pojman, volitionalism has four forms, depending on whether it is direct or indirect, descriptive or prescriptive. **Direct** volitionalism holds that "some or all of our beliefs are basic acts of will." **Indirect** volitionalism holds that "some beliefs arise indirectly from basic acts, acts of will, and intentions." Clifford and James allow for both direct and indirect volitionalism. **Descriptive** volitionalism "merely describes the process of coming to believe through" willing. **Prescriptive** volitionalism "offers direction for engaging in this process well and avoiding engaging in it poorly." While Clifford and James engage in descriptive volitionalism at times, they also propose prescriptive volitionalism.

Pojman rejects **direct, descriptive** volitionalism on two counts: phenomenologically and logically. "Phenomenological" refers to the world as one experiences it. As this relates to belief, "acquiring a belief is a happening in which the world forces itself on the subject" (p. 539). This is not something the subject does or chooses. Therefore, acquiring a belief is not something a subject does or chooses.

Logically, Pojman argues, beliefs are about the way the world is, not merely on what we will the world to be. The distinction between action, which is volitional, and acquiring a

belief rests on probability-- we tend to embrace a belief to the degree it is probably true. Therefore, volitionalism is logically possible but odd. And therefore, volitionalism is logically incoherent or conceptually confused.

Indirect, descriptive volitionalism suffers from the same illogic, says Pojman, so he rejects that form as well.

If descriptive volitionalism fails, then **direct, prescriptive** and **indirect, prescriptive** volitionalism fail since we cannot justify beliefs by willing, if we cannot acquire beliefs that way at all. Therefore, says Pojman, volitionalism fails in all its forms.

Since this paper builds on the volitionalism of Clifford and James, we might oppose Pojman on his own phenomenological and logical terms. Concerning the phenomenological, perhaps one can choose how and when to let the world "force itself" upon the beholder. It seems, for example, that Maj. Cortez is free to choose which elements of the airliner crisis he will consider. As for the logical, Pojman's premise that we have a duty to consider the evidence begs the question why such a duty exists and whether such a duty negates volitionalism. But to push these points further would require an essay devoted fully to Pojman's argument.

We may dispense with non-volitionalism on three counts. First, morality implies rights and responsibilities: morally good behavior means exercising a right or fulfilling an obligation and morally bad behavior means failing to fulfill an obligation or doing something that one had no right to do. Maj. Cortez has a moral responsibility to respond to the airliner crisis appropriately. Second, to ascribe moral praise or blame is to assume that one had control of one's decision and could have done otherwise, that is, one acted from free will. If the airliner blows up in mid-air, we should not hold Maj. Cortez responsible for that. Third, it can be reasonable to say that a person had no right to believe what he claims to believe, or that a person believed precisely what he should have believed. For example it would be morally irresponsible for Major Cortez to respond with a dismissive "Don't worry about it, I have no reason to believe the jet poses a threat to the Capitol." And it would be unfair to hold Cortez morally responsible for this decision if he had not acted from free will. Further discussion of this point requires a protracted debate about free will and determinism, which is unnecessary here. We proceed with the stipulation that how and what one believes may have moral import and that this implies the ability to choose how and what one believes.

Consider Clifford's and James's complete arguments.

Clifford's version of volitionalism is evidentialism: the view that one should choose a belief solely on sound evidence. This evidence must accord with the "uniformity of nature"--it must be scientifically sound. His argument goes like this:

- (i) Even if indirectly, our actions are due to prior beliefs
- (ii) Right actions imply right beliefs; wrong actions imply wrong beliefs.
- (iii) When we believe for bad reasons, we hurt ourselves and society.
- (iv) Therefore, "it is wrong always, everywhere, and for anyone, to believe anything upon insufficient evidence" ([1] p. 518).

For Clifford, Maj. Cortez must not decide whether to shoot down the airliner until he has sufficient evidence for his decision. That there may not be enough time to gather such evidence hints at a problem with Clifford's theory.

James was a pragmatist. According to pragmatism, a sentence is true if there is positive practical value to believing

it; a sentence is false, if it is harmful to believe it; and if there is no practical value, positive or negative, to believing it, then it is neither true nor false. In this spirit, James offers the following argument.

- (i) Knowing truth is more important than avoiding error.
- (ii) Knowing truth requires choosing between competing hypotheses.
- (iii) We must risk being dupes.
- (iv) Therefore, “we have a right to believe at our own risk any hypothesis that is live enough to tempt our will” ([2] p. 525).

Obviously, Maj. Cortez’s decision will have practical consequences, so in James’ terms, he may, if not must, make a decision even if there is insufficient evidence in Clifford’s sense.

Having laid the foundation for a discussion about the ethics of belief, we turn next to what we mean by *ethics*.

THE ETHICS OF THE ETHICS OF BELIEF

Maj. Cortez has to decide whether to shoot down the airliner. Every moral decision consists of two parts: the decision and the reasons for it. In logical terms, these are the conclusion and the premises, which together form an argument. An argument is good when the premises support the conclusion, that is, when the premises are true, relevant to the conclusion, and less doubtful than the conclusion. The three most common sorts of premise that appear in a moral decision reflect three particular theories: consequentialism, regularianism, or deontology.

Consequentialism holds that an act is morally good if its consequences are good, that is, “the end justifies the means.” An advantage of this theory is that one has only to evaluate the objective evidence to pass moral judgment; one does not, for example, have to know the agent’s intentions. But the consequences may not tell the whole story: if all I know is that someone’s act resulted in someone else’s death, how can I decide whether that act was morally good or bad? Was the act intentional murder? Self defense? An accident?

Another challenge to consequentialism is the question, Good for whom? Two consequentialist theories, egoism and utilitarianism, offer conflicting answers.

Egoism argues that an act is morally good if it is good “for me.” Some may dismiss this as too selfish to be morally useful, but many thoughtful egoists distinguish between *self-ish*, which takes no account of others’ interests, and *self-interested*, which recognizes the benefit to oneself of taking others’ interests into account. For example, an enlightened egoist will recognize the value of being a good citizen and having friends, versus facing the state’s enmity and people’s antagonism. Moreover, one sort of egoism, which Thomas Hobbes [5] defended, argues that egoism isn’t a choice: if you are a human being, you are an egoist whose primary motivation is survival, followed by a desire for comfort and ease. A straightforward rebuttal to Hobbes is any example of self sacrifice, such as the proverbial soldier who throws himself on a live hand grenade, thus saving his comrades. If it is logically possible to sacrifice one’s interests for the good of another, or to obey a rule or fulfill a duty, then Hobbes is wrong in claiming that humans are necessarily egoists. American philosopher and egoist Ayn Rand [6] agrees that one need not be an egoist, but she argues that if everyone minded his own business, the world would be a better place. This is rational or ethical egoism, the view that while one need not be an egoist, one should be. An obvious rebuttal is any example of self sacrifice that is morally good, such as the

forfeiting of one’s life to save the lives of others. Note that in offering these rebuttals we are not saying that self interest is always wrong; we are saying that morality includes more than self interest. Indeed, Maj. Cortez’s moral responsibility extends to the airline passengers and to people connected to the Capitol.

Utilitarians agree that morality involves more than self interest. For them it is a matter of achieving the greatest good for the greatest number of stakeholders. This, arguably, is the official ethics of the United States: it underlies democracy, capitalism, and the better part of arguments for or against particular public policies. But it has its shortcomings. First, what about the “tyranny of the majority”? Is it always fair for a majority of stakeholders to benefit at the expense of the minority? A stark example of this is Fyodor Dostoevsky’s [7] question whether it would be morally appropriate to torture and kill a baby if doing so would make everyone else in the world happy. At first blush this appears to be a terrific bargain from a utilitarian point of view: one person suffers so that everyone else benefits. But there remains something morally objectionable about treating a baby this way, regardless of who benefits. More significant in our own time is the question whether torture is morally acceptable if it has utilitarian results. For opponents of torture, there are times when a desirable end does not justify the means.

Another challenge to utilitarianism is what it regards as the good. John Stuart Mill [8], a famous proponent of utilitarianism, says that good means pleasure and the absence of pain. Indeed, most utilitarians hold this view. Thus, a challenge to utilitarianism is a challenge to its hedonism. We may, for example, praise someone for doing her duty, whether or not anyone received pleasure from it. Mill is not referring only to physical pleasure: humans are also capable of emotional pleasure, spiritual pleasure, and intellectual pleasure, thus “It is better to be a human being dissatisfied than a pig satisfied; better to be Socrates dissatisfied than a fool satisfied. And if the fool, or the pig, is of a different opinion, it is because they only know their side of the question. The other party to the comparison knows both sides” (p. 14). In other words, Mill is not saying simply “If it feels good, do it!” One must weigh the pleasures and pains more carefully than that before determining the moral worth of the act. Nevertheless, there appear to be times when consequences are irrelevant to a good moral decision.

The shortcomings of consequentialism invite a brief discussion of three moral controversies that matter to the study of ethics: relativism v. absolutism, subjectivism v. objectivism, and determinism v. free will. Consequentialists tend to be relativists in holding that an act is morally good relative to a particular culture or time. The absolutist, on the contrary, insists that at least some moral values are absolute—that some things are always morally good or always morally bad. [9] While the absolutist may offer the example of rape or child abuse as a clear case of absolute moral evil, the relativist might counter that the terms “rape” and “abuse” are relative, since what constitutes rape in one culture or time may constitute an acceptable act in another culture or time. Perhaps the best quick response the absolutist has is to note the paradoxical view of the relativist in holding that *there are no absolutes*. If this is true, then it is false, since it is an absolute, and if it is false it is false. Many learned relativists have responded to such criticisms, but it is enough for our purposes to acknowledge the debate.

Consequentialists tend to be subjectivist in holding that the moral value of something is in the mind of the person passing judgment, not in the object of that judgment, similar to

the adage “Beauty is in the eye of the beholder.” To be sure, we cannot taste, see, touch, smell, or hear moral value, so it appears to be a mental concept or mental construct. The objectivist, holding that moral value belongs to the object being judged, might argue that if the subjectivist is correct, then morality is a matter of personal taste and, therefore, moral debate is as meaningless as arguing about whether carrots taste good. While the course notes this debate, it proceeds as if moral debate can be meaningful and thus it assumes the objectivity of moral value.

Some consequentialists are determinists: they hold that every human act has an antecedent other than free will. Proponents of free will, on the other hand, hold that sometimes humans act in ways in which they were free to act otherwise. [10] For this course’s purposes, we note that if determinism is correct, then there is no point in ascribing moral praise or blame to anyone.

It is clear that consequentialism will not suffice for all moral decisions. Sometimes consequences are the most significant factor in the moral worth of an act; sometimes they are not. Cortez’s decision will have consequences for many people, but it is impossible to determine all of those consequences in advance of his decision. What’s more, consequentialism alone will not help us determine when to look elsewhere for a moral premise. Both regularianism and deontology offer alternatives.

Regularianism holds that an act is morally good if it obeys a rule and morally bad if it violates a rule. Rules come in many forms, such as divine commands, criminal and civil laws, social norms, and professional codes of ethics. That rule-based ethics is not always helpful in moral decision making is clear from these considerations. Sometimes the rule commands a morally bad act, as did many laws in Nazi Germany. Sometimes a set of rules contain contradictory commands: Maj. Cortez may face such a dilemma: “Save the innocent passengers!” and “Save the Capitol!” Sometimes a generally good rule doesn’t fit a particular circumstance, such as the rule that no one should shoot down an airliner full of innocent people. And sometimes there is no rule that applies to the situation that requires a moral decision. What rule, for example, applies in Maj. Cortez’s case?

In many cases one should obey the rules, but regularianism does not offer all one needs for making a good moral decision.

Deontology is the view that an act is morally good if it is done from duty and morally bad otherwise. This appears to be the most promising of the three theories, since by definition duty is what morally one ought to do. While consequences and rules may be morally bad, duty is never bad. Immanuel Kant [11], the most famous proponent of deontology, offers a careful, sophisticated argument for deontology as the best approach to ethics. In it he makes the case that a genuine duty is absolute, that is, if it is good for one person to obey it, then it is good for everyone to obey it. He also offers the famous Categorical Imperative as the basic deontological formula and test of the morality of an act: “*Act only on that maxim whereby thou canst at the same time will that it should become a universal law*” ([11], Sec. 2, par. 31). This is a souped-up version of the Golden Rule: do unto others as you would have them do unto you. The difference is that Kant says that I should only want you to do unto me what everyone should want done unto him. Thus, for example, it would be wrong for a masochist to hit someone, even though the masochist desires to be hit back, because masochism could not be a universal duty. A fair and thorough treatment of deontology is beyond this paper’s

scope. Suffice it to note that deontology does not help us with conflicts of duty. While Kant denies that such conflicts are possible, our opening case suggests otherwise as Major Cortez has a duty to protect the Capitol and a duty to protect people on the passenger jet, but it may not be possible to fulfill both duties at the same time. W. D. Ross [12] offered a compromise by positing a set of prima facie duties with some taking precedence over others. But it would appear that one selects a duty by appealing to rules or consequences rather than to another duty. Thus deontology cannot stand alone as a theory for moral decision making.

Each of the three basic moral theories is of limited use in moral decision-making, so a theory that synthesizes and takes the best from the three while avoiding their shortcomings would be useful. One such theory is **virtue theory**, which Aristotle [13] defended forcefully and which this paper adopts as its primary approach to ethics.

For Aristotle, ethics is primarily about the agent’s character, not the act’s consequences, or a rule or duty that governs the act. Good moral character is virtue and bad moral character is vice. Virtue, says Aristotle, is the ability habitually to know the good and to do the good. The good, for him, is a species of the perfect: the better something is the closer to perfect it is. Something is perfect when there is neither too little of it nor too much of it. Thus, the good is the mean between the extremes of deficiency and excess. Virtue, then, is a matter of habitually finding and hitting the mean between extremes.

Aristotle compares a moral agent to an archer: an excellent archer knows how to aim at the bull’s-eye and hit it repeatedly. A poor archer doesn’t know how to aim or knows how to aim but misses the bull’s-eye routinely. In between come archers of various abilities. Note that while one ought always to hit the bull’s-eye, morally speaking, one may have to settle for a near miss. Just so, the archer on the hunt may miss the specific targeted point, but still bring down the prey. Also, if a would-be archer hits the bull’s eye once in a rare while, that does not make him a good archer. Similarly, one who does something morally good once in a while is not thereby morally good.

To make this theory more practical, Aristotle notes the four cardinal or basic virtues, on which all other virtues hinge. **Courage** is the means between cowardice and foolhardiness. **Justice** is the mean between giving someone less than he deserves and giving someone more than he deserves. **Temperance** is the mean between using too little of an available resource and using too much of an available resource. And **prudence** or practical wisdom is the means between acting on insufficient knowledge and failing to act in spite of sufficient knowledge to justify an act. These are always virtues, while any other candidate for a virtue, such as honesty or patience, may or may not be virtuous depending on whether they are at once courageous, just, temperate, and prudent. Honesty, for example, is not a virtue if it is a cowardly strategy, such as telling a Gestapo agent where to find a Jewish child in order to avoid being arrested. Patience, for example, is not always a virtue in the emergency room.

Virtue theory offers a way to choose among the three basic theories when looking to apply one to a moral decision. Sometimes consequences matter, sometimes not. The same holds with rules and duties. Aristotle suggests that one avoid excessive or deficient concern for consequences, rules, or duties by deciding when such concern is deficient or excessive relative to other alternatives and by testing the alternative one chooses according to how courageous, just, temperate, and prudent that choice is over the others. Thus, in our opening

example a utilitarian might argue for saving the plane because of the number of passengers on board, versus the smaller number of people in the Capitol. Another might argue for saving the building according to the rule that one ought to protect sacred symbols, regardless of who dies. And another might argue for saving the plane on the principle that killing them would violate a duty. Duty is not too useful here, since there is a conflict of duties (to protect the passengers and to protect the capitol). In terms of prudence, one could argue that there is insufficient knowledge to justify shooting down the plane. Therefore, one could argue that shooting down the plane would be an intemperate use of fire power. One could also argue that killing the passengers deliberately would be unjust, since they have done nothing to deserve that.

Aristotle's view offers a sophisticated response to the debate between the absolutists and the relativists. The principle that one ought always to choose the mean between extremes is an absolute principle, and the cardinal virtues are always morally good. But the mean is relative to the particular circumstance, as in the use of deadly force. Deadly force is justified when it is neither an excessive nor deficient response to the situation. While shooting down the plane might be proper in our example, the same force would be unjustified in others situations. Thus, in a sense, both relativists and absolutists are right.

Aristotle's theory gives us a way to define integrity. This is a ubiquitous word these days, but when we seek a definition of it, we usually get only examples. Thus, a person of integrity will generally be honest, will do only that which he would feel good about having reported in the newspaper, will be able to look at himself in the mirror, and so forth. But this could just as easily describe a sociopath—that is, someone with no moral conscience. A traditional definition of integrity endures: one has integrity to the extent one has integrated the four cardinal virtues in one's life. Thus, to have integrity is habitually to act courageously, justly, temperately, and prudently: qualities we hope for in Maj. Cortez.

Our topic is ethics of belief. Clifford and James argue the extent to which one ought to suspend judgment until one has sufficient evidence to make a sound judgment. Clifford says that we must suspend judgment until we have adequate evidence. James says that we have a right to draw conclusions before we have the sort of evidence that Clifford requires. Virtue theory says that we should choose the option that is the least deficient and the least excessive; that is, we should be able to defend our choice as the most courageous, just, temperate, and prudent among the options. If our opening case description offers adequate information, then it would be better not to shoot down the plane, as this choice appears to be the more temperate, prudent, just, and—arguably—courageous. Clifford might balk, since we are in effect “rolling the dice,” but as James could argue, there is no time to gather further evidence and lives are at stake.

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Secure communication between authorities, companies and citizens within eGovernment

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ABSTRACT

eGovernment begins with electronic collaboration between governmental departments. Several services, like email, video conferencing, discussion forums, use of shared documents, etc. should be supported in assisting the efficient and productive collaboration of remote governmental departments. Since the functionality of the services provided is well known, no detailed description of each service phase is provided. Services for citizens are offered through so called governmental portals. The typical use of a governmental portal is to provide information to citizens and to support several types of citizen–government transactions. For communication between public administrations, business enterprises and citizens, a new electronic document delivery system was created in the Czech Republic. One of the main goals in creating the information system of data boxes was to guarantee a secure method for publishing official announcements or for processing applications for both government offices on one side and business enterprises and citizens on the other. Using a data box is not the same as using common email communication. Only an owner of a data box can access it. But with this method of communication, the problem of secure preservation of electronic documents arises.

Keywords: Information and Communication Technologies, eGovernment, Data Boxes, Time Stamp.

1. INTRODUCTION

Information and communication technologies (ICT) can help public administrations cope with the many challenges they encounter. However, the focus should not be on ICT itself. Instead it should be on the use of ICT *combined with* organisational change and new skills in order to improve public services, democratic processes and public policies. This is what eGovernment is about. [3] eGovernment is the use of information and communication technologies for better public services for citizens and businesses. eGovernment in the EU is supported through research, exchange of good practices and deployment of services. On the basis of existing challenges, deficiencies, and motivators, eGovernment is being discussed in many contexts, and from a variety of perspectives. Initiatives and activities have been launched by governments and institutions at all levels. They can be grouped into strategies and

concrete implementation projects, as well as research activities [2].

2. RELATED WORK

Building eGovernment and the development of Information Society services is not an isolated task; it is closely related to streamlining processes and to the introduction of modern management tools in public administration, as well as the improvement of both policy-making and the regulatory environment. The strategy should therefore be viewed in the wider context of all activities aimed at strengthening the efficiency of public administration and at delivering user-friendly services [7]. Other authors describing opportunities for eGovernment provide plenty of points of view, for example [2], [3], [6], [7], [11], [13] and [14]. eGovernment is based on using information systems, namely their dependability and security [5]. However, not only dependability, but security of information systems and modern management tools has an influence on the problem less practice of the eGovernment. Crucial problems the are preservation of the electronic documents and their secure delivery [1], [4], [7], [8], [9], [10], [11], and [12].

3. E-DOCUMENTS SECURE DELIVERY

eGovernment starts with the electronic collaboration of governmental departments. Several services, like email, video conferencing, discussion forums, use of shared documents, etc. should be supported in assisting the efficient and productive collaboration of remote governmental departments. Since the functionality of the services provided is well known, no detailed description of each service phase is provided. The services for citizens are offered through so called governmental portals. The typical use of a governmental portal is to provide information to citizens and to support several types of citizen–government transactions (e.g. issuing birth certificates, submitting tax forms, conducting electronic payments, etc.). For communication between public administrations, business enterprises and citizens, an e-mail system was usually used [2], [3], [6], [7] and [11].

3.1 Czech method of secure delivery of e-documents

For communication between public administrations, business

enterprises and citizens in the Czech Republic a new electronic documents delivery system was created. This was done by the Ministry of the Interior and the Czech Post. On November 1st, 2009 a new era of communication within public administration, as well as between public administration, business enterprises and citizens began. Based on Act No. 300/2008 Coll., from now on, it is obligatory for all public institutions (e.g. government offices, local governments, institutions established by local or state government, etc.) to use data boxes (or so-called eBoxes) instead of traditional paper forms. One of the main goals in creating the information system of data boxes was to guarantee a secure method for publishing official announcements or for processing applications for both government offices on the one side and business enterprises and citizens on the other. Due to this fact, using a data box is not the same as using common email communication. Only an owner of a data box can access it. But with this method of communication, the problem of secure preservation of electronic documents arises.

Authorities now have to communicate with business enterprises only via data boxes and business enterprises and citizens can use their data boxes to apply for permissions, approvals or licences. Let's imagine that business enterprises and/or citizens have stored a computer document (digitally signed) say 15 years ago. Now a lawsuit requires that an electronic document has to be presented. But the hardware, operating system, and software to extract the electronic document are all obsolete. How can the business enterprises and/or citizens provide the electronic document and verify the digital signature? In the contribution the suggested solutions will be done. The goals of introducing electronic delivery via data boxes are mainly: reducing bureaucracy for citizens and increasing usage of the electronic delivery instead of classical physical delivery where possible [7].

The **information system of data boxes** is run by the Czech Post. It facilitates communication from public authorities because it's faster and cheaper, and it provides for the secure delivery of the messages. One of the main tasks in construction of the information system of data boxes is to guarantee a **secure way** for official announcements or applications. That's why using a data box is not the same as using common email communication. Only an owner of a data box can access it.

Goals of introducing electronic delivery via data boxes are:

- reducing bureaucracy for citizens
- increasing usage of the electronic delivery instead of classical physical delivery where possible

Document delivery - how does it work?

- delivery of documents via data boxes is guaranteed
- the owner of the data box will be notified when he/she receives a new message, he/she can choose the preferred form of notification (SMS, email)
- the message is considered as received and read 10 days after being sent

4. PRESERVATION OF E-DOCUMENTS

The problem of long-term document preservation has been at

the centre of attention of many scientists in past years [1], [4], [7], [8], [9], [10], [11] and [12]. Wide spread is digital signature and time-stamping technology. Time-stamping is an important data integrity protection mechanism, the main objective of which is to prove that electronic records existed at a certain time. The scope of applications of time-stamping is very large and the combined risks related to time stamps are potentially unbounded. Hence, the standard of security for time-stamping schemes must be very high. It is highly unlikely that currently popular trusted third-party solutions are sufficient for all needs, since the practice has shown that insider threats by far exceed the outside ones. This motivates the development of time-stamping schemes that are provably secure even against malicious insiders. According to [1], an adapted scheme appears in Fig. 1.

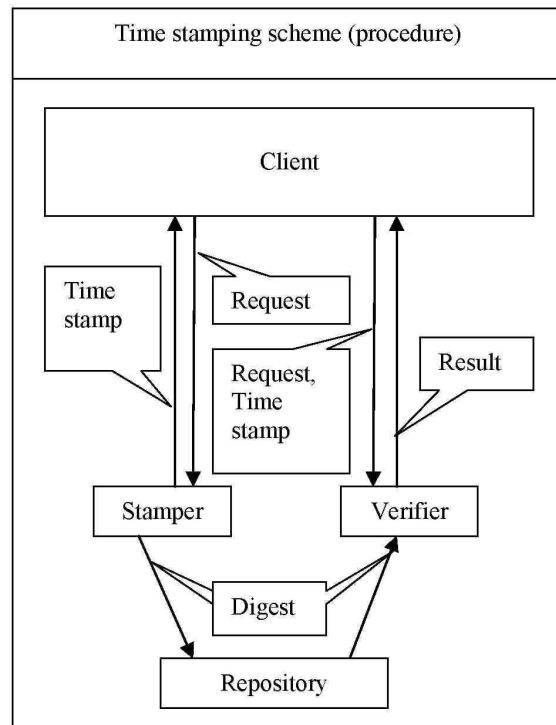


Fig. 1. Time-stamping scheme adapted from [1]

Where:

- Repository – a write only database that receives k-bit *digests*, and adds them to a list of documents *D*.
- Stamper – operates in discrete time intervals called *rounds*. During the *tth* round, Stamper receives requests *x* and returns pairs (*x*, *t*). At the end of the round, Stamper creates a *certificate*. In addition, Stamper computes a digest and sends it to Repository.
- Verifier – a computing environment for verifying time stamps. In practice, each user may have its own Verifier, but for security analysis, it is sufficient to have only one. It is assumed that Verifier has a tamperproof access to Repository. On input (*x*, *t*), Verifier obtains a certificate *c* from Stamper, and a digest *d* = *D* (*t*) from Repository, and returns *Verify* (*x*, *c*, *d*) ∈ {yes, no}. It is not specified how *c* is transmitted from Stamper to

Verifier. In practice, c can be stored together with x. Hence, the size of c should be reasonable. Note that x can be verified only after the digest d is sent to Repository. This is acceptable, because in the applications we address, x is verified long after stamping.

– Client – any application-environment that uses Stamper and Verifier.

A similar idea is described in [9]. The whole process against digital aging is recommended, for example, by [12].

Within this paper a simple and practical scheme, "digital aging", is present to solve the problem of long-term digital document archival and authentication. Initially the document is digitally signed using current technology (e.g. 1024 bit). After, let say 10 years, 1024 bit signing may no longer be secure because of technological advancements. A new layer with time stamp and signature generated by current state-of-art technology (e.g. 2048 bits) is added every year to ensure security.

The aging process also involves migration to more advanced media for storage, forms of information presentation and methods of information processing.

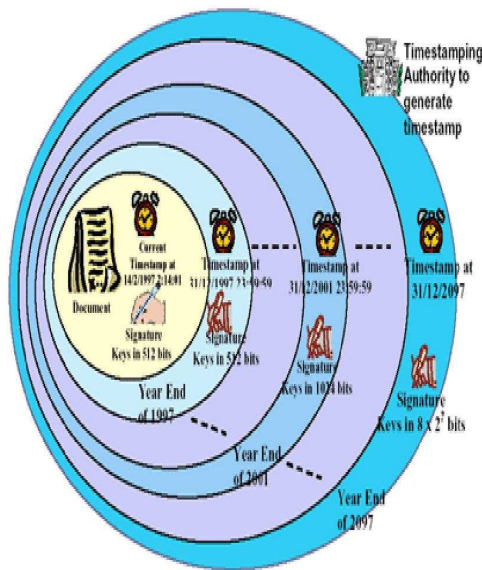


Fig. 2. Document preservation scheme by [12]

4.1 Re-time stamping grace period problem

If the inner time stamp certificate is revoked minutes before the „re-time stamping“, the time-stamping procedure may not be able to catch it. The grace period of the original signature is made possible with a first time stamp. A grace period on a time stamp would imply the need to time stamp as soon as possible, resulting in an infinite chain of time stamps. The following scheme may solve this problem. It is to use two time stamp procedures with time shifts according to Fig. 3.

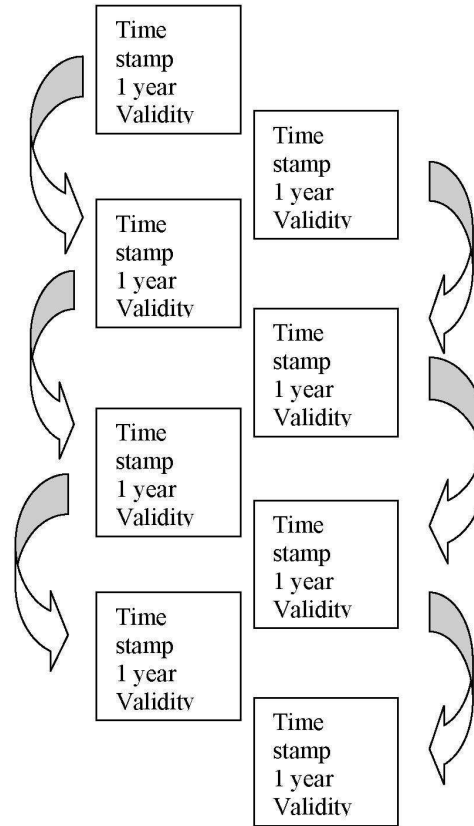


Fig. 3. Time stamp procedure with time shift

5. CONCLUSION

The secure communication between authorities, business enterprises and citizens within eGovernment was discussed within the paper. The Czech system for communication among authorities, business enterprises and/or citizens by data boxes was shown. The problem of safe long-term preservation of electronic documents is solved by the time stamps procedure, and in the article, it is suggested that the time stamp procedure with time shift is effective for minimizing the grace period problem. To tell the truth, long-term experience with secure electronic documents preservation using the time stamp procedure does not yet exist. This experience is very important, namely for using valid electronic documents within court trials, etc.

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An Empirical Study of Gender Difference in Central Government Website Usage: the Korean Case

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ABSTRACT

We empirically analyze the gender difference in the central government Web site usage, which deserves our attentions because the government Web sites are becoming an important channel for public service and information which is the foundation of public choice and is closely linked to the democratic participation of citizens. For the purpose of the paper, we employ the clickstream data of Internet users to trace out their accesses to and their usage volumes of the Korean central government Web sites in 2006. Our regression analyses indicate: (i) the apparent gender difference in the access to e-government service becomes insignificant when we control the characteristics of the family to which a male or a female user belongs as well as the socio-economic factors such as age, occupation, income, education and location; and (ii) the gender difference in the volume of e-government Web site usage is mainly explained by differences in interest or preference between female and male.

Keywords: gender difference, e-government, digital divide, socio-economic factors, family characteristics, clickstream data.

I. Introduction

In the paper, we focus on the gender difference in the central government Web site usage. It is widely acknowledged that the Internet access gap has disappeared between female and male users. However, the Web site usage may differ between genders especially in e-government services. Indeed, our clickstream data indicate that the male has a higher percentage of log-on to e-government Web sites (88.7% vs. 83.9%) and spends more time on these sites (63.5 minutes per year vs. 33.5 minutes per year). This possible gender difference in e-government Website usage deserves our attentions because the government Web sites are becoming an important channel for the public service and information, which is the foundation of public choice [4] and is closely linked to the democratic participation of citizens [5]. Hence a gender difference in the usage of e-government Web sites can lead to a gap in the level of participation or a gap in political influence [1], which may then ultimately give rise to a gender gap in the socio-economic status in the Internet age.

We cannot, however, rule out the possibility that the apparent gender difference in government Web site usage reflects differences in interest or preference between

female and male as well as other socio-economic factors such as age, occupation, income, education and location. In other words, this apparent gender difference may result from different needs for e-government services between female and male or simply reflect a divide caused by the other socio-economic factors. A gender difference by differences in interest or preference has been recognized in Internet usage in general.¹ In the paper, we extend the idea of so-called gender differentiation in Internet usage to gender differentiation in e-government usage since different types of the central government units provide different types of public service and information which may be needed by females and males differently. As will be detailed in section II, we will categorize the types of the central government units by the nature of their public services.

We eventually aim to empirically examine whether there exists the gender difference in the usage of the Korean central e-government Web sites even after we control the gender differentiation by the types of the central government units and other socio-economic factors such as age, occupation, income, education and location. In addition, we will control the influence of the characteristics of the family to which a male or a female user belongs. The importance of family characteristics in Internet usage has been recognized in the literature.² These family characteristics may also affect individuals' e-government Web site usage.

For the purpose of our study, we use the clickstream data collected by the KoreanClick, a private consulting company. The KoreanClick samples households and assigns different identifications to all the Internet users of each household. This sample of individual Internet users selected by the KoreanClick is called the KoreanClick panel, which represents the Internet user population, and the clickstream data collected by the KoreanClick are real-time records of surfing across Web sites by the members of the KoreanClick panel. The KoreanClick also keeps the family identifications of the members of the KoreanClick panel and collects socio-economic information of the each panel member, including age, occupation, education, income, and location. Based on each panel member's family identifications, we can also construct variables for family characteristics such as the number of Internet users in the family and the number of adult Internet users. The number of family Internet users is counted by the number

¹ see [6], [7], [9], [12],

² see [2], [6], [9]

of the KoreanClick panel members with the same family identification, and the number of adult Internet users is counted by the number of these family members with the age of 19 and above.

An individual's Web site usage can be measured in terms of both access and usage volume. In the clickstream data, the access to the related Web sites is determined by whether or not an Internet user has visited the Web sites during the time period in concern while the usage volume of the related Web sites is measured by either (the sum of) the user's duration of visit³ or the number of his/her daily visits⁴ to the sites during the time period.

In order to take account of the gender differentiation by the types of the central government services, we conduct different regressions for each type of government units to see if the significance of gender difference may vary across different types of e-government services. In each regression analysis of access to related Web sites, we use both the Logit model and the Probit model since the dependent variable is a binomial choice in which we code the choice to be "1" if an Internet user has visited the related government Web sites in the entire year of 2006 and to be "0" otherwise. In each regression analysis of the usage volume, we employ the Tobit model since an Internet user's duration of visit or the number of his/her daily visits is censored at 0. In all these regression analyses, the independent variables include a dummy variable for female, other socio-economic factors, and family characteristics.

II. Data

1. Classification of the Korean central government units

Females and males may have different interests and needs for government services. For example, females may be more interested in education and child care, ending up with more visits to the related government units. To take account of this possible gender differentiation in e-government services, we follow the classification of the Korean central government units provided by [8]⁵. Based on the functions of the central government units, [8] categorizes the 44 central government units into the three types characterized by industrial and economic affairs, social and cultural affairs, and public administrative affairs. Out of the 44 central government units, 22 units are leveled by industrial and economic affairs, 7 by social and cultural affairs, and 15 by public administrative affairs.

2. Data

Our data set includes only the individuals who were in the panel for consecutive 12 months of year 2006⁶, ending up

³ The duration of visit is defined to be the time passed between log-on and log-out.

⁴ If an Internet user has logged on to certain Web sites on ten different calendar dates during the time period in concern, it is said that the user's number of daily visits to these sites is ten.

⁵ For the institutional background of the Korean central government, refer to [11].

⁶ Since some of the KoreanClick panel drop out of the panel for personal reasons, others are added into the panel in an effort of the KoreanClick to keep up the size and the representativeness of the panel.

with the 6970 Internet users, 41% of which are female users. Table 1 shows the distributions of the socio-economic variables in our data set.

The clickstream data have been widely used in the study of consumer behavior and demands in the literature of e-commerce (See, for example, [10]). However, the e-government studies have typically relied on survey data which suffer from missing information and a low response rate, and thus the results of these studies should be viewed with caution. Since the clickstream data are obtained from the real-time behavior of the sample users who are carefully selected to represent the user population, the clickstream data have advantages in accuracy and no missing observations.

Table 1. Distributions of socio-economic variable

Socio-economic variables		Number of individuals in our Korean Click panel	Percentage of individuals in our KoreanClick panel
Gender	Female	2897	41.6
	Male	4073	58.4
Age (years)	7~12	311	4.5
	13~18	552	7.9
	19~24	938	13.5
	25~29	962	13.8
	30~34	1392	20.0
	35~39	1010	14.5
	40-49	1314	18.9
	50 and above	491	7.0
Occupation	Unemployed and others	348	5.0
	Full-time housewife	721	10.3
	Student	1892	27.1
	Blue-collar worker	444	6.4
	White-collar worker	3183	45.7
	Self-employed	382	5.5
Education	Student in elementary, middle and high school	946	13.6
	High school graduate	926	13.3
	Student in college and graduate school	1092	15.7
	College graduate	4006	57.5
Monthly Income (million KRW)	Below 1	292	4.2
	1~3	2617	37.5
	3~5	2854	40.9
	Above 5	1207	17.3
Location (Regions)	Southwest (Honam/Jeju)	620	8.9
	Middle (Chugchug/Kwangwon)	665	9.5
	Southeast (Youngnam)	1424	20.4
	Capital area (Seoul/Kyunggi)	4261	61.1

III. Regression Analyses

In this paper, we aim to empirically examine whether there exists a gender difference in the usage of the Korean central government Web sites even after we control the gender differentiation by the types of the central government services as well as other socio-economic factors and family characteristics. In order to take account of the gender differentiation by the types of the central government services, we conduct different regressions for each type of government units as well as all the units to see if the significance of gender difference may vary across different types of e-government services.

In all these regression analyses, the independent variables include a dummy variable for female (to capture the gender difference), dummy variables for other socio-economic factors such as age, occupation, education, income and location, and family characteristics such as the number of Internet users in the family and the number of adult Internet users in the family.

Table 2 in Appendix presents complete regression results for a gender difference in the access to e-government Web sites while table 3 in Appendix provides complete regression results for a gender difference in the usage volume.

Since the main results are the same in the Logit and the Probit models, we report only the estimation results of the Logit model in table 2. Table 2 shows that the dummy variable for female has an insignificant coefficient if the dependent variable is a binomial choice of whether to log on to any central government Web sites in 2006, implying that the apparent gender difference in the access to the central e-government services in general becomes insignificant when we control the family characteristics as well as the socio-economic factors such as age, occupation, income, education and location. Moreover, it turns out that more female users have logged on to the government Web sites characterized by social and cultural affairs while more male users have logged on to the sites characterized by public administrative affairs.

The gender differentiation in access by the types of the central government services is further supported by differentiations in access by other socio-economics variables such as age, occupation, income, education and location although some group of Internet users (such as high-school graduates compared with college graduates and users with monthly incomes of 1 million Korean Won to 3 million Korean Won compared with users with monthly incomes above 5 million Korean Won) have persistently less accesses to any type of e-government Web sites.

Our regression results also indicate the importance of family characteristics in female access to e-government sites. Table 2 shows that family characteristics are very significant in the access to e-government Web sites in any classification. The number of Internet users in the family has a negative effect persistently while the number of adult Internet users has a positive effect except in social and cultural affairs. In addition, without controlling these

family characteristics, the gender difference in access to all the central government units appears to be significant, which induces us to infer that the apparent gender difference in this case indeed reflects the correlation of family characteristics and a gender difference in log-on to the government Web sites.

By contrast, table 3 shows the existence of the apparent gender difference in duration of visit to the central e-government Web sites in general when we do not take account of gender differentiation by the types of the central government services. However, table 3 indicates that there is no statistically significant difference in duration of visit between female and male users to the government Web sites of social and cultural affairs while the male users have more duration of visit to the sites characterized by public administrative affairs. Moreover, if we measure the usage volume by the number of daily visits, it turns out that the female users have a significant and higher number of daily visits to the government Web sites of social and cultural affairs. Hence, we infer that these gender differences in duration of visit are better explained by the gender differentiation by the types of the central government services. The gender differentiation is, as shown in table 3, further supported by differentiations in duration of visit by other socio-economics variables such as age, occupation, income, education and location.

The importance of family characteristics is lessened in the usage volume in a sense that the significance of the gender difference in duration of visit is not affected by excluding the family characteristics from independent variables. However, as shown in table 3, the number of Internet users in the family still has a negative effect on duration of visit persistently across the types of the central government services.

The main results discussed above remain unchanged even when we use the number of daily visits as a measure of the usage volume of the Korean central government Web sites.

IV. Conclusion

In the paper, we empirically examined the gender difference in the access to and the usage volume of the Korean central e-government Web sites. After we controlled the gender differentiation by the types of the central government units as well as other socio-economic factors, such as age, occupation, income, education and location, and family characteristics, such as the number of Internet users in the family and the number of adult Internet users, we found no significant gender difference in the access to the central e-government Web sites in general and gender differentiation in the usage volume of different types of e-government sites. Furthermore, our results indicate differentiations of the e-government Web site usage by other socio-economic variables such as age, occupation, education, income and location.

Our gender differentiation result in e-government Web site usage is consistent with that of Internet usage in general as reported in the previous studies. Our regression results also indicate that more Internet users in the family reduce an

individual's likelihood of the access to and his/her usage volume of e-government Web sites. On the other hand, more adult Internet users in the family turned out to increase the probability of the access to e-government Web sites, which may suggest the existence of certain knowledge diffusion from adult users' Internet surfing experiences to help especially female users to log on to e-government Web sites.

Despite no significant gender difference in access to the central e-government Web sites in general, we found a persistent access gap to e-government services in education (high-school graduates compared with college graduates) and income (people with monthly income of 1 million Korean Won to 3 million Korean Won compared with people with monthly incomes above 5 million Korean Won). This access gap in education and income deserves more attentions and further research since the access gap to the e-government Web sites can lead to a gap in the level of participation or a gap in political influence, which may then reinforce a gap in the socio-economic status.

What will the consequences of gender differentiation be on a gender gap in civil participation and political influence? Gender differentiations in the e-government Web site usage may reinforce gender differences in interest or preference which may further contribute to a gender gap in civil participation and political influence. On the other hand, the experiences on one type of e-government Web sites may encourage users to explore other types of e-government services, which may then lessen gender differences in interest and preference. Furthermore, an individual's experiences and knowledge on e-government services may be diffused especially between female and male users in the family, which may eventually help reduce a gender gap in civil participation and political influence. Further studies on the complementarity of Web site usage of different types of government units and the knowledge diffusion or sharing between female and male are necessary to have more complete understandings of a gender gap in the Information Age.

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Appendix

Table 2. Regression results of access to e-government Web sites (Logit Model)

Dependent variable		All the units	Industrial and economic affairs	Social and cultural affairs	Public administrative affairs	
Dummy for female		-0.1008 ^s (0.085)	-0.0892 ^s (0.071)	0.1833* (0.060)	-0.4602* (0.060)	
Socio-economic variables	Age (Baseline: 50 and above)	7~12	-0.6542*** (0.346)	0.2644 (0.283)	-0.2616 (0.281)	-1.1659* (0.278)
		13~18	-0.7864** (0.330)	0.0132 (0.268)	-0.3044 (0.262)	-0.9266* (0.254)
		19~24	0.0076 (0.224)	0.2335 (0.177)	-0.2114 (0.156)	0.1735 (0.152)
		25~29	-0.0410 (0.188)	0.2775*** (0.152)	-0.2434*** (0.132)	0.0923 (0.127)
		30~34	-0.0044 (0.173)	0.3901* (0.142)	-0.1228 (0.122)	-0.2129*** (0.118)
		35~39	0.2023 (0.180)	0.4955* (0.147)	-0.0199 (0.125)	-0.1955 (0.121)
		40~49	0.1490 (0.166)	0.2871** (0.136)	0.0868 (0.122)	-0.0146 (0.117)
	Occupation (Baseline: Self-employed)	Unemployed and others	0.1762 (0.237)	0.1528 (0.195)	0.4618* (0.159)	0.6887* (0.157)
		Full-time housewife	-0.1568 (0.193)	-0.1536 (0.163)	0.0456 (0.147)	0.0693 (0.140)
		Student	0.3280 (0.270)	-0.1738 (0.214)	0.3426*** (0.180)	0.6527* (0.176)
		Blue-collar worker	-0.1669 (0.204)	-0.1736 (0.171)	0.0003 (0.156)	-0.0778 (0.145)
		White-collar worker	0.2778 (0.172)	0.2494*** (0.142)	0.2213*** (0.122)	0.1538 (0.115)
	Education (Baseline: College graduate)	Student in elementary, middle and high school	-0.1897 (0.273)	-0.4878** (0.220)	-0.2172 (0.215)	-0.3261 (0.208)
		High school graduate	-0.4468* (0.113)	-0.4927* (0.095)	-0.4270* (0.088)	-0.3138* (0.083)
		Student in college and graduate school	-0.0440 (0.198)	-0.0886 (0.156)	0.0157 (0.125)	-0.0857 (0.125)
	Monthly Income (Baseline: Above 5 million KRW)	Below 1 million KRW	-0.5629* (0.191)	-0.4820* (0.158)	-0.0296 (0.140)	-0.2309 (0.142)
		1~3 million KRW	-0.4174* (0.118)	-0.3695* (0.095)	-0.2756* (0.075)	-0.2076* (0.075)
		3~5 million KRW	-0.2595** (0.116)	-0.1375 (0.094)	-0.1330*** (0.072)	-0.1515** (0.072)
	Region (Baseline: Capital area)	Southwest (Honam/Jeju)	-0.0965 (0.125)	-0.1166 (0.106)	-0.0023 (0.094)	0.0015 (0.092)
		Middle (Chugchug/Kwangwon)	0.0806 (0.131)	0.1384 (0.110)	0.2057** (0.087)	0.0412 (0.088)
		Southeast (Youngham)	-0.0940 (0.092)	-0.1639** (0.076)	0.0115 (0.066)	-0.0553 (0.065)
family characteristics	Number of Internet users	-0.4363* (0.059)	-0.3345* (0.052)	-0.1906* (0.051)	-0.3150* (0.050)	
	Number of adult Internet users	0.2224* (0.074)	0.1591** (0.065)	0.0234 (0.064)	0.1651*** (0.062)	
constant		2.8435* (0.233)	1.9040* (0.189)	-0.2455 (0.164)	0.6720* (0.157)	

Standard errors in parentheses, *** p<0.1, ** p<0.05, * p<0.01

^s: significant at the significance level of 0.05 when family characteristics are excluded from independent variables.

Table 3. Regression results of duration of visit (Tobit Model)

Dependent variable			All the units	Industrial and economic affairs	Social and cultural affairs	Public administrative affairs	
Dummy for female			-18.7363** (7.421)	-15.0593** (7.550)	2.2183 ^S (1.418)	-17.4893* (2.960)	
Socio-economic variables	Age (Baseline: 50 and above)	7~12	-54.4736 (33.543)	-3.0759 (34.888)	-7.8625 (6.615)	-55.4967* (13.538)	
		13~18	-60.7182*** (31.391)	-17.4907 (32.744)	-9.1315 (6.178)	-50.9789* (12.308)	
		19~24	-17.0610 (18.892)	9.0915 (19.301)	-8.7930** (3.634)	-10.2635 (7.300)	
		25~29	-13.6625 (15.912)	13.2567 (16.209)	-6.5486** (3.062)	-12.3342** (6.192)	
		30~34	-2.2983 (14.740)	28.5879*** (15.007)	-5.5116*** (2.829)	-21.6788* (5.771)	
		35~39	-1.4444 (15.185)	28.8038*** (15.446)	-1.7289 (2.910)	-23.7367* (5.967)	
		40~49	-4.1602 (14.705)	17.6998 (15.010)	0.4578 (2.825)	-15.8807* (5.756)	
	Occupation (Baseline: Self-employed)	Unemployed and others	70.2739* (19.420)	30.9077 (19.619)	14.4393* (3.694)	55.9432* (7.447)	
		Full-time housewife	-1.5589 (17.629)	-6.8221 (17.905)	1.7256 (3.457)	2.5387 (7.111)	
		Student	28.5523 (21.841)	3.2155 (22.137)	10.7942** (4.219)	24.3224* (8.463)	
		Blue-collar worker	-15.9544 (18.410)	-16.9174 (18.673)	-1.5658 (3.667)	-4.7361 (7.347)	
		White-collar worker	35.6504** (14.552)	31.4552** (14.713)	6.1482** (2.852)	9.4249 (5.755)	
	Education (Baseline: College graduate)	Student in elementary, middle and high school	-14.2751 (25.752)	-30.1429 (26.944)	-9.3364*** (5.089)	-10.6819 (9.975)	
		High school graduate	-19.9979*** (10.406)	-27.5514* (10.575)	-11.6501* (2.073)	-5.4402 (4.196)	
		Student in college and graduate school	-13.7450 (15.413)	-13.0924 (15.581)	-4.2835 (2.948)	-1.7129 (5.935)	
	Monthly Income (Baseline: Above 5 million KRW)	Below 1 million KRW	-27.5524 (17.469)	-27.9812 (17.859)	1.7644 (3.245)	-13.6815** (6.885)	
		1~3 million KRW	-17.8205*** (9.256)	-19.0021** (9.373)	-6.2314* (1.749)	-7.6433** (3.634)	
		3~5 million KRW	4.0132 (8.930)	6.7547 (9.017)	-5.1015* (1.677)	-3.1849 (3.505)	
	Region (Baseline: Capital area)	Southwest (Honam/Jeju)	31.9578** (11.330)	28.4717** (11.507)	1.3301 (2.182)	1.5488 (4.491)	
		Middle (Chungchug/Kwangwon)	0.0049 (10.861)	2.7422 (10.966)	3.5349*** (2.040)	1.0237 (4.278)	
		Southeast (Youngnam)	-1.7603 (8.078)	-8.4328 (8.213)	0.6282 (1.551)	1.1189 (3.200)	
	family characteristics	Number of Internet users	-23.4933* (6.096)	-22.8291* (6.210)	-3.9520* (1.190)	-11.5218* (2.552)	
		Number of adult Internet users	6.6703 (7.585)	6.4341 (7.731)	0.6020 (1.495)	5.3508*** (3.145)	
	constant			64.1332* (19.735)	14.3433 (20.047)	-12.3862* (3.850)	0.3851 (7.743)
	sigma			252.7484* (2.310)	250.8283* (2.417)	40.5066* (0.608)	89.2221* (1.097)

Standard errors in parentheses, *** p<0.1, ** p<0.05, * p<0.01

^S: significant at the significance level of 0.05 if the number of daily visits is used as a dependent variable.

Environment and Governance for Various Specialist Network toward Innovation

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ABSTRACT

Social infrastructure in Japan has undergone a great deal of development over the past 60 years with economic success. However, the social infrastructure facilities are aging, and require appropriate maintenance to remain usable. We have addressed this issue by making use of Information Communication Technology (ICT) in collaboration with specialists in the fields of ICT and social infrastructure. First, we discuss the environment and governance of a project involving a network of civil engineers and ICT specialists. The aim of this project is to obtain trustworthy and excellent results, so physical policies were needed to manage the project. These are indicated based on a framework of social capital, which may lead to innovation. A successful project was inspected within the framework and policies. The project had seven participants: the University of Tokyo, MEX, TEPCO, METRO, JR-EAST, HITACHI Ltd. and NTT. The project was planned and members were selected according to policies related to the environment, and activities were undertaken in accordance with policies related to governance. Our achievements attracted political attention from key persons in important organizations, so new resources come into our project such as leading persons/organization and extra budgets in the second year.

Keywords: Social Capital, Horizontal Network, Project Management, Project Policy, Consensus Building

1. INTRODUCTION

Social infrastructure in Japan has undergone a great deal of development over the past 60 years with economic success. However, the social infrastructure facilities are aging, and require appropriate maintenance to remain usable. [1]. Unfortunately, there is a lack of both engineers and funding in this field [2]. Therefore, large-scale innovation is required for the development of maintenance technologies and efficient applications of social infrastructure facilities. We have addressed these issues using Information Communication Technology (ICT) in collaboration with specialists in the fields of ICT and social infrastructure, because innovation may come from mixed technologies in the fields of civil engineering and ICT. As innovation is based on social capital [3], *i.e.*, resources between social network members, the purpose and outcomes of this project should include the expansion of social capital. To realize innovation in maintenance technologies and efficient applications of social infrastructure facilities, we discuss the environment and governance of a project involving a network of civil engineers and ICT specialists.

2. INNOVATION AND SOCIAL CAPITAL

There have been many empirical studies on the relationship between social capital and innovation. Zheng [4] classified them into three dimensions, *i.e.*, 1) structural dimension, 2) relational dimension, and 3) cognitive dimension as defined by Nahapiet and Ghoshal [5], and this classification framework was used to many studies. Zheng identified 7 sub-constructs belonging to these three dimensions (shown below) from reports in the literature.

Structural Dimension: The structural dimension has four sub-constructs, *i.e.*, Network Size, Structural Holes, Tie Strength, and Centrality.

Relational Dimension: The relational dimension has two sub-constructs, *i.e.*, Trust and Norms.

Cognitive Dimension: The cognitive dimension has one sub-construct, *i.e.*, Shared Vision.

However, there is a possibility that the relational and cognitive dimensions are within the same dimension [6]. Especially, norms in the relational dimension, which refer to shared expectations, are close to shared vision in the cognitive dimension [7]. For planning purposes in our project, the relational and cognitive dimensions were therefore combined into one, which we call "governance." In the same way, we refer to the structural dimension in our project as the "environment." It is important to set an appropriate environment and governance to manage a project, which requires expansion of social capital to achieve innovation. We defined environment and governance of a project toward innovation as below.

Environment of a project toward innovation: In case the project points to innovation, the environment should be considered according to four factors: Network Size, Structural Holes, Tie Strength and Centrality.

Governance of a project toward innovation: In case the project points to innovation, governance should be considered taking into account three factors: Trust, Norms, and Shared Vision.

3. ENVIRONMENT

As the environment consideration for our project, we established policies for Network Size, Structural Holes, Tie Strength, and Centrality.

Network Size

Network Size is considered according to the total number of contacts between actors in the network. Direct contacts result in product innovation [8][9], contacts between upper management and key knowledge workers lead to the creation of knowledge

[10], and frequent contacts between teams in the network lead to high performance [11]. Therefore, we have policies of Network Size that high quality meetings have held constantly, such as once a month meetings with core researchers and engineers, steering committees four times a year, frequent hearing to stakeholders by members of the top management team. In addition, extra meetings have been held as circumstances require.

Structural Holes

Structural Holes refer to unique ties to other actors, in discussion about which it is emphasized such as scarcity value and superiority with knowledge quality [12][13][14]. In contrast, Structural Holes are not significant when knowledge heterogeneity is considered [15][16][17]. Thus, human capital could be complementary to social capital [18]. When there are insufficient Structural Holes in the project, the participation of individuals and organizations with appropriate knowledge and expertise is desirable. Therefore, our project has mechanisms in place for participation by new members with necessary knowledge and skills. Thus, various specialists are involved in our project.

Tie Strength

Tie Strength is considered by combinations of the amount of time, emotional intensity, intimacy, reciprocal service, etc. [12][19]. As communication among actors is beneficial [20], appropriate clear steps, schedules, and roles of each actor have been set up to promote such participation.

Centrality

Centrality is considered as an actor’s position in the network. Thus, a high degree of Centrality means a higher position and more importance [21]. Although researchers in central positions could create innovation with sufficient knowledge and information in the network, peripheral researchers in the network require external ties for innovation [16]. Our project has a social and political support mechanism for external ties to foster innovation in peripheral areas, because one of our purposes is to expand social capital to achieve innovation. This is very important for projects to proceed smoothly.

4. GOVERNANCE

As governance for our project, we established policies for Trust, Norms, and Shared Vision. These are developing throughout the project.

Trust

Trust is defined as the belief that actions of another person and their results will be appropriate from the view of an actor [22]. Trust keeps transaction costs low, facilitates communication and knowledge sharing, and leads to successful negotiation and collaboration [23][24][25][26][27]. Therefore, fair rules and management methods were included in our project charter; we were especially clear regarding our aims and duty with regard to confidentiality. In addition, participants should make an agreement established by all members when they join our project.

Table 1. Project situations and project policy toward innovation of seven factors

Dimension	Factor: definition	Previous situation	Objective situation	Project policy toward innovation
A) Environment (Structural Dimension)	1) Network Size: total number of contacts between actors in its network 2) Structural Holes: unique ties to other actors 3) Tie Strength: nature of a relational contact 4) Centrality: actor's position in a network	1) Contact inside an organization, constant meetings 2) Fixed actors 3) Common goal, vertical division of labor 4) Solid centrality by plan	1) Contact among organizations, extra meetings held if needed 2) Flexible participants as occasion requires 3) Common awareness and goal of issue, horizontal specialization 4) Fluid centrality by actors' interactions	1) High quality constant meetings and extra meetings if needed 2) Various forms of participation for effective knowledge resources 3) Appropriate clear steps, schedule, and role of each actor 4) Mechanism of social and political backing
B) Governance (Relational & Cognition Dimensions)	1) Trust: belief that actions of another person and their results will be appropriate from the view of an actor 2) Norms: expectations about appropriate or inappropriate attitudes and behaviors 3) Shared Vision: facilitates communication in a group, such as shared representations and codes	1) Maximum achievements of each project, steady enforcement, following rules 2) Maximum benefit for individuals and organizations 3) Formation based on vision and goal, agreement of each role	1) Maximum achievement of common goals, respect and friendly rival relationships 2) Maximum benefit for long-term win-win relationships Autonomous work, contribution to others 3) Shared awareness of issue, joint planning of vision and goal through facilitation	1) Fair rules and management methods Aim and confidentiality Agreement by all participants 2) Reciprocal understanding Correct and shared information by workshops and meetings 3) Consensus building Analysis of stakeholders' interests and relationships

Norms

Norms are expectations about appropriate or inappropriate attitudes and behaviors [28]. We set up workshops with core members, and at the same time hearings between each stakeholder and the top management team. Collected information was shared among core members to facilitate understanding of norms. In less than half a year, we have collaborated with other stakeholders effectively. Norms has taken a firm hold on actors with Shared Vision.

Shared Vision

Shared Vision is a common mental model of future state among actors [29] with such resources as shared representations, interpretations, and systems of meaning in the network [5]. To develop a common mental model of future state, we used various methods to determine their interests, analyze relationships between stakeholders, etc. It takes some time to build consensus in the first stage, but once a shared vision and norms have been established the project can proceed at a rapid pace.

Four factors of environment and three factors of governance are shown in Table 1 with definitions, and we compared what project situation should be (objective situation) to previous project situation. It is also shown physical policy toward innovation in Table 1.

5. CASE

We commenced a five-year project toward innovation in the infrastructure field in April 2009, which is named the “Research Initiative for Advanced Infrastructure with ICT.” The aims of this project are as follows: 1) highly developed management of infrastructure facilities with ICT, 2) creation of new business with infrastructure innovation utilizing ICT, 3) intelligent platform of practical research with a variety of knowledge and experience. In the first year, there were seven members: University of Tokyo, Metropolitan Expressway Co. Ltd. (MEX), Tokyo Electric Power Company (TEPCO), Tokyo Metro Co. Ltd. (METRO), East Japan Railway Company (JR-EAST), HITACHI Ltd., and Nippon Telegraph and Telephone Corporation (NTT).

Before starting the project, the seven members were selected and all agreed to join the project. The Network Size and Shared Vision is the most effective policy toward innovation because many extra meetings were required to build consensus. The project had three initial research aims, which were shared in public as well as among members. The activity was based on the mechanism of social and political backing that is Centrality. The kick-off meeting was held with an appropriately clear schedule and role of each other (Tie Strength), and also fair rules, management methods and consensus building (Trust and Shared Vision).

In the first phase, it was proposed to determine the present situation, correct and classify problems, and then evaluate measures through constant meetings, extra hearings, and workshops related to the policy of Network Size and Norms. It goes without saying that the project has been proceeded by all policies, especially Shared Vision is used through any process of the project.

In the second phase, we constructed a clear structure of eight measure areas. After achieving agreement among members, eight research plans were made public, which came from the mechanism of social and political backing i.e. Centrality. The process of agreement was derived from fair rules,

management methods, and consensus building i.e. Trust and Shared Vision. Our activities have obtained social and political approval based on public relations efforts regarding the project’s outcomes. Following approval, the project developed some additional needs and issues. Therefore, we reconstructed the five research fields, including eight research plans that had already been set up.

In the third phase, the rules were established for new participants to cover the five new research fields. The project needed extra knowledge and experience due to expansion of the research fields involved. Thus, new participants as human capital were complementary to Structural Holes, and the roles of these new participants were clarified as Tie Strength. Trust was maintained to make fair rules of contract based on the consensus that is the Shared Vision. We accepted new appropriate leading persons and organizations and extra large budgets for each of the five research fields at the end of the first year.

Table 2. Activities/Outcomes and effective policy in each period

Period	Activities / Outcomes	Effective Policy
Pre	Preparation of project Select 7 members	A1) Network Size B3) Shared Vision
First (Apr – Sep 2009)	Start project period Share 3 research aims (in public) Search present situation Share 3 status & 3 environment conditions Correct problems Share 133 problems in the field Classify problems into 8 areas Share 8 problem areas and 33 measures Evaluate 33 measures Share 16 selected measures	A3) Tie Strength A4) Centrality B1) Trust B3) Shared Vision A1) Network Size B2) Norms ↓
Second (Oct – Dec 2009)	Build a structure of 8 areas Share 8 research themes (public) Public relations according to outcomes of the first period Correct additional issues Share 5 research fields including 8 areas	A4) Centrality B1) Trust B3) Shared Vision A3) Tie Strength
Third (from Jan 2010)	Make rules for participation Share activity policy & 4 type participation styles Collect new members & extra budget Accept new appropriate leading figures & budget for each of 5 research fields	A2) Structural Holes A3) Tie Strength B1) Trust B3) Shared Vision Expand Social and Human Capital

6. CONCLUSIONS

We have commenced a project geared toward innovation in the field of infrastructure management, because there are a number

of urgent problems in the field that must be addressed over the following ten years but there is a shortage of appropriate specialists, such as engineers and researchers. Hence, we have determined the relationships between social capital and innovation, and identified the situation regarding previous projects and objective project situation in order. As our aim is to obtain trustworthy and excellent results, physical policies are needed to manage the project as shown in the last column of Table 1. The project was planned and members were selected according to policies related to the environment, and activities have been carried out according to the policies related to governance. Our achievements attracted political attention by key persons in important organizations, which led to an influx of new resources into our project, such as leading persons/organization and extra large budgets in the second year.

7. FUTURE PERSPECTIVES

As we have confidence in our outcomes and achievements, our next aim is to evaluate the project in clear form. One idea to evaluate the project is to use transaction costs because projects geared toward innovation have a flexible structure and a variety of resources which it is possible to give basic explanation in the same way that D.C. North showed the effective property structure [30]. In the near future, we will present a paper regarding evaluation of the project toward innovation.

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The Impact of Mobilization Power of the Elderly on Welfare Spending for the Elderly in South Korea -Visualizing the Variation Applying Geographical Information System-

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ABSTRACT

Population structure in current Korea is characterized as “aging society”. Under this aging society, the prompt and large-scale expansion of welfare for the elderly is required to meet the welfare demand. To figure out the factors influencing welfare spending, we test how the mobilization power of the elderly which could be instrument to improve their welfare benefits, and political factors such as political competition for a county headman, female share in a local assembly, and election year influence welfare spending for the elderly with 30 local governments for 2000 to 2007. Economic conditions, financial capacity of local governments, financial structural factor, and welfare demand are used as control variable. We find that GRDP, political competition, share of the elderly in population, welfare spending in the previous year, local tax, economic development spending and female share in local assembly influence welfare spending for the elderly. Unfortunately, mobilization power does not affect welfare spending in spite of their higher electoral participation. These results imply the mobilization power is not represented to political mechanism or decision making system, and economic development is the priority for local governments. Then we display the significant explanatory factors like political competition and female share in a local assembly, and the dependent variable in each jurisdiction on the map using Geographical Information System to visualize how those factors associated. Generalized Least Square is applied to analyze the model and ArcGIS 9.3 is applied for the visualization.¹

Keywords: Decentralization, Mobilization Power, Welfare for the Elderly, Political Competition, Geographical Information System

1. INTRODUCTION

One of significant characteristics in current Korean society is ‘aging society’ due to the improvement in quality of life, the development of medical technology, the expansion of national

medical insurance, and decrease in infant birth rates. Under this aging society, the prompt and large-scale expansion of welfare for the elderly is required to meet the welfare demand of the elderly in South Korea. As we know, dependent children and the disabled can be classified as ‘deserving’ for welfare services while the elderly be classified as ‘undeserving’ one because the latter can be protected by social insurance. But current social security system is insufficient to cover the deficiency of welfare for the elderly because national pension and basic old age pension provided by the government do not cover welfare demand for the elderly. At this moment, the mobilization power of the elderly and what factors should determine welfare for the elderly in a local level are meaningful questions to be explored to suggest the directions that elderly groups and local governments should consider to proceed their benefits and policies. This study explores the effects of mobilization power of the elderly and political factors of local governments on welfare spending for the elderly due to the transfer of social welfare services from the national government to local governments. In a realistic perspective, devolution of authority to local governments had not occurred to result in variation in policy outcomes across local jurisdictions that mobilization power of the elderly and political factors could work before government innovation in 2004. In other words, local governments’ heavy dependency on the national government in welfare policies does not allow the discretion (slack) that the political mechanism of local governments can work. But there could be possibility that political mechanism of local governments influence welfare spending for the elderly because the national government allows discretion that local governments exercise by giving authority in designing and implementing welfare policies to local governments in 2004.

We try to identify local political mechanism influencing welfare spending for the elderly beyond existing studies which are only focused on adoption of self-governing system after the transfer of the authority in welfare policies to local governments from the national government in 2004. Especially, we try to figure out the impact of mobilization power of the elderly and political factors on welfare spending with 30 local governments in Daegu-metropolitan city and Gyeongsangbuk-province. Social and economic factors which are used in the previous studies are considered to identify more reliable effects of political mechanism. Generalized least square is applied to for the analysis due to the panel data has heteroskedasticity across panels.

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2.THEORETICAL REVIEW

Aging and the mobilization power of the elderly

Korean society entered into ‘aging society’ in 2000 and population of the elderly has increased fast. Especially, aging population in Gyeongbuk and Daegu providences reached about 15% of total population in 2005(National Statistics Office, 2009). This aging brings about social problems like poverty, disease, alienation from the society, and loss of social role for the elderly.

To resolve these problems, increased aging population could be main body to represent their interests and benefit by mobilizing their political power, as well as to request welfare meeting with the demand for the elderly. Existing theories can be divided to psychological and political approaches. The former one includes continuity theory and disengagement theory. Continuity theory argues individuals who engaged in society actively continue to be engaged while disengagement theory argues that as individual gets old, they gradually disengage from social participation(Cutler, 1977). The latter is focused on population share participating in elections as representation. In this perspective, who participates in politics is important factor; who votes, who does not have significant consequences for who gets elected and for the content of public policies(Griffin and Keane, 2006). According to this theory, the degree of influencing power is different depending on the level of representation.

There has been no study examining the impact of mobilization power of the elderly on welfare spending so far in South Korea. Thus it is valuable to explore how the mobilization power of the elderly influences welfare for the elderly. Especially, the impact of population share of the elderly and participation rates of the elderly in general election is examined as main explanatory variables influencing welfare spending for the elderly.

Devolution (decentralization) and logic in welfare spending for the elderly

Devolution implies a transfer of authority to design and implement policies from the national government to local governments. This decentralization allows local governments to have more discretionary power in welfare decision making, and local environments like political, social and economic factors in local jurisdictions to influence welfare policy through increased discretionary power of local governments (Cho et al, 2005; Fording et al, 2007; Kim and Fording, forthcoming). Compared with local governments in a centralized government system, local governments in a decentralized government system can design and implement their own policies that meet their jurisdictions need. Hence, there could be more variation in policy outcome across local jurisdictions, and this variation can be explained by local environments. There have been two different arguments about the question that how local environments influence welfare spending; political model, and economic and social model. Political model implies that welfare spending is a function of political mechanism whereas economic and social model implies that welfare spending is a function of economic and social environments. Key (1949; 1956) and Lockard (1963) argue the political competition between the two parties and voting rate are important political factors influencing policy. But there is a contradiction about factors influencing welfare spending. Some scholars emphasize political factors such as party competition, majority party share and political ideologies of majority party, are important in

deciding budget. Especially, strong party competition catalyzes generous redistributive policies for low-income citizen and then increases welfare spending to obtain support of low-income citizen to win an election. Thus party competition has positive relationship with welfare (Wildavsky, 1974; Wong, 1988). Others emphasize economic factors. Peterson (1981) argues welfare policy executed by local governments is restricted by economic interests. Only local governments achieve economic development and have excessive financial resources pursue welfare policy (Wilensky, 1975). Regardless of factors emphasized, government expenditure scale is decided by various environmental factors surrounding local governments. Fabricant (1952) found that income per capita, urbanization, and population density are significant factors influencing public expenditure. Dawson and Robinson (1963) found that party competition is closely related to welfare spending in states, but it becomes insignificant when they control income. They concluded that income per capita, population density, and urbanization determine welfare spending rather than party competition. Dye (1979) also stated social and economic factors are more influential than political factors. But Fry and Winters (1970) found political factors have significant and independent relationship with redistributive policies. Based on previous studies, we assume that welfare spending is a function of environmental factors such as political, social, and economic factors surrounding local governments.

Literature review: As expressed in the previous subheading chapter, there has been no study on the impact of mobilization power of the elderly on welfare spending. Most domestic studies about the determinants of local government welfare spending applied the analysis model of foreign studies to domestic cases. Studies performed in early 1990s when self-governing system reinitiated, discussed institutional perspective of administration system and the impact of adoption of self-governing system on welfare spending. Empirical studies began in 1995 when the county and city headman began to be elected by his citizen (Lee & Kim, 1992; Kim, 1998; Son, 1999; Kang, 2003). These studies explored whether adoption of self-governing system increased welfare spending or not. The finding of each of these studies is different and inconclusive. Studies about the effect of political competition on local government expenditure are undertaken by Ji & Kim (2003) and Shin (2007). Both studies found political competition influences social development spending.² Recent studies on welfare spending tried to figure out factors influencing welfare spending by considering various political (party identification of a headman and an assemblyman, relationship between a headman and a local assembly, the time of adoption of self-governing system), social (population, population density, the number of low-income welfare beneficiaries, the number of the elderly), and economic (income per capita, financial autonomy of local governments) factors (Jin, 2006; Park & Park, 2007). Although there is a little difference in their findings, they found social and economic factors are more influential than political factor commonly. Doesn't political mechanism of local governments influence welfare spending in reality? We think political mechanism of local governments influences welfare spending. In the previous studies, scholars did not use appropriate measures for political factors producing variation in welfare spending across local governments. They considered party

2 Social development spending includes housing, health, welfare, culture, and manpower development spending.

identification of a headman of local government, participation rate in an election, majority party share in the composition of local assembly, and the relationship between a headman and a local assembly. In Korean political system, there is no political ideology spectrum like liberalism to conservatism in the U.S. Hence, party identification or majority party share is not proper selection to examine political impact on welfare spending. We use V. O. Key's political competition concept as main explanatory variable. In spite of the reinitiation of self-governing system in 1991, little transfer of authority to design welfare policy from the national government to local governments, heavy financial dependency on the national government, and low financial autonomy of local governments do not allow the room for the political mechanism of local government to work. But government innovation under the president Roh in 2004 transferred a significant amount of authority in welfare policies to local governments. We anticipate this devolution gives the room that political mechanism work. Empirical study on the impact of local political factors on welfare spending after 2004 government innovation is only Park & Park (2007)'s one. They considered party identification of a headman of local government, and an election year as political factors and found only an election year is significant factor influencing welfare spending.

3.HYPOTHESES AND MODEL

Case selection and hypotheses

To test the hypotheses, we examine 30 local governments (similar to county or city governments) in Daegu Metropolitan-City³ and Gyeongsangbuk-Do⁴ (similar to state) for 2000 to 2007 in South Korea. We restrict research period from 2000 to 2007 because the national government transferred 67 out of 138 policy authorities in welfare to local governments in 2005.⁵ This devolution gives a slack that local environments influence welfare spending and produces variation in welfare spending across local governments.

We focus on political factors such as mobilization power of the elderly, political competition, and female share in a local assembly influencing welfare spending for the elderly. As electoral participation rates of the elderly increases, welfare spending for the elderly increases because their mobilization power makes the local government design and implement more generous policies for the elderly. We term this potential effect of political factor the "political mobilization hypothesis".

H1: As electoral participation rates of the elderly increases, welfare spending for the elderly increases.

As electoral competition between two top vote getters for a mayor or a county headman, and an assemblyman gets stronger, welfare spending for the elderly increases because they need to obtain the marginal votes of the minority who are usually not considered as a main target to win an election in low levels of

electoral competition situation. Under the a two-party system or a multiple-party system, there is a tendency that welfare policies for the minority become generous as electoral competition between two top vote getters gets stronger. We term this potential effect of political factor the "political competition hypothesis".

H2: As electoral competition between the two top vote getters gets stronger for a county headman and an assemblyman, welfare spending increases.

We also test another newly issued political factor, the share of female assemblywomen in a local assembly because the introduction of proportional representation and the quota system for female local assemblywomen in 2006 resulted in the dramatic increase in the number of female assemblywomen in a local assembly. We hypothesize that as the number of female assemblywomen who have a tendency to be generous to welfare increases, welfare spending increases. We term this potential effect of political factor the "female share hypothesis".

H3: As female share increases in the composition of a local assembly, welfare spending increases.

Model

Hypotheses are analyzed through the following equation and pooled time series and GLS (Generalized Least Square) are applied for the analysis:

$$Y_{i,t} = \alpha + \beta_1 X1_{i,t} + \beta_2 X2_{i,t} + \beta_3 X3_{i,t} + \beta_4 X4_{i,t} + \beta_5 X5_{i,t} + \beta_6 X6_{i,t} + \beta_7 X7_{i,t} + \beta_8 X8_{i,t} + \beta_9 X9_{i,t} + \beta_{10} D1_{i,t} + \beta_{11} D2_{i,t} + \beta_{12} Y_{i,(t-1)} + \varepsilon \quad \text{Eq.(1)}$$

Y= Welfare spending for the elderly per capita,
X1=Rates that electoral participation of the elderly out of total participation,
X2=Share of the elderly population,
X3=Local tax revenue per capita,
X4= Financial autonomy,
X5= Economic development spending per capita,
X6=Electoral competition between the two top vote getters for a county headman,
X7= Electoral competition between the two top vote getters for a local assembly,
X8= Female share in a composition of a local assembly,
X9= GRDP per capita,
D1=Election year,
D2=Devolution,
Y_{i,(t-1)}=Welfare spending per capita in the previous year,
i=county or city, *t*=year

Data for the dependent variable are collected by various ways. Most of those are extracted from the budget document of each county or city. A part of those are collected by petition for the release of information or visiting the county/city governments. Welfare spending for the elderly per capita is defined as welfare spending for the elderly in each local government divided by the number of population in each local jurisdiction. As explained case selection and hypotheses section, we consider mobilization power of the elderly, electoral competition between the two top vote getters for a headman of local governments and for a local assemblyman in each electoral district, and female share in each local assembly.⁶ Mobilization

3 Daegu Metropolitan City is composed of 7 Gus (Cities) and 1 Gun (County).

4 Gyeongsangbuk-Do is composed of 10 Sies (cities) and 13 Guns (counties).

5 No previous research has found significant political effects on welfare spending including studies examining welfare spending before 2004.

6 Existing studies considered a percentage of the vote that a headman

power of the elderly is measured as the share that electoral participation of the elderly out of total electoral participation. Thus a higher share implies a higher mobilization power. Political competition between the two top vote getters for a headman or a mayor is measured as the value that the proportion of vote obtained by the second highest vote getter is subtracted from the proportion of vote obtained by the first highest vote getter in an election. Thus a lower percentile value indicates smaller gap in vote poll between the two top vote getters and implies stronger competition whereas higher percentile value implies weaker competition. Measurement for political competition between the two top vote getters for an assemblyman in each electoral district is identical to the measurement for political competition for a headman. As stated in the hypothesis 1 and 2, we anticipate welfare spending for the elderly increases as mobilization power gets stronger and political competition becomes stronger. Female share in the composition of a local assembly is defined as the number of female assemblywomen divided by the number of total assemblymen in each local district. We anticipate that welfare spending increases as female share in a local assembly increases. According to election results in 2006, female assemblywomen are 437 out of total 2,415 assemblymen due to introduction of proportional representation and the quota system for female. This dramatic rise of female share in a local assembly could be a new political factor influencing welfare policies. We anticipate that welfare spending for the elderly increases as a share of female in the composition of a local assembly increases because many of them have an academic degree in social work, and have work experiences in women's organizations and in a welfare committee in an assembly. Kim (2004) studied the role of female in the national congress and found that they play a significant role in improving welfare for women, the disabled, children and low income families. Although it is difficult to apply the findings to a local assembly directly because of the difference in the level of governments, the finding could be the clue that we anticipate the growth of female share in a local assembly increases welfare spending for the elderly. Political factor which is confirmed in the previous studies is election year. Welfare spending increases in the year when an election is held because an incumbent of a local government is likely to increase welfare spending to obtain the vote of the minority who are welfare beneficiaries. We give 1 to the election year 1998, 2002 and 2006, and 0 to the others.

We consider financial autonomy of local governments as financial capacity of local government. Financial autonomy is a standard that we can evaluate the financial capacity of a local government. It is measured as the proportion of local tax revenue and non-tax receipt to general account budget (Lee and Kim, 2007). Generally, welfare spending increases as financial autonomy gets higher because a local government has more financial capacity. We also consider economic development spending per capita to figure out which policy is local governments' priority between economic development and welfare. We anticipate economic development spending per capita has negative relationship with welfare spending for the elderly per capita because local governments concentrate on economic development have less financial room for welfare. We consider local tax revenue per capita and GRDP per capita

or a mayor obtains, a relationship between a headman (mayor) and a local assembly, and party identification of a headman or mayor as political factors.

as economic variables. Local tax per capita and GRDP per capita represent economic prosperity. Thus we anticipate welfare spending for the elderly increases as local tax per capita and GRDP per capita increase. We also consider the proportion of the elderly to total population as the welfare demand factor. We anticipate that as welfare demand factor increases, welfare spending for the elderly increases. We consider devolution of authority to local government as financial structure factor. Due to the point that welfare budget is influenced by itself in the previous year, we give the lagged effect (t-1) to the dependent variable and input it as internal explanatory variable. Definition and sources for variables used in the model is identified in table 1.

Table 1. Definition and Sources for the Variables

Variable	Definition (unit)	Source
Welfare spending for the elderly per capita	Welfare spending for the elderly in a city or county / the number of total population (won)	Budget document of each local government
Mobilization power of the elderly	% of the elderly participating in an election out of total population participating in an election	National election commission
Political competition for a headman	% of vote obtained by top vote getter-% of vote obtained by the second-vote getter	National election commission
Political competition for an assemblyman	Mean(% of vote obtained by the top-vote getter-% of vote obtained by the second-vote getter in each election district)	National election commission
Female share in a local assembly	The number of female assemblymen / total number of assemblymen (%)	Daegu, Gyeongsangbuk-Do election commission
Election year	2002=1, 2006=1, the rest year=0	
Proportion of the elderly population	The number of people who are age 65 and over age 65 / the number of total population (%)	Statistical yearbook of Daegu, Gyeongsangbuk-Do
Financial autonomy	(local tax + non-tax receipt) / general account budget (%)	Financial yearbook of local governments
Economic development spending per capita	Economic development spending/the number of total population	Financial yearbook of local governments
Local tax per capita	Local tax / total population (won)	Financial yearbook of local governments
GRDP per capita	GRDP/ total population (thousand won)	Financial yearbook of local governments
Devolution	Before 2005=0, Since 2005=1	
Welfare spending per capita in the previous year	Welfare spending per capita in the previous year	Budget document of each local government

4.RESULTS

The coefficient estimates for the equation are presented in table. 2. Adjusted R² value is 90.28 in OLS. This value represents explained variance compared to total variance. We think fitness of the model and explanatory power is pretty strong.

Table 2. Coefficients and Standard Error

Variables	OLS	GLS
	B	B
Mobilization power of the elderly	-0.131 (.205)	-0.094 (.170)
Political competition for a headman	-0.080** (.039)	-0.058*** (.019)
Political competition for an assemblyman	-0.070 (.083)	-0.050 (.033)
Female share in a local assembly	0.580*** (.215)	0.444*** (.120)

Election year	-2.505 (2.164)	-0.567 (.979)
Financial autonomy	-0.135 (.173)	-0.087 (.102)
Economic development per capita	-0.051* (.026)	-0.039** (.020)
Proportion of the elderly	1.942*** (.593)	1.923*** (.000)
Local tax per capita	0.0009 (.0006)	0.0006* (.0003)
GRDP per capita	0.00007** (.00003)	0.00006*** (.00002)
Devolution	2.484 (2.751)	1.812 (1.295)
Welfare spending per capita in a previous year	0.689*** (.068)	0.656*** (.066)
adj-R ²	90.28	
N	210	210

*p<0.1, **p<0.05, ***p<0.01

We cannot find a critical difference in the significance of coefficients between OLS and GLS except local tax per capita, but a difference in the value of those. Unfortunately, hypothesis 1 is rejected; the mobilization power of the elderly which measures electoral participation of the elderly to total electoral participation is not significant statistically, and the direction of coefficient is contrary to our expectation. This result implies although an electoral participation of the elderly is relatively higher than that of other age groups, their interests are not represented to the politics and policy decision mechanism. Consistent with our expectations, we find that as political competition between two top vote getters for a headman gets stronger, welfare spending for the elderly increases. This finding conforms to the ‘political competition hypothesis’ that as electoral competition between the two top vote getters gets stronger, welfare spending for the elderly increases, and implies that under strong political competition, the incumbent increases welfare spending to obtain the marginal votes of the minority who are usually not considered as a main target to win an election in lower levels of electoral competition situation. We also identify female share is significant factor affecting welfare spending for the elderly. As female share in a local assembly increases, welfare spending for the elderly per capita increases. This finding conforms to the female share hypothesis that as a percentage of female assemblywomen increases in a local assembly, welfare spending increases. Contrary to the results in the previous studies, welfare spending decreases in the election year, but it is not significant statistically.⁷ As expected, proportion of the elderly has a positive relationship with welfare spending. Local tax per capita and GRDP per capita have a positive relationship with welfare spending for the elderly, and those are significant statistically. Unexpectedly, financial autonomy has a negative relationship with welfare spending. As financial autonomy gets higher, welfare spending decreases. This unexpected result is probably caused by the reason that local governments which have higher financial autonomy are more likely to spend on economic development than on welfare as found by a few previous researches. Negative relationship between economic development spending and welfare spending

7 Welfare spending in the most of local governments decreases in 2002. This factor results in negative value of coefficient for election year. When we exclude 2002 election year, the coefficient is changed to positive value and is significant statistically. This result implies the incumbent headman spends more money for welfare to obtain the votes of welfare beneficiaries.

for the elderly supports our argument. Devolution is positively related to welfare spending as expected. But it is not significant. Welfare spending for the elderly per capita in the previous year is positively and significantly related to welfare spending per capita. This result is identical to Wildavsky’s argument that budget can be explained by incrementalism well.

As we see in table.2 political competition and female share in a local assembly are significant political factors determining welfare spending for the elderly per capita. We display these on the map by using geographical information system (GIS). Figure 1 and 2 below display political competition, female share and welfare spending for the elderly in each jurisdiction within Daegu-metropolitan city and Gyeongsankbuk-Do (Province) in 2002 and 2006. Blue-color bar represents political competition and lower bar indicates stronger competition. Orange-color bar represents female share in a local assembly and higher bar indicates higher female share. Brown-color fulfills in each jurisdiction on the map represent welfare spending for the elderly per capita and darker brown indicates higher welfare spending.

Figure 1. Visualizing Significant Political Factors (2002)

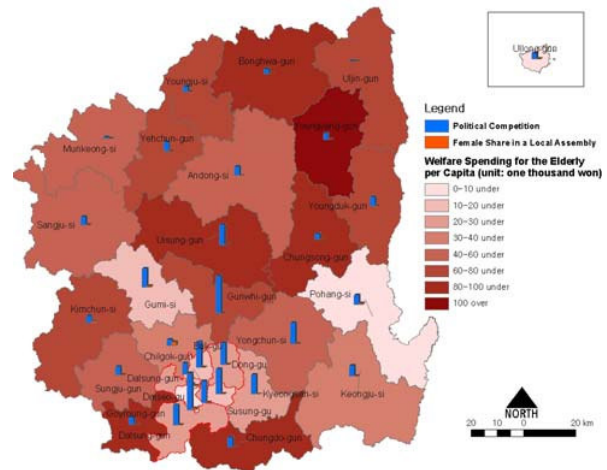
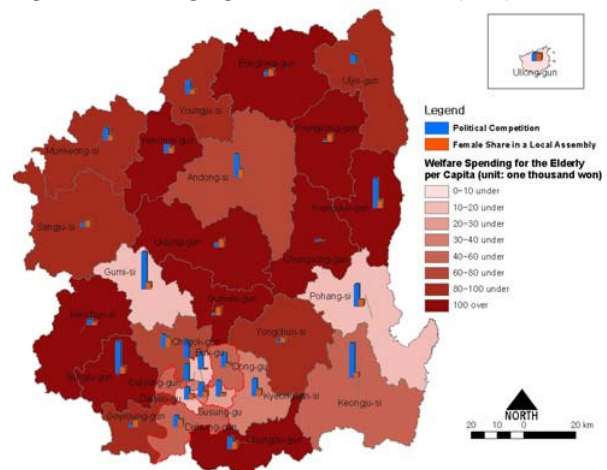


Figure 2. Visualizing Significant Political Factors (2006)



5.CONCLUSION

We explored whether the mobilization power of the elderly is represented in politics or policy decision mechanism or not, as well as other political, and control factors determining welfare spending for the elderly. Mobilization power of the elderly does not influence welfare spending for the elderly per capita while political competition and female share in a local assembly do influence. These results imply that local political mechanism is working in a process of policy decision making due to the transfer of authority in deciding and implementing welfare policies from the national to local governments in 2004. But relatively higher level of electoral participation of the elderly does not represent their interests in deciding welfare policy for the elderly. To connect their power to the decision making, the elderly should mobilize their power as collective power and issue their interest to local political mechanism. Although local governing system has been initiated for a long time in Korea, local governments had been just implementation institutions of the national government rather than autonomous governments establishing their own policies and arranging budget to meet their own citizens' needs. This dependency is caused largely by non-transfer of authority from the national government to local governments, and local governments' financial dependency on the national government. Previous studies concluded that political factors did not affect welfare spending except for the election year. This conclusion is come out by two factors that scholars had not applied appropriate measurement for political factors to their studies, and devolution of authority to local governments had not occurred to result in enough variation in policy outcomes across local jurisdictions that political factors could work.

But considerable authority in welfare policies is transferred to local governments from the national government since 2005 and this devolution of authority might allow local government to design and arrange their own welfare policies partially and produce variation in policy outcome across local jurisdictions. We examine whether devolution causes variation in welfare spending for the elderly across local governments, and if so, how it can be explained. Especially, we try to identify the effects of political factors such as mobilization power of the elderly, political competition, female share in a local assembly and election year and find strong political competition and female share in a local assembly increases welfare spending. Thus, this study provides new implications that political factors of local governments influence policy outcome (welfare spending), as well as devolution of the authority to local governments from the national governments allows political mechanism of local government to work in the decision making process in Korean public administration system.

This study can be extended by increasing the number of local governments as research object and extending study period. We are collecting data on 22 local governments in Junlanam-Do, 14 local governments in Junlabuk-Do, and 31 local governments in Gyeonggi-Do for 2000 to 2009 to generalize the results of the study.

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The Evolution toward “Bureaucracy 2.0”: A Case Study on Intellipedia, Virtual Collaboration, and the Information Sharing Environment in the U.S. Intelligence Community

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ABSTRACT

In the wake of the 9/11 terrorist attacks, the Intelligence Reform and Terrorism Prevention Act of 2004 mandated that an Information Sharing Environment (ISE) was to be established to act as an approach that facilitates the sharing of terrorist information. The ISE represents both a technological and cultural transition toward a more post-bureaucratic United States Intelligence Community (USIC) – an evolution toward “Bureaucracy 2.0.” Through the introduction of new Information and Communications Technologies (ICT), such as the wiki “Intellipedia,” and by integrating department-specific networks into an Enterprise Architecture Framework, the various agencies within the USIC can more effectively organize and share information through virtual collaboration.

Although there has been a myriad of literature examining the intelligence failure and agency adaptation failure that preceded 9/11, the ISE has largely gone overlooked since its implementation in 2006. While adaptation failure is self-evident, instances of adaptation are often less obvious. Accordingly, this paper explains post-bureaucratic adaptation with ICT projects in government agencies through an evolutionary model. It examines both the internal sources and external sources of technological and institutional change through a case study on the USIC, its reforms through the ISE, and use of Intellipedia for virtual collaboration.

Keywords: Post-bureaucratic, Evolutionary Model, Information Sharing, Intellipedia, Information Sharing Environment, Intelligence Community, Virtual Collaboration

DEFINING “BUREAUCRACY 2.0”

Bureaucracy 2.0 can best be defined as a post-bureaucratic model of organization through the use of ICTs, such as Web 2.0 technologies. The focus of this research has been primarily based in business management and the private sector. “So far, interest of studies on Information Systems (IS), management and change studies has been on organizations from the profit-seeking sector.” [1] But, this discussion can shed light on changes in organization in the public sector, as well; after all, government is most associated with the oft-used pejorative connotation of “bureaucracy.” Likewise, “Government organizations have been facing dramatic transitions, in part related to the increasing implementation of web-based Information Technology (IT) projects.” [1] These “dramatic transitions” merit further elucidation.

As the name implies, Bureaucracy 2.0 is an update and advancement to traditional bureaucracy through technology. The literature on post-bureaucratic organization and e-government is vast and varies widely; thus, it is important to

further elucidate what is implied by post-bureaucracy. What characterizes the post-bureaucratic type? Emmanuelle Vaast and Maria Christina Binz-Scharf expound upon the concept:

Web-based IT projects are characterized by their openness and user-friendliness, which may seem to go against the tradition of hierarchical structuring and vertical decision making in government organizations. Moreover the trend towards free circulation of information and ideas may contrast with established organizing principles of government organizations...Taken together, these trends have been related to the emergence of so-called “digital government” and “post-bureaucratic” organizations. “Post-bureaucratic” organizations are usually meant as a contrast with the bureaucratic model of government organizations, especially as web-based IT applications are being implemented. [1]

Jamali, Khoury, and Sahyoun outline several characteristics of the post-bureaucratic type to include *effective communication*, whereby “[t]he ability to organize, create and disseminate information is a source of competitive advantage in the information age and has direct implications for the dynamics of teamwork and collaboration,” and *increased flexibility*, which “entails agility and responsiveness, which are critical in an age of change and high velocity.” [2] Heckscher defines the post-bureaucratic organization as an ideal type that is characterized by increased teamwork, lateral coordination and networks. The implications of a post-bureaucratic evolution suggest:

The essential proposition here is that these mechanisms, which are currently growing up within bureaucracy, can be extrapolated to a full and distinct form of organization with greater capacity than bureaucracy itself...The development claim of this evolution would suggest that the post-bureaucratic type is “better” in that it incorporates the old bureaucracy into a new form of organization which is better able to adapt to a wider range of conditions, hence it is more advanced and evolved. [3]

Thus, the post-bureaucratic, as used here, refers to an advancement of traditional bureaucracy through increased lateral teamwork, coordination, networks, and horizontal information flows. This, in turn, creates more effective communication and increased flexibility. ICTs are conducive to these desirable characteristics and are heavily used and associated with this post-bureaucratic model. Bureaucratic models of government, “by contrast, with their still vertical information flows, rigid practices, and strict division of labor, are still organized according to the top-down models created for the industrial economy.” [4] This post-bureaucratic transformation through the use of ICTs is an improvement over

inefficiencies associated with traditional bureaucracies – the rigidity of hierarchical structuring and processes, the stove piping of information flows, the over-segmentation of departments and individual responsibilities which can break down communications, bureaucratic politics and infighting, and an inability to maximize the use of collective intelligence and information needed for responsive, flexible and accurate decision-making. [3] William Eggers captures these pitfalls well, when he describes traditional government bureaucracies as that which “still operate as fractious collections of hierarchical, rule-laden, stove-piped bureaucracies, whose modus operandi is fanatical protection of their turf.” [4]

While bureaucracy is not inherently “bad,” post-bureaucracy represents innovation and an evolutionary advancement of the management, processes, and structuring of a bureaucratic organization. The post-bureaucratic type is, in effect, then, an ideal type, but post-bureaucratic reforms are very real. The evolution to Bureaucracy 2.0 is a transition that is based both as a response and representation of the changes in the broader society. Donald F. Kettl explains:

Government is struggling to use twentieth-century tools to cope with twenty-first-century problems. We have pursued good management through authority and hierarchy for a century. When new challenges emerged, we responded by reorganizing and strengthening the bureaucracy. Today’s problems, however, simply don’t fit bureaucratic orthodoxy. [5]

Likewise, Eggers adds:

In short, a bureaucracy built for the Industrial Age can’t adapt to the Age of Information. Transformation requires uprooting our obsolete, century-old systems and replacing them with new models better suited to the twenty-first century. [4]

The evolution to Bureaucracy 2.0 is a transformative stage in government that coincides with the technological and institutional evolution of society. Post-bureaucratic reform and technological innovation through the use of ICTs are the means by which the government can more effectively tackle the problems of today.

AN EVOLUTIONARY MODEL OF AGENCY ADAPTATION

While it is often clear when government agencies fail to adapt (e.g. an intelligence failure leading up to a terrorist attack or a lack of regulatory oversight prior to an economic crisis), [6] it is less clear when they succeed to adapt. This is important because instances of agency adaptation, and instances of agency adaptation failure, may also have no indicators or be less obvious if a major failure has not yet occurred; that is, its shortcomings have not yet become evident. So, how can we differentiate a malign, stagnant agency to one that is efficient and adapts readily? While this is a difficult question, it is the ambitions here to elucidate a model for examining why agency adaptation failure may occur, under what circumstances agency adaptation is likely to take place, and the processes by which agency adaptation and policy innovation may take place.

Agency adaptation is not simply equated to any change. Change always takes place in a path-dependent manner in an

organization, where normal trends in policy may be exploited. [1] Adaptation consists of the significant changes that an organization adopts in order to effectively adapt to its environment. Amy B. Zegart expands upon this concept:

As sociologists have long pointed out, organizations are always changing. The key issue is whether those changes matter, or more precisely, whether the rate of change within an organization keeps pace (or lags behind) the rate of change in its external environment. Manifestation of this concept is more easily observed in the private sector, where responding to shifting market forces, consumer tastes, and competitive pressures can mean life or death for a firm. The concept may be less obvious, but no less important, for evaluating public sector organizations. The question is not: Are you doing anything differently today? But: Are you doing enough differently today to meet the challenges you face? Adaptation must be judged relative to external demands. [6]

Adaptation failure in the private sector might mean the bankruptcy and extinction of a firm, but in government extinction is a rare occurrence. In a study on “U.S. government agencies between 1923 and 1973, for example, Herbert Kaufman found that 85 percent of those in the 1923 sample were still in existence fifty years later.” [6] Thus, if agencies exist for such long periods of time, it does not mean that each adapted accordingly but that it is the nature of U.S. government and government in general for existing bureaucratic structures to stay in place despite any shortcomings. Whereas the free hand of the market punishes firms which fail to adapt, agencies in the government do not go bankrupt. They linger. They persist. They survive despite their inefficiencies and failures to adapt to external demands.

Zegart points out three impediments to reform, which can contribute to adaptation failure: “1) the nature of organizations; 2) the rational self-interest of political officials; and 3) the fragmented structure of the U.S. federal government.” [6] The *nature of organizations*, and more specifically the nature of government bureaucracy, is that they are resistant and slow to change. Government agencies are more constrained by the demands of external political actors, they are built to be held accountable and reliable rather than innovative and adaptive, and “organizations become more resistant to change as routines, norm, and relationships become firmly established.” [6] *Rational self-interested officials* may not see it in their interest to undertake bureaucratic reforms. While Presidents may have an incentive to do so, “[t]hey have little time, limited political capital, few formal powers, and packed political agendas. Presidents therefore almost always prefer to focus their efforts on policy issues that directly concern and benefit voters, rather than on the arcane details of organizational design and operation.” [6] Similarly, legislators are more concerned about electoral interests, as well, and may even seek to impede reform to maintain congressional sway over bureaucratic entities. Just as important, bureaucrats have little interest to undermine their own authority or influence, and may view reform as ceding their own power in a zero-sum game. [6] In the words of Charles E. Lindblom, “Almost every interest has its watchdog.” [7] Lastly, *the fragmented structure of the U.S. federal government* exacerbates attempts at reform through the difficulties represented by decentralized democracy.

Some of the cherished features of American democracy impede effective agency design and raise obstacles to reform. Separation of powers, the congressional committee system, and majority rule have created a system that invites compromise and makes legislation hard to pass. [6]

If there are such significant obstacles to reform, the question then becomes as to when and under what conditions is policy innovation likely to occur? When can these obstacles be overcome? While there is varied literature on the origins of policies and the policymaking process, the multiple streams framework presented by Nikolaos Zahariadis presents an intriguing lens to understand the preconditions necessary for agenda setting decision making. [8] In brief, Zahariadis contends that there must be a mix of three streams (or factors) present – problems, policies, and politics. These streams are described:

A problem stream consists of various conditions that policy makers and citizens want addressed. Examples are government budget deficits, environmental disasters, rising medical costs, and so on. Policy makers find out about these conditions through indicators, focusing events, and feedback.... The policy stream includes a “soup” of ideas that compete to win acceptance in policy networks. Ideas are generated by specialists in policy communities (networks that include bureaucrats, congressional staff members, academics, and researchers in think tanks who share a common concern in a single policy area such as health or environmental policy) and are considered in various forums and forms, such as hearings, papers, and conversations...The politics stream consists of three elements: the national mood, pressure-group campaigns, and administrative or legislative turnover. [8]

When there is a coupling of any of these streams, a policy window emerges in which policy entrepreneurs can push a policy agenda and policy alternatives can be explored. Thus, this policy window is an opportunity for policy change and the use of innovation, from which trends toward Bureaucracy 2.0

might emerge. Notable here is that a policy window for adaptation is often preceded by a problem; unfortunately, the problem may, in fact, have been brought to light by a previous failure to adapt. It is exceedingly difficult to determine how to adapt without significant indicators of adaptation failure.

Agency adaptation is derived from three different sources according to Zegart: 1) internal reforms made by the agency; 2) executive branch action such as presidential directives; and 3) through statutory reforms involving both Congress and the executive branch. [6] An agency can adapt independently, the President can issue an executive order, or Congress may pass a legislative action to reform an agency.

These three sources represent two different mechanisms of policy diffusion. The first mechanism is *learning* and is an internal source of change, whereas the external source of change allows for the mechanism of *coercion*. [9] Learning is the mechanism or process by which a federal bureaucracy may explore policies implemented by other external organizations or in society itself, such as state level governments or private sector firms and adapts the policy in order to improve their functional performance; this occurs through management or change agents. Coercion is policy reform that is forced upon the bureaucracy from institutional pressures through mandates from Congress or the President.

Once the policy innovation occurs, the relevant agency adopts it and adapts to its external environment. These policy adaptations may include introducing new routines and processes through ICTs, which may also lead to organizational restructuring – the creation of new IT offices and a structure of virtual collaboration. This, in turn, is accompanied by a transformation or altering in the relationships, politics, and overall culture within the organization. This theoretical discussion can be developed into an evolutionary model of agency/policy adaptation. Figure 1 demonstrates the utility of understanding the process of policy adaptation by government agencies through an evolutionary model. [1] (See Figure 1 below.) This evolutionary framework will be utilized for the case study on the ISE, Intellipedia, and virtual collaboration in the U.S. Intelligence Community.

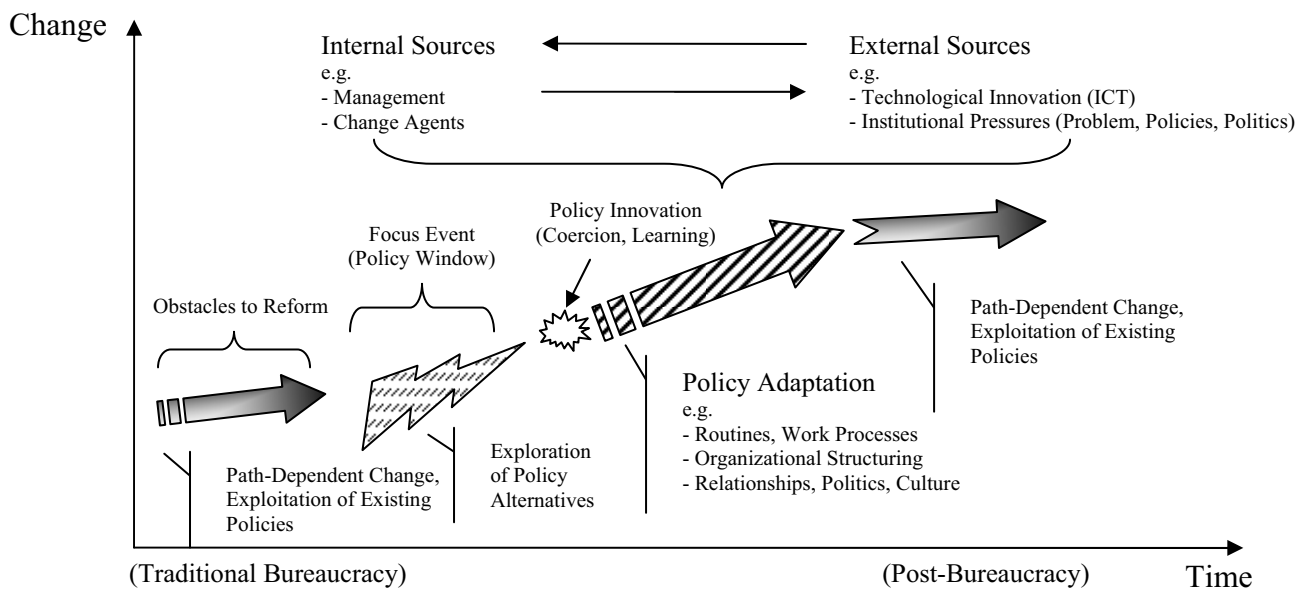


Figure 1: An Evolutionary Model of Agency Adaptation

POST-9/11 AGENCY ADAPTATION IN THE U.S. INTELLIGENCE COMMUNITY

This section will address a brief case study consisting of two separate but related events of agency adaptation, whereby the U.S. Intelligence Community (USIC) adopted policy innovations under both the Information Sharing Environment and Intellipedia, and will outline how these two innovations represent an evolution toward a post-bureaucratic type of government organization through the use of ICTs and virtual collaboration.

The USIC is a bureaucratic structure consisting of multiple agencies and departments. It has long used technology in its daily operations, and the USIC has undergone typical path-dependent changes throughout its history and has utilized ICTs to accomplish its mission. From 1994 to 2005, the USIC developed a system of intranet networks with different levels of security clearance – JWICS, SIPRnet, and NIPRnet. [15] In and of itself, technology is not the sought-after ends, however, and the mere existence of an intranet environment does not ensure that it is effectively and optimally utilized for information sharing. There were numerous failed attempts at reform prior to September 11, 2001, including reforms aimed at improving information sharing.

Of 340 recommendations for changes in the intelligence community, only 35 were successfully implemented, and 268 – or 79 percent of the total – resulted in no action at all. Closer examination reveals surprising agreement on four major problems: the intelligence community's lack of coherence or "corporateness"; insufficient human intelligence; personnel systems that failed to align intelligence needs with personnel skills or encouraged information sharing; and weakness in setting intelligence priorities. [6]

The 9/11 attacks, however, acted as a focusing event, a policy window whereby institutional pressures arose for agency adaptation. The focusing event was a catastrophic terrorist attack and, thus, a very visible problem presented itself: intelligence failure and a threat to homeland security. This was coupled with political pressure from public opinion and the national mood. This provided the impetus needed for reform, thereby generating the momentum necessary to overcome the obstacles to agency adaptation and to implement policy innovation in order to improve the performance of the USIC.

During the policy window, policy alternatives and recommendations were made in the form of papers and hearings, including most notably: The Joint Inquiry of House and Senate Intelligence Committees into the Terrorist Attacks of September 11, 2001 (report issued in December of 2002); The Congressional Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction (issued annual reports from 1998 to 2003); and The National Commission on Terrorist Attacks Upon the United States (issued the 9/11 Commission Report in July 2004). In the time period following 9/11, several policy ideas gained traction and were manifested in the form of policy innovations from both internal and external sources. In June of 2002, the Homeland Security Act of 2002 was signed into law by President Bush after having passed both Houses of Congress, thereby establishing the Department of Homeland Security, which Customs, Border Patrol, the Coast Guard, and

Immigration and Naturalization Service would all fall under. [10] On May 1, 2003, President George W. Bush created the Terrorist Threat Integration Center, which acted as a fusion center integrating representatives from various intelligence agencies. [10] The Federal Bureau of Investigation made several adjustments on its own, including the creation of 66 Joint Terrorism Task Forces throughout U.S. cities. [10] It is clear that there was a policy window, whereby many policy alternatives were explored, some rejected and some adopted.

The 9/11 Commission recommended that the position be created for the Director of National Intelligence (DNI) and that a National Counterterrorism Center (NCTC) be established. President Bush, by his use of executive order, took up these recommendations and established both the DNI and NCTC on August 24, 2004. With this as a backdrop, Congress passed the Intelligence Reform and Terrorism Prevention Act of 2004 (IRTPA), which further solidified the establishment of the Office of the DNI (ODNI), where the NCTC would be located. The 9/11 Commission also concluded that a breakdown in communications and information sharing had occurred, contributing as a key factor to the intelligence failure preceding the terrorist attacks. Thus, following these recommendations, the IRTPA included a provision under Section 1016 which stated that an Information Sharing Environment must be established and defined it as "an approach that facilitates the sharing of terrorism information." [11] The law also required the Presidential appointment of an ISE Program Manager and establishment of an Information Sharing Council, which would "advise the President and the Program Manager on the development of ISE policies, procedures, guidelines, and standards, and to ensure proper coordination among federal departments and agencies participating in the ISE." [11] On November 16, 2006, the ISE was born when the DNI submitted the ISE Implementation Plan. The ISE, is a department within the ODNI and is a post-bureaucratic reform (a policy innovation) that largely includes the use of ICT to improve information sharing among 16 federal intelligence agencies, [12] thus inducing several structural, procedural, and cultural changes. From the ISE website, there is a clear outline of what its purpose is and what it seeks to achieve:

The ISE aligns and leverages existing information sharing policies, business processes, technologies, systems, and promotes a culture of information sharing through increased collaboration.

ISE Goals

Goal 1: Create a Culture of Sharing Establish employee behaviors including awareness of information sharing policies, responsibility to perform information sharing activities, and accountability and incentives for carrying out those responsibilities.

Goal 2: Reduce Barriers to Sharing Use of Policy, Business Process and Practices, and Technology to remove obstacles and enable information sharing.

Goal 3: Improve sharing practices with federal, state, local, tribal and foreign partners Enhance information sharing by standardizing practices, improving interagency coordination, and developing guidance and enabling infrastructure to support the information sharing mission.

Goal 4: Institutionalize Sharing Make information sharing routine through championing, leading, using and sustaining efforts to standardize policies, resources, business practices, and technologies. [11]

The post-bureaucratic characteristics mentioned earlier in this paper are clearly evident; increased lateral teamwork, coordination, networks, and horizontal information flows are all present in these goals, as well as the use of ICTs. The ISE created an ISE Enterprise Architecture Framework (EAF) to integrate the preexisting information systems used by the different agencies within theUSIC and has now even introduced the ISE EAF Version 2.0 as an updated and improved version to its predecessor. [13] The EAF model acts as an information sharing network between agencies:

A smoothly functioning ISE requires IT systems and infrastructures that support the development, integration, and sustained operation of standardized information sharing systems by all participants. The ISE Architecture program meets this goal by aligning and connecting the diverse myriad of IT systems and infrastructures used by ISE participants—which are often isolated by their very different and sometimes conflicting policies, business practices, and cultures—into a more uniform, seamless, well-defined set of interconnected systems...the ISE architecture program fits into the Federal Enterprise Architecture (FEA), serving as a bridge between individual component architectures. [14]

Through the use of the EAF, the ISE alters the structure of theUSIC by decreasing horizontal segmentation and increasing lateral communication flows and coordinating technological and systems-wide guidance across the ISE community. [14] To complement this, the ISE also seeks to reduce barriers to information sharing and institutionalize new information sharing routines, practices, and standards. The ISE Program Manager creates and revises sharing standards as part of the Common Terrorism Information Sharing Standards Program (CTISS). [14]

Likewise, in an effort to internalize a culture of information sharing and to foster teamwork between theUSIC agencies, the ISE has taken additional steps, which were also part of the mandated reforms included in the IRTPA and 2005 Presidential Information Sharing Guidelines and Requirements. [14] The ISE has done the following to accomplish these aims:

- The Office of Personnel Management (OPM) and the PMI-ISE partnered to produce policy guidance that directed agencies to make information sharing a factor in Federal employees' performance appraisals. This issuance guides agencies in how to develop competency elements regarding the proper sharing of information for use in employee appraisals.
- The PM-ISE released an ISE Core Awareness Training Module to help move Federal agencies from the traditional "need to know" culture to one based on a "responsibility to provide." [14] The Module provides Federal agencies with a common tool for developing an understanding of the ISE as well as an overview of the Federal Government's counterterrorism and homeland security organizations, systems, and challenges.

- Three-quarters of Federal ISE agencies have now incorporated information sharing into their awards programs. For example, the Department of Defense Chief Information Officer established annual awards that include "information sharing and data management" among criteria for consideration. [14]

These reform efforts are significant and should not be overlooked. Overhauling and synchronizing the structures, routines, and cultures of the diverse aggregation ofUSIC agencies into a single integrated information sharing environment is no small feat and .

Concurrently with the development of the ISE, another policy innovation was separately emerging over at the Central Intelligence Agency (CIA). In 2005, a pilot project emerged for collaborative data sharing; the ICT program was a wiki dubbed "Intellipedia." Given the same background and policy window, its origins are from a CIA essay competition dubbed the "Galileo Awards", which sought to spur innovation by welcoming ideas submitted from any employee at the intelligence agency. [15] The essay that came in first place was "The Wiki and the Blog: Toward a Complex Adaptive Intelligence Community," written by D. Calvin Andrus, Ph.D., the Chief Technology Officer in the CIA's Center for Mission Innovation. [15, 16, 17] Andrus had learned from external technological innovation in society at large that wikis had vast potential as an ICT in theUSIC. "Andrus' essay argued that the real power of the Internet had come from the boom in self-publishing, and noted how the open-door policy of Wikipedia allowed it to cover new subjects quickly." [18] The powers that be had agreed.

The ODNI took the idea and adopted it as a policy and technology innovation of its own, and it is managed by its Intelligence Community Enterprise Services, which also manages the ISE EAF. The impact of Intellipedia appears substantial. "Founded in 2006 and now with 90,000 users in the global intelligence community, Intellipedia operates on three networks, including an unclassified network, Intelink-U. [19] Reportedly, its biggest contributor is a 69-year-old analyst, and there are "on average more than 50,000 contributions to Intellipedia daily." [20] The latest 2009 estimates show that Intellipedia hosts 900,000 pages, had 100,000 users, and takes on 5,000 page edits daily. [21]

Like the ISE, and as part of the integrated ICT, in theUSIC's Intellipedia has the same post-bureaucratic effects of horizontal integration, lateral information flows, creating a network for virtual collaboration, and an overall improved coordination of information resources. Intellipedia has taken a strong foothold in the culture of theUSIC and has promoted information sharing into the routines and practices of intelligence analysts and workers. ODNI has stated that "the project will change the culture of the U.S. intelligence community, widely blamed for failing to 'connect the dots' before the attacks of September 11, 2001." [22] This virtual collaboration negates physical structures and geographic distance that act as impediments to horizontal integration efforts, thus overcoming traditional bureaucratic segmentation and allowing for a more efficient use of collective intelligence, knowledge, and information.

The ISE and Intellipedia, taken together, demonstrate that technology is an enabler for bureaucratic performance. By reducing the barriers between agencies and institutionalizing

information sharing, the ISE and Intellipedia could have profound effects on the bureaucratic politics that have plagued the USIC. Although there are, and always will be, defenders of the status quo and interested parties resistant to change, government agencies will continue to innovate through ICTs and internalize a post-bureaucratic culture. John C. Gannon speculates:

In the years ahead, reformist managers will find their strongest supporters among the new technology-savvy generation of analysts who come to their jobs with advanced information technology skills, intimate familiarity with the web, a sophisticated appreciation for the value of internal and external collaboration – and no corrupting experience in the IC’s information-hoarding stove-pipes.” [23]

Likewise, the newly created ODNI that accompanied these policy innovations is working at great lengths “to emphasize integration and collaboration in intelligence analysis and to provide central direction aimed at rising above the bureaucratic fiefdoms that can prevent the sharing of sources and analytic perspectives.” [24] While it is still relatively newborn, these post-bureaucratic transformations of the USIC through the use of ICTs and corresponding institutional changes mark the beginnings of an evolution toward Bureaucracy 2.0.

The future of virtual collaboration in the USIC holds vast potential and many possibilities as there continue to be new developments for the use of new ICTs and Web 2.0 technologies in the USIC. In September 2008, the ODNI introduced A-Space, which is “a highly restricted Facebook-style website that’s designed to encourage the sharing of ideas and information among members of the FBI, the CIA, the NSA and the U.S.’s 13 other intelligence services.” [25] A more formal definition:

...a common collaborative workspace for all analysts from the [intelligence community]. That is accessible from common workstations and provides unprecedented access to interagency databases, a capability to search classified and unclassified sources simultaneously, web-based messaging, and collaboration tools. [26]

The current development of A-Space is yet another excellent example of the promise that virtual collaboration has as a means for the USIC, and government at large, to keep up with and adapt to today’s increased external demands of information processing.

The use of ICTs is becoming more prevalent as the USIC adapts to its surrounding external environment and the institutional and technological changes in society. At the same time, there has been a complementary shift in IC policy from a “need to know” to a “responsibility to share” intelligence information on terrorist activities. Collectively, these reforms have contributed to an ongoing technological and cultural evolution toward Bureaucracy 2.0 in the USIC.

CONCLUSION

In discussing the impact of Bureaucracy 2.0, this paper has demonstrated that innovations in ICT can have profound implications for the bureaucratic process, structure, and politics of information sharing in the USIC and that these changes are

evident of post-bureaucratic adaptation. In doing so, this interdisciplinary paper is an effort to bridge the political science and ICT communities by elucidating under what conditions government agencies adopt policies of technological innovation and, in turn, the effects of ICT on the bureaucratic process.

The evolutionary model of agency adaptation presented here has incorporated relevant literature and perspectives from political science and policy studies. While it may be critiqued as an overdetermined “kitchen sink theory,” the argument here is that this is a comprehensive model which can help us to better understand the historical process and underscore the various factors which influence policy innovation and agency adaptation. It provides a useful tool for examining change in politics and public policy and understanding when the adoption of ICTs is most likely to occur. Consequently, this model would be useful for examining other case studies at the federal, state, and local government levels. Admittedly, the preliminary empirical evidence is lacking to a degree, but given the sensitive nature of intelligence activities in the USIC, this is to be expected. This line of research would benefit greatly with the fruitful addition of data and information. Similarly, there are likely many hypotheses that can be drawn from the inferences made here and tested elsewhere.

As the recent intelligence failure and thwarted terrorist attack on December 25, 2009 has highlighted, the evolution to Bureaucracy 2.0 is not complete. Challenges will persist in effectively implementing ICTs in the USIC, and, in a world of imperfect information, intelligence failures are inevitable. The daunting task is for the USIC to avoid and minimize these failures and to continually adapt to the rate of external changes and threats; ICTs not only facilitate this endeavor but embody it. Adaptation must be continuous and requires vigilance. Moreover, Bureaucracy 2.0 may always be an ideal-type, but what it represents is the post-bureaucratic transformation of government through the use of ICTs. Throughout modern history, bureaucracy has steadily evolved and adapted to the external institutional and technological changes in society. This trend will undoubtedly continue into the future at an accelerated pace as government agencies must constantly strive to evolve and adapt to the high velocity of the Digital Age.

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Developing Web Applications for Disenfranchised User Groups

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ABSTRACT

As information on health care and other social concerns becomes widely available online, technology has great potential to increase the quality of life for older users and for persons with disabilities. However, these user groups together with non-native speakers are also at risk of being disenfranchised in the digital age. Although these groups are clearly separate from one another, they do share some challenges when attempting to access information online. Web designers need to begin by considering some basic aspects of design that can increase usability for all three of these user groups.

Keywords: web design, web applications, older adults, disabled persons, non-native speakers, health care information, disenfranchised user groups

INTRODUCTION

Today there is an increasing reliance on Web applications to disseminate information to the public. Web sites are becoming the primary means by which most people get information on health care and benefits and other important social services. However, many of the Web sites that provide this information are not easily accessible to older users, disabled persons, and non-native speakers. Web applications need to be developed for these disenfranchised user groups. This need becomes particularly acute as the population of older adults grows larger. This paper discusses the challenges faced by these disenfranchised user groups and the digital divide between users who can easily access online information and those who cannot. This divide has serious implications for the health, well-being, and educational opportunities of members of disenfranchised groups.

DISENFRANCHISED USER GROUPS

As information on health care and other social concerns becomes widely available online, technology has great potential to increase the quality of life for older users and for persons with disabilities. However, these user groups together with non-native speakers are also at risk of being disenfranchised in the digital age.

Web applications may present some challenges for all user groups, but certain user groups (older adults, disabled persons, and non-native speakers) typically face the most serious challenges and have the greatest difficulty locating information. As the world population of older adults increases exponentially, a great deal of attention has been focused on the need to make Web applications more accessible for older users. Older users frequently seek health care information online, and their health and longevity may be directly related to their ability to locate this information [1, 2, 3]. Like older users, persons with disabilities [4, 5] and non-native speakers [6, 7] also face significant challenges when seeking information online.

The World Wide Web Consortium has developed Web design guidelines to make sites more accessible to these user groups [8], still there is much more work needed to implement the guidelines and verify that using the guidelines will lead to sites that are more accessible to all user groups.

As Chisnell, Redish, and Lee have pointed out, Web sites used by older adults are “usually developed by people who are much younger” [p. 39]. Web designers often assume that they represent typical users [10]. Further, Web developers and the institutions they work for are frequently more focused on content than on users’ needs and abilities [4, 11].

CHALLENGES FACED BY OLDER ADULTS

The challenges faced by older users are often a result of age-related changes in vision, cognition, motor skills, and literacy [1, 3]. Of course, these age-related changes may vary greatly in the population of older adults [12]. However, researchers agree that a majority of older adults do experience some difficulty accessing Web applications because of these age-related changes [1, 2, 3, 4].

Becker conducted a study of Web usability for older adults seeking to access health care information online. She found that some aspects of Web design such as fonts, colors, graphics, and background images presented challenges for older users seeking health resources [1].

Age-related changes in vision, cognition, motor skills, and literacy may interfere with the ability of older adults to access information online. Specifically, changes in visual acuity may impact an older adult's reading speed, comprehension, navigation, and searches [13].

Changes in cognition may also affect Web usability for older adults. For example, as adults age, their ability to perform tasks related to working memory declines. Working memory involves retaining and manipulating information while performing various cognitive tasks. A decline in the ability to perform working memory tasks means that older adults will have much more difficulty locating and focusing on information in the presence of distracting information [14]. Therefore, they will have difficulty searching for information when they encounter visual noise in the form of a cluttered Web site with a large number of links. Grahame, Laberge, and Scialfa found that older adults required more time and were much less successful than younger users when conducting Web searches in conditions where there were a large number of links and other visual clutter [15].

Motor skills also are likely to decline with age making it more difficult to scroll down pages, to use a mouse, and to click links. Older users may not be able to position a cursor and move a mouse as easily as younger users due to a decline in fine motor skills; this difficulty becomes most acute when dealing with small links and objects [16].

Finally, older users may also be affected by an age-related decline in literacy skills. As working memory capacity decreases there may be a corresponding reduction in language comprehension skills [17].

CHALLENGES FACED BY DISABLED PERSONS

Disabled persons experience some of the same challenges with Web usability that older adults experience. Johnson and Kent define a disabled user as "an individual with one or more impairments relating to their visual, hearing, motor, or cognitive abilities" [p. 210]. Like older adults, persons with disabilities are not usually considered during the development of Web applications.

Disabled persons and older users are considered to be the two users groups most likely to have difficulty accessing and using Web applications. Further, while the two groups clearly have distinct characteristics, they do share some common challenges related to impairments of their visual, motor, and cognitive abilities that should be noted by Web designers.

Many Web sites are not useable by persons with disabilities. At the present time, the Americans with Disabilities Act does not encompass online environments [18]. Newton states that "because of its passage prior to

the growth of the Internet, its provisions do not contemplate online commerce. Advances in Internet technology that could most benefit people with disabilities, such as virtual worlds, are accessible only at the whim of developers" [18].

Many online retailers are motivated to make their Web sites accessible for users with disabilities in order to prevent lost revenue [4]. However, since they are not required by law to accommodate users with disabilities, many sites still do not. For example, a group of blind individuals brought a lawsuit against Target claiming that Target's retail Web site was discriminatory because it did not make accommodation for the screen-reading software that they use to view Web sites [18].

CHALLENGES FACED BY NON-NATIVE SPEAKERS

Like older adults and disabled persons, non-native speakers are likely to face challenges when attempting to access information online. Moore et al. conducted a study on Web design for a Hispanic medically underserved population. The study examined a regional consumer health Web site created to serve an audience with low levels of computer and health literacy.

The researchers found that when users had difficulty locating information they were likely to abandon the Web site. The participants in the study encountered problems with navigation, inconsistent terminology, and the nature of the images used in the site. The findings revealed the need to simplify language, include relevant graphics, and provide culturally relevant examples. The authors concluded by emphasizing the importance of conducting usability testing with the target audience [7].

It is not surprising that cultural issues are likely to become relevant for a population of users who are not native speakers. The users may be recent immigrants to the United States or they may be members of co-cultural groups who do not necessarily conform to the norms of the majority culture. In any case, the ability of non-native speakers to access and comprehend health care information may be compromised when that information is not presented in a culturally-sensitive manner.

Cultural issues may also be a concern in online education. More and more courses at colleges and universities are being delivered online. Further, many US colleges are now delivering instruction to students around the world. Web sites designed either for classes including international students in the United States or for students abroad who are receiving education through universities in the US need to have a culturally adaptive interface. Such an interface should include "technological functions which support off-task, non-verbal, and relationship

building communications” [19]. According to Ingram, Ou, and Owen, a culturally adaptive interface will

- Use colors carefully to avoid any that might be culturally offensive
- Use icons that can be understood by members of other cultures
- Display pictures that support the content
- Provide more than one way to navigate through the course material and avoid overreliance on a solely linear organization of material
- Provide multiple interfaces for student communication including the opportunity for students to communicate privately with the instructor [19]

EXISTING WEB DESIGN GUIDELINES

Several sets of guidelines have been developed to address the needs of older adults. The Web Content Accessibility Guidelines (W3/WAI) and the US Section 508 Guidelines were both developed to help designers make sites more accessible to older users [12]. Both the US National Institute on Aging (NIA) and the US National Library of Medicine (NLM) have developed guidelines for Web design based on “scientific findings from research in aging, cognition, and human factors” [1, p.389]. Despite these guidelines for senior-friendly Web design, there are still many Web sites that present challenges for older users.

Becker conducted a study of 125 Web sites offering information on health resources. She evaluated the sites based on the NIA Web guidelines. None of the sites she examined ranked highly for senior-friendliness. She concluded that improvements to Web design are still needed to accommodate vision, cognition and motor skills of older users. Chisnell, Redish, and Lee evaluated 50 Web sites and found that “[W]eb sites seeking to serve a wide audience” [p. 55] failed to meet the needs of older adults as represented by two personas developed by the American Association of Retired Persons (AARP). It is not enough that the guidelines exist. Web designers must understand them and know how to implement them.

Most Web design guidelines have focused exclusively on older users, although a few studies have focused on both older users and disabled users [4]. In addition to the dearth of guidelines created specifically to address the needs of disabled users and non-native speakers, there are at least two other issues to consider. One is the fact that the existing guidelines have not been used to inform the creation of many Web sites currently in existence. The

other is the fact that the guidelines themselves may be called into question. Some guidelines are vaguely worded and, therefore, difficult for even the most motivated designers to implement.

Guidelines can provide valuable information regarding users, but only if they are used and used effectively by Web designers. Czaja and Lee argue that some guidelines are “vague and difficult to implement” [p.346]. They go on to point out that “guidelines or standards do not guarantee a good experience for all users” [p. 346]. Hart, Chaparro, and Halcomb also reflect on the shortcomings of Web design guidelines stating that “[i]n addition to their lack of specificity, most guidelines are not prioritized by criticality” [p. 198]. They suggest further research “to establish criteria...by which the guidelines can be prioritized and applied” [p. 198]. They also cite the need for studies that determine which guidelines improve usability.

Additionally, some researchers have raised the question of whether using Web design guidelines developed specifically for older users in a site intended for a broader audience would affect usability for other users. Johnson and Kent found that it was possible to develop a Web application for older adults and disabled persons without detracting from usability for other users.

RECOMMENDATIONS FOR DESIGNERS

Much more study is needed to create a viable set of best practices for Web design for disenfranchised user groups. The existing guidelines are a good starting point, but, as has been noted, they have shortcomings that must be addressed. Further, for the most part, the existing guidelines, like the W3/WAI and the US Section 508 guidelines only address one of these disenfranchised groups, older adults.

Despite the need for more study, it is possible at this point to determine a set of basic considerations for good Web design that will increase usability for all three groups (older adults, disabled persons, non-native speakers). These considerations can be divided into these three categories: Interface Design, Graphic Images, and Language.

Many of the considerations presented here are included in the NIA/NLM guidelines for Web design that is accessible to older users. However, these considerations also include advice that is particularly relevant for the other disenfranchised groups.

Interface Design

1. Avoid visual noise and cluttered visual fields.

2. Increase link/button size and reduce the number of links.
3. If possible, reduce the number of clicks necessary to access information.
4. Use effective figure/ground contrast.
5. Avoid using background images which may detract from the legibility of the content.
6. Use sufficient font sizes.
7. Use sans serif fonts.
8. Enable the feature to resize type on the site.

Reducing the visual noise will make it easier for users to locate information, particularly older users who may have a decline in their working memory skills. Providing larger/link buttons will help both older and disabled users who may have impaired visual acuity. Larger buttons will also make it easier for users with decreased fine motors skills to click on the items they want to select. Reducing the number of clicks needed to access a piece of information will also be helpful to users with impaired motor skills.

Strong figure ground contrast will help uses who have visual impairments due to age or disability. Similarly, using large font sizes will help these users as well. Further, including a feature that allows users to resize the type will be especially useful on sites intended for both older and younger users. Further, even non-native speakers will benefit from these design guidelines since they are likely to find it easier to navigate a site in another language when the words are not obscured by a lot of visual noise.

Graphic Images

1. Use graphic images that support the meaning of the information presented rather than using graphics merely as decoration.
2. Make icons large and distinct.
3. Avoid using icons and graphics that may be culturally offensive.

All users will benefit from graphic images that support the meaning of the content presented. For non-native speakers, the graphics will support the meaning of the text and reinforce their understanding. For older and disabled users, having graphics that echo the meaning of the text will aid memory and will reduce distraction.

As with links, icons should be large and distinct so that users know where to click. Having large icons will be especially helpful to users with both visual and motor impairments. Similarly, icons should be selected carefully to make sure that users can interpret their significance and can use them effectively.

Using graphic images that are culturally sensitive is imperative from an ethical standpoint. Although the most obvious instance of such a consideration might apply to avoiding images that stereotype cultures (sombros, chopsticks), it is equally important that images of older users and disabled users be presented in a respectful, non-stereotypical manner.

Language

1. Use active voice and a simple writing style.
2. Use terminology consistently.
3. Write at a 6th grade reading level when targeting a broad audience, as in health care sites.

Simple and unambiguous language is vitally important for all three disenfranchised user groups. As was noted earlier in the paper, older adults tend to experience a decline in their literacy skills and language comprehension. Of course, non-native users will benefit from a simple writing style as will disabled users who suffer cognitive impairments.

The use of simple language will also make the content of the site easier and less costly to translate. Becker has noted that only a small percentage of state and commercial Web sites providing health care information offer translated versions to meet the needs of ethnic older adults [1]. Many of the older adults seeking health care online may be non-native speakers.

Web sites providing information on health care and benefits and other services to a broad audience should be written at a 6th grade reading level to make sure that the information can be comprehended by the target audience [7]. With the increasing reliance on Web sites to provide access to health resources and other services it is vitally important that such sites are accessible to individuals who may be dependent upon them as their only source of information.

CONCLUSION

Older adults, disabled persons, and non-native speakers face serious challenges when seeking information on health care and other services online. Individuals in these groups are in danger of becoming disenfranchised when they are unable to access crucial information because of

visual, cognitive, or motor impairments or because of challenges related to literacy.

Although these groups are clearly separate from one another, they do share some challenges when attempting to access information online. Further, despite the existence of guidelines for Web design for older users, many sites still fail to accommodate the needs of older adults and of other potentially disadvantaged users.

Web designers need to begin by considering some basic aspects of design that can increase usability for all three of these user groups. These considerations include the design interface itself, the graphic elements used, and the language and reading level of the sites. These common sense guidelines are a useful first step for addressing the needs of disenfranchised user groups at a time when more and more vital information is being delivered via the Web. Finally, as future applications are developed, it will be important for usability testing to include members of these and other potentially disenfranchised user groups.

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Computers and Young Turks: The Integration Potential of Digital Media

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ABSTRACT

Recent works in immigration studies have established that the second generation of (in particular) Turkish immigrants is not (or not adequately) integrated in a number of Central European countries. Instead European immigrant youth is experiencing rising discontent and resentment. In Central Europe, sociologists have warned that the second generation is segregating into secluded segments, disenfranchised from the mainstream society. However, in the globalized world of the 21st century, media use restructures human interactions within and across national borders. Audiences have become increasingly global. The internet is becoming integrated into every-day life of European countries; young people increasingly get involved with internet cultures, developing new patterns of social interaction and playing internet games. Centering on questions of integration through the digital media, this paper focuses on the second generation of Turkish decent in Austria and their enthusiasm for the new media. We seek to understand if (and how) the children of Turkish immigrants attempt to alleviate their social standing by looking for membership in existing virtual societies that are at least partially based on online realities. Through digital media new ways of identity formation become possible, and we are interested in analyzing what media behavior might enhance the individual members' chances of successful adjustment to the majority society and what behavior might increase their risk to social isolation.

Keywords: New Media, Second Generation, Gaming, Visual Stimuli, Chatting

1. INTRODUCTION

Public debate about the second generation in Europe has taken a dramatic turn in the last decade.¹ In the post 9/11

world, arguments about the individual European country's failure to integrate relatively high numbers of Muslim immigrants have resulted in the claim that a truly multicultural society is not achievable in Europe.

Integration

Integration focuses on what happens after immigration. It involves not only access to some formal rights of the nation state but also effective economic and social integration. Therefore integration policies frequently raise questions of poverty, social and urban exclusion, unemployment, education, and religion. The integration of immigrants and their descendants remains a sensitive issue for the individual states because it questions the ability of national governments to address problems that lie at the very core of their sovereignty. Even within the EU framework, national governments have preserved their control over many fields related to integration, such as social policy, education, and above all citizenship requirements.

Integration is a complex process shaped by a diverse range of factors, some of which, like government policy and levels of racism, are usually beyond the influence of the second generation. However, agency and the role of immigrant communities themselves remain crucial for integrative processes. In addition to different particularly cultural and educational factors the integration of the second generation is also based on socioeconomic pressures. Although in educational settings and in the workplace there is the potential for "formal acculturation" (Gans 1992) of the second generation into the mainstream, the additional informal experiences outside school or work

¹ An earlier, longer version of this paper has been submitted to Media, Culture and Society. All young people born to one or two Turkish parents who identify themselves with Turkish heritage, culture, and traditions, independent of the language spoken in the

young persons' household and his/her citizenship are included by the authors as "second-generation Turks." Such children and young people were frequently born in Austria, raised as Austrian citizens, and speak German as their mother tongue. For simplification, we refer to this group either as youth of Turkish descent, second generation, or young Turks.

can be more significant especially if young people have been left disillusioned by poor schooling or low-paid and low-status employment. The values that have been attributed to integration, such as upward mobility through good education and hard work, may not be highly valued by some members of the second generation, particularly in countries where the structural obstacles to successful integration seem overwhelming. The question of into which social setting, that is, what section of society, these young people are actually integrating into remains a crucial one to ask.

Our central research question focuses on the potential integration (or lack thereof) of the second-generation youths of Turkish descent into the Austrian majority society through digital environments such as online games. Our definition of integration is based on social relations and networks that have a low inter-ethnic level homogeneity but instead display frequent habitual contacts with the host society. It stresses individual *factors of acculturation*, such as improved language skills and increased interaction patterns with out-group individuals (e.g., members of the host society but also other minority groups) and enhanced testing performance in schools. These processes comprise the adoption of the host culture, acculturation to the global virtual reality of the Internet, and the maintenance of the original culture simultaneously. Total assimilation is a myth, particularly in the Central European nation-states, where historical and geopolitical patterns have resulted in structural constraints to immigrant assimilation and subsequently entrenched ethnic segregation.

Segmented assimilation theory places the process of becoming Austrian (and a citizen of the global world), in terms of both acculturation and economic adaptation, within the context of a society consisting of segregated and unequal segments. This paper focuses on how the second generation's activities on the Internet and in digital environments do or do not contribute to the inclusion of members into broader Austrian society. Successful adaptation for members of the second generation depends on how these immigrant children fit into their own ethnic communities, or their local environments if such an ethnic community is absent, and how their ethnic community or the local environment fits into the larger mainstream society. However, gamers who are members of the second generation might think that being part of a virtual network within a gaming environment could offer a better route to upward mobility and integration (into a specific high-tech society) than assimilating into the Austrian mainstream society or into the native-born mainstream youth subculture.

Methods

We interviewed 16 young people of Turkish descent between the ages of 14 and 20 (of which 3 are female). Most were part of the second, some of the third generation. We used focused semi-structured qualitative interviews, seeking information about media use, social interactions, and acquaintances both online and personally. The interviews were about 1 hour long. The interviewers took notes during the interview that were later fleshed out with additional details at the end of the interview. The selection of interviewees was based initially on contacts already established in Vienna, followed by snowball sampling. Our starting points were two youth centers, financed by the city government, located in two separate districts of Vienna. At the end of interviews, gamers were asked for contact information of fellow-second-generation gamers. Snowballing, a non-probability method generally used when the desired sample characteristic is relatively rare, is a useful selection method for this kind of research.

2. OUR ASSUMPTIONS: GAMING AS AN INTEGRATIVE METHOD

Many young immigrants and members of the second generation discover digital environments in addition to their physical world. In the virtual environments they frequently design playful identities, in a spontaneous way without any particular purpose. With these activities, however, they might gain "media-cultural symbolic capital" (Vogelgesang 2000) and engage in communicative and social relations (Kuhn 2009). The third-person perspective allows the gamer to use an avatar as a virtual representative and to experiment with different identities within a virtual but safe environment. This enhances the immersion into game playing, and allows for a personality and identity development to occur within a sphere that is unhindered by parental supervision and the protection or guidance of friends from the same cohort.

Our initial assumption was that online games (especially Massive Multiplayer Online Role Playing Games or MMORPGs) would be popular in this cohort. Easily established and informal, digital games allow for the creation of social networks beyond and outside of the usual in-groups where members of the second generation typically mingle. Participation in digital games is a low-cost practice: computers are very common in Austrian households (80% own a PC), and Austrians have an Internet access potential of 80%. An increasing number of online games are free. However, even the monthly US\$ 10 rate for games like "World of Warcraft" is low compared to the cost of movie tickets or DVDs. Moreover, these games can clearly aid in the socialization of players. The long-term engagement in MMORPGs and other online games can provide the gamer with both the social capital and the skills needed to succeed in integrating into various aspects

of the mainstream society and the virtual meta-society. Digital relationships potentially can also become serious friendships.

The premise of these games is based upon establishing group relations. Online gamers usually build communities or guilds that have common goals, characteristics, and attitudes. These features promote equal status among the players. Gamers have similar socioeconomic profiles, for example, they have congruent interests (mastering difficult tasks), similar hobbies (like reading adventure stories), and even similar lifestyles (young, urban).

An additional advantage could be that the social costs are reduced, because the lack of social context clues restricts the possibilities of discrimination (the names, dialects, facial features of the players remain concealed) as well as self-expression (like mime, gestures, language, look, and style in face-to-face meetings). The establishment of social relationships is voluntary, which might help to overcome ethnocentric bounds. The media-related construction of identities (e.g., gender roles) could help overcome one's real-life shortcomings. Even gender-swapping is possible and gender-overlapping friendships--an absolute impossibility in their tangible realities--could be easily established in game environments; other authors found that online gaming enhances IT and language skills.

Also, more than all other activities in the virtual world, gaming provides ample opportunities to expose second-generation and native-born Austrian youth to each other within *one* digital environment: the virtual world of the game. In these encounters the playing field is leveled: the rules of the game further equality by forcing cohorts to act according to certain codices and conventions, and eliminating ethnic and other advantages (because of the relative ease with which identity markers can be cloaked). In such an environment, we assumed that friendships might develop more easily between the second-generation and majority Austrian youth. Friendship practices between immigrant cultures and the host culture might in turn reduce prejudices like fear of crime or the "cultural takeover" by the immigrant culture. Thus, Internet activities, such as Online Role Playing Games, can be seen as platforms for cultural approximation and as settings for different ethnic groups to meet and interact in.

3. THE RESULTS: VISUAL STIMULI AND LOW-LEVEL CHAT

We found that the young people of Turkish descent in our cohort demonstrate a rather limited usage of the Internet in general and of gaming in particular. While they frequently use the Internet, they are more interested in entertainment and socializing than in education or information. Google, Netlog, YouTube, and msn were the most popular

features/services; watching videos, chatting and downloading music were the most popular activities among young migrants (originating from various countries of descent) – which were not significantly different from youngsters without migration background in Switzerland. The young Turks in Vienna customarily use the Internet for visual stimuli, music consumption, and low-level chat as well as for shopping. Almost half of our sample (6 out of 14), however, also frequently plays online games that represent a relatively broader portfolio of the digital world. Some of these games arguably have the potential to lead to personal enrichment of the gamers and to expand the social networks of the individual players. This, in turn, could lead to habit-breaking experiences, for example, such as the attempt to overcome real-life shortcomings. Some gamers might establish gender-overlapping friendships. Others might break taboos. While searching for skills or tool enhancements within gaming environments, others might enter Christian churches (instead of mosques), something they would never do in the real world. And a third group might remedy what the members miss in the tangible world. They might engage in habitual work in the game while being unemployed in reality. Habit-breaking experiences thus allow gamers to broaden their horizons and to begin thinking creatively about options and opportunities that exist in addition to the obvious ones.

In contrast to young men, young women of Turkish descent do not play online games or use other online platforms and networks, such as Netlog or Facebook, because they are afraid their families might learn about their Internet interactions and penalize them. However, young women frequently use other Internet communication tools, such as msn chat and email.

Instead of MMPORPGs, most young adolescent gamers of Turkish descent play sports games, ("Fifa 09") and race games ("Need for Speed"), both of which are in the Top Ten charts of the game market—as well as "Grand Theft Auto" and the Online Shooter game "Counter Strike." This data correlates with the gaming behavior of German adolescents, according to the 2008 JIM (Jugend, Information, Multimedia) Study.

Online role-playing games are also popular, particular with young Turks with relatively high levels of technology ownership, correlating with educational advancement. However, young people of Turkish descent are less likely to play games that cost money, such as "World of Warcraft," but are instead more likely to play free games that are also widely available on the web. Our interviewees also paid less attention to games based on SciFi and fantasy plots and were more interested in (action) games that use humanoid avatars.

For example, 6 interviewees frequently played Counter Strike, an online shooter game that is played in teams. Each team (or “Clan”) consists of 4 to 7 persons. A number of authors (Bushman and Anderson 2009) have argued that these rather antagonistic and violent games lead to a rise in aggression and hostility, cultivation effects and a potential for isolation and seclusion. The counter-arguments are numerous as well: that these games actually might provide relief from daily frustrations, allowing the young people to learn to deal with their own feelings. Shooter games most importantly provide young people with laboratories into which different identities (Turkle 1998) and relationships can be tested. Cheryl K. Olson (Interview in theGap 09/9) emphasized the positive learning effects of these games exactly because young people can “try out” other identities and experience what it feels like to be, for example, stressed or powerful. In these group games players can learn how other gamers behave in certain situations, and how their friends act in certain circumstances (usually young people like to play with acquaintances and friends). In these virtual gaming environments, experimental acting/probing is possible without risk.

Furthermore, gaming is considered a social activity that not only strengthens the circle of friends but also causes the gamer to move beyond his close-knit band of associates. The clan structure of some of these games, for example, Counter Strike, compels players to leave the familiar group of friends and acquaintances in search for other, unfamiliar gamers. The game structure encourages players to get to know the new gamers they meet (at least in the online environment). In online role-playing games such as “RuneScape,” “Metin2,” and “Cabal,” players can also establish relationships with a large number of previously unknown gamers. The configuration of the game supports group and community creation in the form of guilds because only one player cannot perform many game activities. The potential depth of these kinds of online relationships can develop from a short-term strategic alliance to a long-lasting sincere (gaming) friendship.

Despite these hypothetical assumptions, our survey has shown that young gamers of Turkish descent are rather limited to a certain locality (Vienna and surrounding areas) in their social relationships, their own ethnic culture, and their social milieu. In addition, adolescents of Turkish background express strong relationships with their parents and other family members, and their lifestyle is usually centered on the family and the peer group (Janssen and Polat 2006).

Homogeneous vs. Heterogeneous Structures: The Meaning of Friendship

Friendships among young people usually are established in gender (and culturally relative) homogeneous structures.

These are expressed through close friendships (cliques) and more loose acquaintanceships. The latter, less intense relationships are almost exclusively a function of geographic proximity. For example, Sercan, the 18-year-old gardener apprentice explains: “Mich kennt von jedem Bezirk die Hälfte” (Interview with Sercan 09/23/2009 BackBone, Vienna). This means literally “of each district half of the population knows me.” Thus, Sercan believes he is very widely known, not only in his immediate neighborhood but also in other boroughs of Vienna. Nevertheless, close friendships are relatively scarce and highly valued among this cohort. If asked how many close friends he has, Sercan answers “one, one good one. But I have many ‘bad friends’.” Thus, this young Turk, like many others in our sample, found his associations and developed these kinds of relationships mostly in the nearby districts, neighborhoods, parks, schools, and youth clubs, and rarely expands beyond the city borders.

For the male subjects of our sample, close relationships are based on personal knowledge (transitivity) and geographic proximity (“we know each other from the neighborhood [Wohnblock]”). Close friendships are frequently built on values of trust and support activities (both of which can be found more easily and shared by individuals who originate from the same cultural background), as well as the direct recognition of other group or clique members. To achieve this status, the young Turks must show dedication to these relationships and demonstrate a high commitment to their peer groups over long periods.

In addition, a homogeneity based on age and interests/hobbies exists within these groups. This relates clearly to the homophile thesis (Lazarsfeld and Merton 1954) that states that people who are socio-demographically similar are more likely to like each other. The close networks of the interviewees of this sample are usually based on age and gender homogeneity and include only very few people of non-Turkish descent.

All these variables point toward the existence of a high-context culture within the youth groups of Turkish descent (Hall 1976). In contrast to the low-context culture of the modern Austrian society, members of this high-context youth culture have a tendency to use high-context messages (“chillen”=hanging out often with friends, “chatten”=communicating in chat rooms) over low-context messages in routine communication. This particular choice of communication style is frequently used in societies that cater toward in-groups. In-groups consist of members with similar experiences and expectations, from which deductions and conclusions are drawn. In a high-context culture, many things are left unsaid, because the shared cultural context fills in the gaps. Words and word choice become very important in higher-context communication because a few words can communicate a complex message

very effectively to an in-group (but less effectively outside that group), whereas in a lower-context culture the communicator needs to be much more explicit and the value of a single word is less important. Because of the obvious limitations of high-context communication techniques in MMPORPGs, online role-playing games are less attractive for young Turks. We speculate that online gaming is a less attractive activity for the cohort of our sample because it does not provide the language and codes necessary for a successful engagement of people conversing with each other in high-context communication modes.

High-context communication furthers very strong relationships based on cultural homogeneity and geographical proximity. These strong relationships, however, add few new aspects or alternative views and ideas to the young peoples' experience. They do not provide new access to economic, individual, social or cultural resources, or to other social groups. Moreover, there is a significant risk of social isolation for members who exclusively engage with small homogeneous groups that lack contacts with the outside world.

This is why weak, loose networks are seen as crucially important for the societal integration of immigrants. Loose relationships are less emotional and intimate, rest on a limited set of interests, are constrained by a few selected identities (e.g., hobbies), based on a less extensive time engagement, and are easier to give up. These looser social networks also result in much more modest consequences if these relationships break up or undergo some other kind of trauma. Contacts based on loose networks introduce individuals to people outside their close family and friendship associations. In other words, looser social networks are crucial for the establishment of contact to individuals who are outside one's class and culture, and who have a different level of education and experience. These contacts eventually could lead to the discovery of new knowledge and information. They also can provide a person with a different understanding of one's patterns of action, social roles (behavior), and identity, which is not possible in one's own close-knit network.

Nevertheless, relationship deficits of this kind can be partly compensated for by computerized (computer-mediated) communication, and new relationships can be formed via the Internet (see, among others, Götzenbrucker 2009). The de-territorialization of relationships and identities (Hepp 2003) through the syncretic web can therefore be seen as an opportunity for social integration. For example, in online gaming, the community of players consists often of gamers who belong to diverse ethnic groups and live in different geographic locations.

Gaming and Real-World Deficits: The Case for Education

Gamers, however, compensate real-world deficits in the game environments. They engage in friendships that are outside their cliques within the online game and thus expand their real-world friendship group substantially. More than one third of our sample (6 out of 16) plays MMPORPGs and other Role-Playing Games at rather advanced levels and engages with other online players frequently, independently of the other players cultural background or geographic location. All six gamers are high school students and have gone beyond the minimal necessary level of education in Austria. Thus, we speculate that class, education, and the educational level of the parents influence the choice of spare time activity of these young Turks, pushing them to engage in activities that are more intellectually challenging and rewarding. These online gamers also own their own PCs and have internet access at multiple locations--at home, at school, in the library, etc.—in contrast to other interviewees, especially Turkish girls.

Media Lifestyles and Identity Formation: Gender Differences

Within our study, the most desired online activities remain listening to music, "hearing songs" (on Youtube), "chatten" to get to know each other (on MSN and Netlog), and to watch funny movies (on Youtube).

The male interviewees of Turkish descent in our study focus very much on picture contents and music (see also Moser 2009). Chatting (with MSN or Netlog.de) is also a lower-threshold activity (e.g., because one does not need to pay attention to correct spelling/grammar). Text-intensive offers such as blogs or wikis generally are not used. The computer is frequently privately owned, and the Internet is used mostly in the person's spare time. The cell phone is much more important than the computer and the Internet, because it can be used right away to stay in contact with friends. For example, Youtube (films and music) is preferably watched in groups, such as in youth clubs, because the young people do not own a private computer at home or there is frequently not enough room or privacy in the parental home.

Young male Turks in particular use Netlog.de playfully, creating their own profile sites, with lots of detail and work invested in portraying a cool image, often with the help of uploaded pictures. Hip Hop attitudes used by these adolescents are striking. The site also includes self-composed texts and "rhymez." Youth of Turkish descent use the site for identity construction and management, and also to improve their reputation: the more friends the better; the more blond women among their friends, the better!

Nevertheless, there are large gender differences regarding the use of Netlog.de (Schidolgu 2009). Male teenagers use the platform mostly to represent themselves and to get to know women. Female teenagers of Turkish descent are much more careful with the distribution of their data. They prefer the use of chat rooms, email contacts, and the cell phone. Their main argument against Facebook or Netlog is the fear that their private data (including pictures, feelings, and relationships) will become public and that their family would find out that this information is posted on the Internet. This could lead to dangerous conflicts with their fathers and male siblings, who feel that their daughters and sisters should behave in accordance with the honor and behavior codex of their Turkish culture. Young women of Turkish descent prefer to cover their faces in the depictions of themselves that they put on the Internet. They also frequently surf Turkish Internet dating sites like “Charismatic” and “Cingene” where they use pseudonyms as in the chat rooms. Young women also like to show themselves in enigmatic and mysterious photos or to use pictures of stars rather than themselves. Their real photos only get to be exchanged in person-to-person meetings (personal conversation with Ivana Martinovic, journalist for “das Biber,” an Austrian monthly whose readers are immigrants and immigrant children of Southeast European descent, as well as academics and other public policy activists).

Online young Turks—both men and women—tend to engage more in low-threshold activities, such as listening to music and watching videos. Both sexes also frequently visit online dating sites. However, while young male Turks use sites based on German servers as identity formation platforms that allow them to experiment with their image and polish their reputation, young female Turks are much more cautious; they use mostly Turkish sites and hide their true identities in various ways.

4. CONCLUSION

This paper has analyzed the integration of teenage members of the second generation of Turkish descent into the broader Austrian mainstream society through Internet activities. We found that these young Turks who use the Internet to carry out high-threshold activities, such as blogging, and gaming usually hold higher degrees or attend schools beyond the minimum required school years. Although only a minority of interviewees engages in these activities, we realize that these teenagers do so in spite of substantial economic barriers and other real-world deficits. Thus, the online pursuits of the individual—leading to the possibility of integration into mainstream society, through, for example, the establishment of heterogeneous friendship patterns with other gamers—portend well for the successful integration of young people with immigration backgrounds. The majority of our interviewees, however, use the Internet

almost exclusively for low-threshold activities, such as listening to music or as an online dating resource. Social network sites are not very useful as resources for the development of weaker relationship structures that are considered horizon broadening, with a potential for personal advancement and career enhancement because of their interconnected structures. They are used for finding a romantic partner. In contrast, in online role-playing games, the players engage in more long-term relationship building that is not exclusively based on specific relationship qualities, but rather centers upon the expansion of the gamers’ individual sphere of influence. For the interviewees of this sample, their friendships are based on closed relationships, usually based on age, gender, and ethnic homogeneity. They include only very few people on non-Turkish descent. These strong relationships do not provide new access to resources nor to other social groups. Moreover, the risk for social isolation remains significant. This is exactly the reason why diverse, weak networks are seen as crucially important for the societal integration of immigrants. New media and technology does not provide the second generation with sufficient incentives and possibilities to create weak networks.

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The States of Sub Saharan Africa on the way to the Global Information Society

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ABSTRACT

The paper devotes to the problem of overcoming of the digital divide in the Sub Saharan African states. On the example of Kenya the author speaks about the comparative success in the development of the information technologies in Africa and in turn underlines the most significant obstacles on the way of African states to the global information society and suggests the means how to overcome them.

Keywords: Sub Saharan African states, information society, information and communication technologies, information policy.

1. INTRODUCTION

The present level of the development of the information technologies in Africa doesn't make it possible for the States of Sub Saharan Africa to integrate in to the global information society. This is due to several reasons, but the principal one is that there is lack of well considered strategies of the formation of the information society in African states which would be fixed in official documents.

Though today it is clear enough that the states of Sub Saharan Africa begin to pay increased attention to the problem of the proliferation of information technologies in their national policy. To our opinion, this policy is not aimed at the rise of living standards of the ordinary African people, but at the reduction of the rising digital divide from the well developed states in order to possess equal rights in the international relations. In that case they are speaking about the development of the information and communication technologies (ICT) in urban areas whereas the rural areas are straying completely undeveloped. That's why we can conclude that the most significant obstacle on the way of the Sub Saharan African states to the information society is the problem of internal digital divide between urban and rural areas. It is clear enough that the presence of the ICT in big sites doesn't indicate the level of the e-readiness of the country in whole. Our point is that they can construct the information society only in case if every human being from every part of the country will have an access to the ICT. And only after overcoming the internal digital gap the country will be able to pretend for the place in the global information society.

In this paper we propose the overview of the problem of digital divide basing on the example of Kenya. We have chosen this country due to several reasons. Firstly, Kenya is one of the most developed countries in the region and has been pursuing a consecutive informational policy for at least ten years. But the final realization of the informational policy had met the same obstacles in Kenya as in the vast majority of African states. Therewith we have

been in Kenya in April 2010 and had a chance to measure the real level of the development of the ICT in the country.

2. BRIDGING THE DIGITAL DIVIDE

The problem of the overcoming of the digital gap is one of the most important problems of the social and economic development of African States which was mentioned in the Program of the New Partnership for Africa's Development (NEPAD) in 2001 as the key factor of the sustainable growth of the States of Sub Saharan Africa [1]. This disposition was further reflected in different national strategic visions of the development.

For example in Kenya "Vision 2030", which seems to be the most general official document aimed at the coming up to the sustainable social and economic growth by the year 2030, which was adopted in January 2007, they have underlined three pillars on which the social and economic development of the country is based: the economic one, the social one and the political one. And ICT forms, according to the "Vision 2030", the backbone of each pillar [2]. That's why the elaboration of ICT sector in Kenya seems to be one of the major priorities of the national development.

The National Information and Communication Policy of Kenya have been elaborated by the Ministry of Information and Communications in the early 2006. This document has outlined the major priorities in the development of the ICT sector.

Challenges of the development of ICT: Kenyan view

To our opinion the most important point of the National Information and Communication Policy of Kenya comes to the declaration of the private-public partnership in the ICT sector. That means that the private sector is responsible for the creation and modernization of the adequate ICT infrastructure and for ensuring the universal Internet access. But the government should regulate the activity of private companies and create a favorable environment for private investors. That's why it is clear enough that the creation of an adequate legislature is one of the most important tasks of the Kenyan Government.

The National Information Policy of Kenya has underlined all key factors in the further development of the ICT in every country.

Policy, legal and regulatory framework: In the Information and Communication Policy of Kenya they notice that the present Kenyan legislature is rather poor and inadequate and can't regulate the permanently transforming and modernizing information relations. That's why there is necessary to elaborate and adopt the new legislative base and a regulatory framework in order to support the development of the ICT sector of the country, to promote competition in the industry and to support researches in ICT.

ICT infrastructure: It is clear enough that the lack of adequate ICT infrastructure put the serious obstacle on the way to the provision of the ICT services in the country. Thereupon the Kenyan government underlines the necessity of the development of the whole system of the ICT infrastructure including the support infrastructure such as energy and roads, the country wide optical fiber network and the software and hardware development.

Human resource development: The Kenya government recognizes that the human resource development play an important role in the social and economic development of the country. That's why the government declares the necessity to promote ICT in primary and secondary schools, to set up a framework for evaluating and certifying ICT training programs and courses and to develop a mechanism for attracting and retaining skilled human resources.

E-learning: In order to develop the Kenyan national e-learning platform the government recognizes that it is necessary, firstly, to provide an affordable infrastructure and to promote the development of local digital content aimed at the educational needs of primary, secondary and tertiary institutions. Secondly, the government should facilitate sharing of e-learning resources between institutions. And, finally, it will be necessary to integrate e-learning resources with other existing resources.

Universal access: In the National Information and Communication Policy of Kenya they recognize that nowadays the access to ICT services is mostly limited to a few major towns leaving out the rural areas of the country where most Kenyans live. In order to ensure the universal access to the ICT services all over the country, not only in Nairobi, Mombasa and some other more or less big and significant towns of the country, the Kenyan government has obliged to supply the national ICT sector by adequate resources, to develop the requisite ICT infrastructure and to elaborate incentives for service providers to deploy services in rural areas.

E-government: The Kenya government declares the necessity of the development of the key principals of the concept of the e-government in order to provide governmental services in an efficient and effective way. It is clear enough that the e-governmental platform simplifies the communication and information provision within Government, with the citizenry and the business community. But in order to unroll the e-governmental platform, from one side, it will be necessary to develop an adequate capacity within the Government, to provide required skills for the staff and, from another side, to ensure the universal ICT access for the vast majority of Kenyans, especially those, who live in rural areas. But it is clear enough that the simple availability of the public ICT access centers and the technical opportunity to connect every computer to the Internet all over the country won't set the tremendous growth of the usage of ICT services itself without elaborating the effective national programs of the modernization of rural primary and secondary schools. Only in that case there will be possible to educate the new generation of citizenry who realize the benefits of the usage of ICT services and e-government platform in particular. Nowadays as far as we could observed during our research undertaken in Kenya in April 2010, even a vast majority of school-leavers from expensive private schools don't know how to use the modern computer technologies what forces the Kenyan universities, for example, United States International University in Nairobi (USIU), to implement special courses of computer literacy for the first year students.

E-commerce: The Kenyan government recognizes the importance of the implementation of the e-commerce service. Thereupon they declare the necessity of elaboration and adoption of an adequate legislation in order to support the development of e-commerce.

The development of local digital content: The Kenya government compares the ICT with a conveyor of information which provide opportunities for local people to communicate with each other expressing their own ideas, knowledge, heritage and culture in their own languages. It is very important if the country is pretending for the equal integration to the global information and communication space. In order to achieve this goal the Government proclaims the development of national digital content in local languages and to stir up the process of convergence of the local cultural heritage.

Electronic security: It is necessary to underline that nowadays the problem of e-security has become an important feature of the national security. That's why the Kenyan government declares the need to establish an adequate national legislative base in order to ensure the network security, the reduction of cyber-crimes and terrorism, and to establish mechanisms for international cooperation to combat cross-border crimes.

Kenya on the way to the information society: problems and prospects

As one can understand from the above mentioned documents Kenya government attach great importance to the development of ICT sector in the country. This policy take place from the year 1980 when they have published an official report considered the further development of scientific and research centers of the country. In this document they have mentioned that without development of the national science it was completely impossible even to speak about the independent development of Kenya. And they recognized the dependence from foreign researches, which extremely serves foreign interests but not national ones. That's why the Government have recommended to the research centers such as University of Nairobi and Kenyatta University College, which have the greatest concentration of scientists in Kenya, to involve personnel in a collaborative effort to identify problems requiring research attention and in devising research strategies and developing research programs [4]. But the development of the national research foundation has stroked on the lack of financial base. As we could ascertain nowadays the State finances only the 40 % of the expenses of the University of Nairobi which is not enough even for paying salaries for the researches and lectures. But the vast majority of reach Kenyans prefer to send their children to study in private universities such as United States International University and Stratmore University rather to the national ones.

In order to ensure the realization of the "Vision 2030" and the National Information and Communication Policy the Kenyan government has adopted a number of national strategies and action plans devoted to the development of ICT in the country.

Thus the Ministry of Information and Communications of Kenya has elaborated the Strategic Plan 2008-2012 which produces a strategic middle term point of view how to develop Kenya as a globally competitive and prosperous nation by creating an enabling environment that encourages and enhances the development, expansion and use of the ICT. In order to achieve this mission the Strategic Plan underlines three key strategies:

1. To improve universal access to ICT services to the public by developing the appropriate infrastructure,

establishing digital villages and providing affordable ICT hardware and software.

2. To build the human capacity within the ICT sector through establishment of ICT training programs.

3. To enable public service provision through e-government [5]

Another document of that kind is the Strategic Plan of the development of ICT sector for the period 2008-2013, elaborated by the Communication Commission of Kenya. The mission statement of this document is to facilitate access to communication services through enabling regulation and catalyze the country's socio-economic development [6].

In order to obtain the main goals proclaimed in the above mentioned official documents the Government has set up a number of ICT strategies aimed on the development of ICT sector.

Indeed the reforms of the ICT sector in Kenya have started in the early 1998 when the Kenya Communication Act has been adopted. This Act put the end of the monopoly on the communication market of the State Postal and Telecommunication Corporation. The Act proclaimed the creation of Postal Corporation of Kenya, the Telecom Kenya Limited and the Communication Commission of Kenya. The Commission should become the regulatory authority for the communication sector in Kenya. Its initial mandate, proclaimed in the Act of 1998 consisted in regulation of the telecommunications and postal subsectors and in the management of the country's radiofrequency spectrum [7]. Ten years later the Kenya Communications (Amendment) Act 2009 had extended the power of the Commission which have become not only the regulatory authority responsible only for the licensing of server providers and other telecommunication companies but an authority responsible for facilitating the development of the information and communications sectors (including broadcasting, multimedia, telecommunications and postal services) and electronic commerce [8]. Besides the Commission is responsible for the annual monitoring of the intensity of the ICT development in Kenya basing on which it elaborates recommendations how to improve the situation.

During our time being in Kenya we could supervise that Kenyan Government was able to make a comparative success in the development of the ICT sector. Though according to data produced by the International Telecommunication Union (ITU) nowadays Kenya by the level of the development of ICT sector rank only 116 position in the global rating of the countries [9].

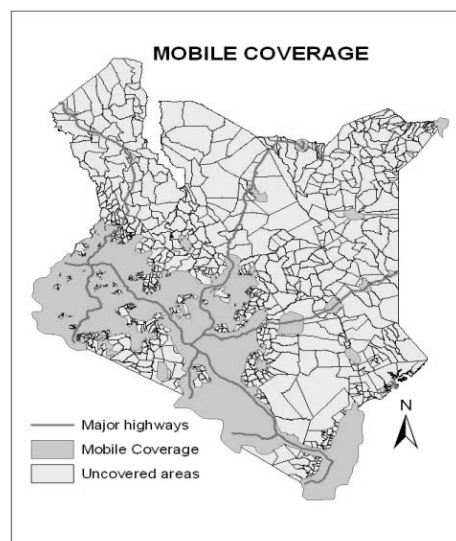
As we could ascertain on our own experience the mobile telephony is rather developed in the country. According to recent data in December 2010 they fixed about 19.5 mln. of mobile subscribers. This fact gives us an opportunity to conclude that about 50 % of the Kenyans use mobile telephones [10].

Nowadays in Kenya there are four main private mobile operators, but all of them belong to the foreign investors. For example Safaricom is a joint venture with British corporation Vodacom, Zein belongs to the investors from Kuwait, Yu – to the investors from India, and Orange is a branch of the French mobile operator Orange which is a part of the French Telecom. And even the greatest parts of shares (51%) of Telecom Kenya which used to be a national telecommunication corporation belongs to the French Telecom. Thus we can conclude that the Kenyan information and communication space is fully handed to the foreign investors.

Therewith the development of the mobile communication which have been declared and the attraction of big private investors don't mean that the

significant part of the country will get the mobile coverage in the nearest future. The figure below demonstrates that only the south of the country has the mobile coverage.

Figure 1. Mobile coverage



As regards to Internet we can conclude that despite all the efforts undertaken by the Government nowadays only 9 % of the Kenyans have the fixed Internet access especially in Nairobi, Mombasa, Kisumu, Nahuru and some other more or less big towns[11].

The breakthrough of the development of the broad band internet has happened in the year 2008 when they have finished the submarine cable system going from Johannesburg through Mombasa to OAE. The shutdown of this project made it possible to reduce the tariffs for Internet access. Telecom Kenya and Kenya Data Network, two biggest Kenyan service providers have begun to construct a ramified optic fiber cable system in order to assure the access for the high speed Internet. According to the general strategic plan they are going to expand the broad band Internet over 80 % of the territory of the country. But for the moment there are few backbone optic fiber lines from Mombasa passing through Nairobi via Kisumu [12]. But in the development of the modern broad band Internet connection there is a serious problem due to the scarcity of the optic fiber cable itself. The company put the cable but during night time somebody takes it out, cut some pieces and sells them. Due to this business some parts of Nairobi can rest without any Internet connection for a long time.

But of course it is not the only obstacle on the way of the spreading of high speed Internet. The serious problem is the technical solution of the technology of last mile in order to connect every village to the global network.

Nowadays all mobile operators provide a 3 G mobile Internet which in theory can produce an Internet access in the whole region which is under the mobile coverage. But even in the south and center parts of the country there are a great number of villages without electricity where it is completely impossible to use personal computers. That's why we can conclude that the problem of the electrification of African villages is one of the most

serious obstacles on the way of the spreading of the ICT in the rural areas. In urban areas the Internet is more or less well developed but still it isn't very fast. For example in Nairobi the average speed of the Internet, even in University campus which has connection to the optical fiber cable comes to 512 bit/sek. And it is rather low.

The Kenyan government pays great attention to the development of the e-government strategy. The Government believes that the achievement of the strategy will help:

1. Improve collaboration between government agencies through reduction in the duplication of efforts, and enhance efficiency and effectiveness of resource utilization;
2. Improve Kenya's competitiveness by providing timely information and delivery of government services;
3. Reduce transaction costs for the government, citizens and the private sector through the provision of products and services electronically;
4. Provide a forum for citizens participation in Government activities [14].

The Kenyan Government has established the specific e-government Program in June 2004. Firstly the realization of the strategy supposes the complete modernization of the national government itself. Now all governmental Ministries dispose of their own Internet sites and every year they send a significant number of employees from Ministries to attend special courses of computer literacy [13]. Besides they have initiated the process of procurement of new computers and the construction of Optical fiber-based Government Common Core Network which must connect all governmental Ministries between each other.

But never the less there are serious obstacles on the way of realization of the strategy:

1. The process of procurement of new computers is bureaucratic and slow. Besides end-user software and hardware are not centralized.
2. Quality of the network infrastructure isn't sufficient for the complete realization of the strategy because of low speeds and limited network management.
3. As a rule the modernization concerns only central governmental Ministries in Nairobi whereas local ones stay fully unmodernized. Besides the vast majority of local governmental structures know about the implementation of the e-government strategy from mass media but not from the special governmental circulars what says about the bad communication between central and local governmental structures [16].

In addition the realization of the e-government strategy depends from the arrangement of the Universal Internet access in order to let the Kenyans to use governmental services electronically. That's why in 2007 they have launched the Digital village project which supposes to organize a public internet access points in almost every Kenyan village.

But in our opinion such points will be demanded only in case of growth of the educational level of the Kenyans. That's why it comes to be clear enough that all the most popular modern internet services, including e-government, will become popular only in case of the capital reform in educational sector and the comprehensive penetration of the ICT in the educational process in all levels.

The Kenyan government understands that in order to ensure the usage of all Internet services it is necessary to stimulate the development of the ICT in high, secondary and even elementary schools.

That's why in 1999 there was established the National Research and education network the Kenya Education Network Trust (KENET) which is responsible

for the development of the ICT in educational sector and for the improvement of the information exchange between Kenyan universities and research centers.

The KENET aims to interconnect all the Kenyan universities and research centers by setting up a cost effective and sustainable private network with high speed access to the Internet. Besides, the KENET facilitates electronic communication among students, researches and faculties in member institutions [16].

Nowadays KENET provides the high speed Internet access to 42 member institutions for a monthly cost of 2330 USD instead of the commercial price of 3000 USD. Besides KENET is a founding member of the UbuntuNet and now negotiates for the direct access to the East African submarine optical fiber cable system in order to further reduction of the cost for international Internet bandwidth to its member institutions. Apart of the basic service of providing Internet access to the member universities and research centers, KENET aims to transform and strengthen its member institutions by actively promoting the use of ICT in teaching, learning, research and management. Another objective of the KENET is to provide a research network for the researches in the leading universities in order to ensure the development of the exchange of information among the researches from different research centers [17].

The analysis of the ICT development in the high school shows that the vast majority of the Kenyan universities recognize the important role of ICT in the educational process including teaching, learning, research and management. But as we could see during our time being in Kenya there was a number of obstacles in the way of the implementation of ICT in the Kenyan high school. The experts who were engaged in the elaboration of the KENET Strategic Plan 2007-2010 have identified the following weaknesses [17]

1. Low investment in the ICT infrastructure in most of the member institutions, most of which still don't have integrated campus network infrastructure.
2. Lack of institutional ICT policy and framework – most institutions don't have any formal policy and organizational structure for ICT.
3. Limited human capacity:
 - most senior managers are not aware of the strategic impact of ICT;
 - technical capacity in member institutions is limited or non-existent;
4. Limited ICT funding:
 - most institutions have small ICT budgets;
 - there is limited funding for KENET investments and operations.
5. Lack of a sustainable business model, both in member institutions and in the KENET itself which highly depends on donations from the Communication Commission of Kenya, member institutions and development partners.
6. Weak and inadequate linkage with strategic industry partners.

In addition to the abovementioned points we can add that the development of the ICT in the high school even if there is enough money fully depends on the effective management. Several years ago the US International University in Nairobi had no ICT infrastructure at all. It had happened because of the lack of an effective management. It is rather expensive private university and it has a significant financial base. But due to the ineffective management almost all computers in the university were out of work. But when two years ago the post of the director of ICT department had hold Redgina Mutoko she has dismissed the previous IT team and

employed a new one and it has become possible to straighten out the situation. Now the University disposes of 800 computers, 400 from which are for the students and 400 – for the lecturers.

Unfortunately the vast majority of Kenyan universities especially a national ones still has serious problems with the building of the internal ICT infrastructure. But it is clear enough that only in case of the comprehensive implementation of ICT in the educational process from one side it will become possible to ensure the further development of the national researches in the field of the ICT and, from another side, to bring up a new generation of the well educated Kenyans who know the benefits of the every day usage of the ICT. Thereby the modernization of high school is the principal circumstance of the construction of the modern information society in Kenya.

3. CONCLUSION

As it have been illustrated in the paper, despite the comparative development of the ICT sector in African states, as it was shown on the example of Kenya, there are still a number of obstacles which in total impede the formation of the information society in African States. The most significant of them are as follows.

To our opinion the real formation of the modern postindustrial information society in the region is possible only if the mentality of the ordinary African people will change according to the demands of the postindustrial network society. In other words, people in Africa should reconsider their attitude to the modern information technologies and to learn how to use them in their everyday life. They need to realize the advantages of the modern information technologies and to be ready for training during the whole life in order to get adopted to new information and network technologies. For as long as it doesn't happen the information technologies in Africa will remain mainly an elite one.

Nowadays the vast majority of African people, especially those who live in rural areas, don't view the Internet as the effective mean of intercultural communication. To our opinion it is possible to overcome this situation only if the State will elaborate the well developed national policy and strategy of the implementation of the modern information technologies in African society which would be aimed at the popularization of the informational and communicational technologies and networks in Africa.

Implementing its national information policy the State should aim at the broad implementation of the modern information technologies to all spheres of the society including business, government, mass media and private life of ordinary African people. It is necessary to underline that the State should create favorable conditions for its people to use information technologies, especially by creating the branched network of the public internet centers not only in big cities but also in rural areas. According to the data produced by the International Telecommunication Union at present, public internet centers are set up only in 1520 African villages out of 400 000 which make up less than 1 % of the total amount of African villages [18].

Of course this is impressive fact but still more important is the fact that in rural areas people are mostly illiterate.

That's why the precondition for African States on their way to the global information society is the rising of the educational level of ordinary African people. It is necessary to say that this problem is a subject of the

discussions in different intergovernmental forums including the "G8" summits.

But despite the decisions elaborated in such summits according to the data produced by the World Bank, at present more than 40% of the Africans remain illiterate [19]. And it is clear enough that without solving the problem of traditional illiteracy it is almost impossible to solve a computer one.

That's why it is important also to include fundamentals of computer literacy in the programs of high, secondary and even elementary schools. It is necessary to do this in order to produce in Africa a new modern generation of people of the new postindustrial informational age.

An other main point is that in implanting their national policy in the development of information technologies the States of Sub Saharan Africa should pay more attention to the problem of the popularization of African languages in the Internet.

At present, the vast majority of the information allocated in the Internet is presented in European languages, especially in English. And the share of English language in the Internet, according to UNESCO's data, makes up more than 70% whereas the share of African languages is less than 1 % [20].

Of course taking into account the fact that there are more than 2000 languages in Africa it is impossible to present all of them on the Internet. That's why it would be reasonable for African states to pay attention to the most popular language of the region, e.g. Swahili or Hausa and to translate the Internet sites aimed at the local audience in to those languages. These measures will permit to reduce the cultural dependence of African States from its more developed Western partners and to construct a self-reliant information society based on the cultural and national identity of African States.

Another precondition of the construction of the information society in Africa will be the implementation in the region of the basic principals of the concept of the "E-Government". That means that in African States their should appear the special governmental computer systems aimed at the establishment of the effective communications between governments of African States on the one side and the ordinary African people, private sector and public organizations on the another.

It is clear that the realization of the concept of the "E-Government" makes the government more democratic and transparent for its people and, besides, it increases production efficiency of the State.

It is obvious that the present level of the development of the information technologies in African States doesn't permit the implementations of basic principals of the "E-government". Particularly almost the complete absence of the Internet in rural areas puts serious obstacles in the implementation of an effective E-dialog between the government and the population with the use of the modern information technologies.

Finally, the precondition for African States on their way to the global information society is the elaboration of effective informational laws which would respond the demands of the postindustrial informational age. It means that the States of the region should elaborate the legislative rules which would guarantee the observance of the basic principles of the free receipt and usage of the information.

That's why it is necessary to adjust the problems covering the informational process in general; the activity of Internet-providers in order to exclude the monopolization of the informational market; the Internet itself and the information spreading with aid of the global network.

Only the comprehensive implementation of all the abovementioned frameworks can finally lead to the construction of the modern information society in the States of Sub Saharan Africa which wouldn't be just a copy of a Western model of information society but it would be a self-reliant African model based on the national and cultural identity of African States and nations. We should add that each African State should elaborate its own self-reliant way of the development of information technologies. Of course for the vast majority of African States except South Africa and the more or less well developed Northern African States it is rather difficult task.

But the States of Sub Saharan Africa can try to join their forces and to create the integrated Pan African informational and communicational space. In our opinion it is the only way of solving one of the most important African problems – to overcome the “digital gap”.

As we can see, despite of all the difficulties African States try to promote the Pan African integration process. Thus in 1996 the UN Economic Commission for Africa on the initiative of the African States have elaborated the Africa Information Society Initiative (AISI). The general idea of the AISI is to help the African States which approve the AISI to elaborate the national strategy of the development of the information and telecommunication infrastructure basing on its national priorities.

According to its designers the AISI is not just a technology but an effective mean of the raising the living standard and poverty reduction in African States. That reaffirms the point that the development of the information technologies in Africa and the possessing integration of African States to the global information society is one of the key factors of the social progress and economic growth in the region.

But one can reach this goal only with the aid of the well developed national information policy. The African States recognize that, that's why they underline the necessity of the development of national strategies and action plans of the implementation of information technologies. Only then it becomes possible to stir up the regional and sub regional information and telecommunication integration in order to create an integrated Pan African information and communication infrastructure which may lead to the foundation of the self-reliant African informational community.

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Cultural Mapping: the Semantic Web as a survey tool for the construction of the Cultural Plan

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ABSTRACT

The research falls within the studies of the methodological approach to the cultural planning. In particular, we have focused on how the technique of cultural mapping, which is currently considered the first phase of the construction of the cultural plan, might be considered the key to identify the potentialities of the territory in the framework of urban development.

In our scientific approach cultural mapping is not only used as a mere tool of gathering information, but it becomes also a means of consultation, in order to highlight the cultural traits of a community or a city, involving citizens in the decision-making. All of this is possible thanks to new technologies. The potentialities of the Semantic Web applied to a Semantic Geo Browser are the fulcrum of these technologies. In this sense we wonder if the use of new technologies in building cultural networks may encourage the affirmation of a culture in the web network, on different levels of demand, through the action of cultural actors.

Furthermore, is it possible to conceive a cultural plan that could be not only a support to decisions and policies, but also an useful way to involve citizens?

Keywords: cultural plan, semantic web, cultural mapping.

1. INTRODUCTION

The research falls within the studies of the methodological approach to the cultural planning. In particular, we have focused on how the technique of cultural mapping, which is currently considered the first

phase of the construction of the cultural plan, might be considered the key to identify the potentialities of the territory in the framework of urban development.

While the technique of cultural mapping was used by agencies such as UNESCO or ASEAN to understand and

represent the history of indigenous people or to describe the traditional activities of a territory, we suggest an idea of cultural mapping as a process of gathering, recording, analysing and, finally, synthesizing information. We mean a method to describe and depict resources, networks and links within a group or a community.

In our scientific approach cultural mapping is not only used as a mere tool of gathering information, but it becomes also a means of consultation, in order to highlight the cultural traits of a community or a city, involving citizens in the decision-making.

All of this is possible thanks to new technologies. Within the research project coordinated by Professor Antonino Porrello the Sistema Informativo Semantico delle Risorse Culturali (SISC – cultural resources semantic informative system) has been implemented which allows us, on one hand, to define the state of a territory and its cultural offers and, on the other hand, to let all stakeholders and users share the actual implementation of cultural mapping. The potentialities of the Semantic Web applied to a Semantic Geo Browser are the fulcrum of these technologies. In this sense we wonder if the use of new technologies in building cultural networks may encourage the affirmation of a culture in the web network, on different levels of demand, through the action of cultural actors.

Furthermore, is it possible to conceive a cultural plan that could be not only a support to decisions and policies, but also an useful way to involve citizens? Eventually, from a strategic point of view, can we think of the application of the cultural planning as an effective instrument that does not exhaust its proactive charge just in drawing the plan? Oppositely, may it become a means to build a continuous and direct relationship between territory, stakeholders, institutions and citizens?

We have tried to find an answer to these and more queries through a theoretical study as well as a practical case study in the Veneto Region (Italy).

2. THE APPROACH TO CULTURAL MAPPING

Over the last decade the phenomenon of globalization has responded in a more or less conscious way through a reevaluation of the local with the identification of quality as an engine of local development. There are many measures of planning, programming and policies which, especially in Europe, focus on development capacity deep-rooted in the territory or urban environments. The picture that we have is varied. Just think of the topic of landscape which is increasingly thought as an expression of places culture and not only as a set of non-reproducible cultural heritage [1].

Another example are urban regeneration programmes which put side by side purely architectural-planning actions and inquiry activities which aim to draft social and cultural regeneration policies, with particular attention to "places". For instance, it may be useful to cite strategic plans as well, which, in a medium long-term, intend to achieve a good balance between the dynamics dictated by globalization and the demands that emerge from local contexts even (and above all) in the social field and in the fields of economy and culture.

In this general context, we include cultural mapping, considered one of the primary tools of research and investigation in the cultural planning. This is the reason why, in our approach, it is the first step in building a cultural plan. At first, the characteristics of cultural maps were based on the collection of data - analysis and synthesis of cultural information. These data were represented on the maps with the aim to highlight the network and the relationships between different communities or groups. As discussed below this first stage of the cultural maps has been overcome thanks to the contribution of new technologies. Within the disciplines related to cultural planning, among the many tools used perhaps community mapping [2] is the closest to the cultural mapping. The community maps are placed halfway between the participatory planning and creative investigation and can be defined as "a reflection on the specificities of a given community" [3].

This reflection starts from the hearing of local communities and ends with the graphic representation of the peculiarities of an area through a map which does not necessarily reflect the canons of official maps, in fact often reverses the sense. The knowledge that you have of the place at the end of the process, ensues much more enriched and likewise the planning process, traditionally associated with technical and partial knowledge.

The need of resorting to community maps has arisen during the last two decades with the strengthening of the two opposite (but in one sense complementary) dimensions of global and local.

On these two issues it has been already argued in depth and we are aware of the fact that it will be an argument discussed even in the future; nevertheless, in our researches, we focus on how globalization and localism are urging each other in creating the bases of self-government communities, which go with a greater awareness and understanding of cultures and places where people live [4].

In this context, "the growth of place awareness" [5] takes on the value first of all as a moment of regeneration of dormant knowledge; secondly, as a moment of reflection on the citizenship itself and its government; finally, as a moment of "re-appropriation of the innovative and proactive potentialities within a given territory and population" [6]. The community maps are born, then, within this adversarial climate and suggested - through processes of inclusion and participation of citizens - to focus on what makes a community and a place unlike any other and therefore worthy to be told, lived and developed. The aim is to set in motion a process that manages to capture the ability of a territory and population settled in it, that the meanings commonly associated with places, values, cultural stratification that has really passed in time to a particular component population. As in a participatory process, where through listening techniques, such as the meetings with citizens, assemblies and workshops, in community maps several points of view are taken into account, as many as the taking part stakeholders and the concerned interests [7].

If you associate the process of cultural mapping with the community maps briefly described above, it is easy to imagine how, from a simple tool of analysis, cultural maps may become a more complex and comprehensive process of investigation.

Through citizen involvement and bottom-up inclusion processes, typical of community planning, it is possible to seize both the relationship and the cultural potentialities of a place and/or a community. The instrument in question is useful exactly because the subject includes both tangible and intangible assets and resources, such as identity, relationships and action possibilities. Consequently, in our approach, in establishing a cultural map the first step is a quantitative evaluation of cultural resources; afterwards, it must be followed by a second phase of through examination by (means of) qualitative analysis of resources, activities and policies.

It is evident that quantitative and qualitative surveys may coincide, as for the community maps process. Through the different stakeholders involvement in drawing up a cartographic report of offers and cultural potentiality, in fact, it is possible to have not only a detailed summary of the events quantities or of the employed resources, but also of their quality connected to a future planning.

Furthermore, the inputs provided by a community, although just through some significant representatives and not in its entirety, enlarge the level of knowledge of technicians and decision-makers. Those inputs create

shared expectations, collective interests and a greater degree of success and development of cultural activities besides the community and the territory which are studied. The possibility of seizing the capabilities of a place and its inhabitants is directly proportioned with the opening and the citizens inclusion in decision-making [8]. The cultural mapping process - as articulated above - not only simplifies the understanding and sharing of culture, but also creates a time and a place to think the history of the area and community over; it promotes creativity and development, creates new prospects in terms of a cultural plan already shared and accepted in its preliminary remarks. Moreover, through the investigation process of cultural mapping, it is possible to identify needs and requirements more specifically in terms of cultural demands of a population. Finally, you can understand a territory according to the eyes of those who live there, thanks to the possibility of seizing, the cultural proposals which lack or which should be further developed, through innovative methods of investigation.

3. MAPPING NETWORK

The original concept of cultural mapping, expressed by Marcia Langton and quoted above as a method of representation of resources, networks and links in a group or a community with their own geographical location [9], has evolved as a consequence of the development of informatic technology, settling finally the extension of cultural mapping to the Internet.

Here, an object (a resource) is characterized by an additional "network" coordinate, in other words, an address (URL) that uniquely identifies the object on Internet.

The network mapping offers extraordinary opportunities since it connects the intelligence to current web structure.

The web we know today, the resources are connected by a physical infrastructure (the Internet), but not from a semantic point of view. Carrying out a network based on concepts, and not only on physical connections and keywords, can be a great advantage as real "intelligence networks" can be achieved even though they are limited to specific areas of interest [10].

Towards semantic interoperability

Sharing knowledge on the Web means that you can have at your disposal tools and technologies which allow to express the contents and to structuralize and adequately show them. It makes explicit the semantic and allows everyone to enjoy information, regardless of particular cultural background and technological context. In the field of cultural heritage, in which tradition and cultural settings coexist and are difficult to change, it is important to achieve the semantic interoperability, breaking down cultural differences, without forcing anyone to give up his/her own.

This problem seems to find possible solutions within the context of the research "Semantic Web", which combines skills and different interests, pursuing the objective of creating a Web in which the interaction between machines takes on great importance. Furthermore, the

information, enriched by metadata, can be used in a more effective way by intelligent software agents.

An essential feature of the cultural heritage sector is the deeply multi and inter-disciplinary approach. Cultural objects are not isolated entities. At the contrary, every piece of information should be placed in its spatial, temporal and cultural context, according to associative paradigms based on space, time and semantic relationships between concepts and, sometimes, on their combinations.

The approaches commonly adopted in other application environments are not always adequate, for example, the temporal aspect has a particular valency as both geography and the meaning of some terms may change over time, and a lot of dates are known with approximation. As a consequence, it is necessary to define a suitable temporal algebra which allows to manage correctly the dates (punctual or durative), their order and any superimposition or disjunction of time intervals.

In a broad and decentralized context such as that of the cultural heritage and the Web, the integration of information is particularly important. In this process the role played by a core ontology is essential: its aim to provide a global and extensible model in which data from disparate sources can be put in correspondence and integrated.

This canonical form is able to provide a single base of knowledge for tools and cross-domain services (resource discovery, browsing, data mining). The existence of a single model reduces the combinatorial complexity that arises from the attempt to put in correspondence the individual formats of metadata or ontologies. The distinction [11] between a core ontology and the definition of core metadata (eg Dublin Core) is thin but important. Although both seek to integrate information, they differ as to the importance attribute to the comprehensibility by a human reader.

Metadata are compiled and used primarily by humans, while a core ontology is a formal model used by tools which provide integration of various data sources and perform many other different functions. Consequently, while human factors, particularly the readability, are a key element in the definition of core metadata, a core ontology can accept a greater level of complexity, focusing on the completeness and logical correctness and not on human comprehension. All data are fitted out with metadata, whose semantics is coherent with that one adopted by the conceptual model of the domain.

The possible relationships between descriptive elements and metadata are contained in a space of concepts (concept space), which is used by software agents to identify possible associations among documents and to implement the appropriate interaction paradigms (space, time, classification, and their combinations). The space of concepts is not necessarily unique; therefore, it needs a translation and harmonization function between a descriptive scheme (data or terminology) and another.

Interoperability is the ability of an informatic system or product to cooperate and exchange information or services with other systems or products in a more or less

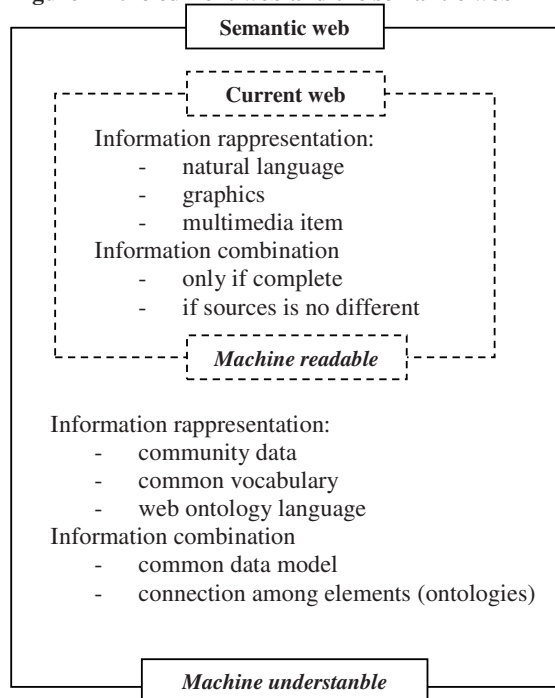
complete and devoid of mistakes way, with reliability and resources optimization.

Thus, the aim of interoperability is to facilitate the interaction among different systems as well as the exchange and reuse of information even among non-homogeneous systems (both for software and for hardware).

Interoperability is on the ground of:

- diffusion of marking languages in the exchange of structured information among administrations, providing dimensional elements in order to determine costs and possible action priorities;
- organization and method of feeding a repository of marked and structured information exchanged by governments through interoperability services, or applications services; within the proposal it must be tackled the problem of the optimum modality of relationship between spontaneous agreements and coordination initiative;
- analysis tools help the marking of documents, as regards their standardization and the maturity of the market;
- measures to promote the use of XML, designed to improve service allocation/supply to citizens and firms.

Figure 1 - the current web and the semantic web



In Cultural Mapping ontologies are created keeping in mind the predominant specificities of the area under investigation.

Only through a correct composition of words (both substantive and qualificative) it is possible to map one on the other.

In many situations, there are already [12] catalogues of cultural heritage; thus, they can be imported. However, this does not preclude us from a more determined commitment that comes from a developed literary consultation that tell the place, build the story and describe the mutations. From these sources it is possible to extrapolate the ontological vocabulary related to cultural heritage and create logical connections between the sequence of events, such as relations with other specificities, or environmental and natural goods. With this sequence of actions it can be traced to the terms (in use or missing) that more specifically highlight the relationship among nouns that promptly refer to a cultural reality; choosing the areas, which, although different, can be summarized in the following categories: anthropological, sociological, archaeological, genealogical, linguistic, topographical, botanist, musicology, etc. At first, the mapping takes advantage of the mechanism of importing existing ontologies (inventories of museums, libraries, archives, etc.); afterwards, the existing ontologies interact with the new specifications, giving rise to semantic concepts. Through a formal description of classes, concepts and relations among these classes, we want to establish connections among objects which describe a "consistent piece of the world", as they will be useful for the optimization of sharing knowledge processes (domain knowledge).

All things considered, in the development of a semantic search system, we would go to verify its applicability in different situations. In the case of our research, specifically if inserted in the cultural sphere, we should deal with all those cultural institutions that preserve a series of objects that, unlike, witness the evolution of human beings (museums, archives, libraries, photographic libraries, etc.). The same cultural institutions - such as archives or museums, or libraries - take over cataloging systems supported by sometimes very different organizational logic. And we can not disregard it.

The action we undertake aim to produce an ontological vocabulary that takes into consideration and circumscribes the area under investigation, to avoid the creation of those specificities that do not have any other branches. In order to do this, it is necessary that a direct collaboration with operators of those cultural institutions so that we can refine the ontology, to make it as specific as possible within the domain.

4. PERSPECTIVES IN CULTURAL ASSESSMENT

The examined themes of cultural planning in recent years by the research group are also closely linked to the disciplinary field of evaluation. So, the valuation of assets, activities and cultural policy is becoming an important tool for decision support for policy-makers and practitioners in the cultural sphere. Approaches, models and evaluation techniques change; they depend on considering culture as general a condition, a factor or the final product.

The evaluation of the final product is similar to that of a good (proven, public or quasi-public) to the total costs

needed to produce and direct and indirect benefits it generates.

The economic approach has to provide a conceptual and technical-analytical support, for the applications which aim to assess costs and benefits of changes in the stock of cultural resources and services offered by the cultural heritage.

Defining a system of relations among concepts, an ontology allows to define an object (in our case, a web resource) as an instance of the ontology itself; this takes all the links and the characteristic properties of the class in which it is placed, taking all the implicit knowledge in this system of relations.

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The Role of Digital Media in Empowering Individuals: Public Diplomacy, the Blogosphere, and the Digital Divide

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ABSTRACT

With the powerful presence of mass media sources reaching large-scale audiences and the rapid growth of multimedia sources available online, mass media industries have certainly had a prevailing effect on culture and communication, as well as public political views, both domestically and internationally. Today the consumers and receivers of media have power in terms of influencing the media as well as other members of society. The most dominant example of empowering the general public can be seen with the blogosphere. However, on the flip side of the idea that new communications technologies are empowering individuals, it is important to consider the digital divide. With a world increasingly dependent on electronic technologies, it is obvious that anyone without access to these technologies is being left behind. Not introducing computers to various parts of the world worsens inequality while access to cyberspace gives users freedom from certain social constraints.

Keywords: digital media, public diplomacy, digital divide, new media, international relations

INTRODUCTION

The mass media has the potential to reach large audiences through online sources. Today, more than ever society is dependent on various forms of communication media. This dependence clearly illustrates the extensive power of the professional media as well as the impact that media has on the knowledge of diverse audiences. However, digital media can also be used to empower individuals and to foster public diplomacy.

THE MEDIA'S POWER

The media has the ability to influence people's behavior, in the form of thoughts, speech, or action. Obviously, the media has no coercive might or political mandate, but this is not a source of weakness, since the power of the pen has increasingly out-manuevered the ability of the sword, especially in the post-Cold War era. This is not to say that military might does not count anymore, but to suggest that military might is not necessarily the solution to all world problems. This situation is in contrast to that of ancient times, when disputes were often resolved by military or physical campaigns, it was assumed that winner enjoyed the divine blessing, and ordinary people accepted the result as the will of god or nature without question. The power of media can also be depicted in what is called the Control Revolution. The Control Revolution is the ability of the media to influence the consumption of mass audiences with communication technologies.

Furthermore, with the rapid growth in information technology, the control of government and major markets does not have to depend on face-to-face communication; now control is reinsured in bureaucratic organizations, telecommunications, and international communication with the new mass media. In addition, according to the "control function," information processing and communication are intertwined and therefore the ability to control a society—through interpersonal communication to international communication—will be "directly proportional to the development of its information technologies."²

Nevertheless, our contemporary world is very different, since people around the globe increasingly question authority (even in the most religious societies), do not always follow blindly, and prefer justice over peace. The evidence for this is the increasing number of mass

revolutions against the militarily strong dictators (e.g. in China, Cuba, Iran, Mexico, and Russia), since the start of the twentieth century. If the military might was the answer to all conflicts nowadays (as in the past), then there would not have been a Palestinian-Israeli conflict, considering that the military balance is overwhelmingly in favor of Israel. Today's underdogs do not accept forced solutions. They value and pursue justice more than peace. People around the world want a better life, similar to the one in the West, mainly as the result of what they have seen, read, or heard, information produced and broadcast by the mass media.

The media has the ability to aim its message to whomever it wishes globally, and it has the ability to produce whatever information supports its interest.³ The first aspect of media influence is the ability of "selective process." The media has the capability to select whatever information it desires to produce. In addition, individuals use "selective perception." When individuals face discordant content, they will choose what they find acceptable.⁴ For example, as history points out, it was very unlikely that pro-Vietnam interventionists would have chosen to watch content discussing the senselessness of the Vietnam War.

Priming is another influential power of the media. The media cannot control what the people think, but it can project what they should think about. The priming theory suggests that media images stimulate related thoughts in the minds of the audience. This is similar to and associated with another power of media: agenda setting. Agenda setting is described as a process through which public figures and important events help to shape the content of the media. The audience's ranking of what they consider to be the most important issues tends to match the amount of coverage that the media gives to those particular issues.⁵

PUBLIC DIPLOMACY

The media also has power associated with public diplomacy, which has traditionally been a power in the hands of governments. However, with the advances in communication technology and lessening of legal restrictions, the news media can set their own agenda, and form international opinion through public diplomacy.⁶ Public diplomacy is the idea of "direct communication with foreign peoples, with the aim of affecting their thinking, and ultimately, that of their governments."⁷ It most often takes the form of cultural or academic exchange programs, public relations campaigns in foreign mass media, dissemination of print or video materials, or governmental or non-governmental sponsored radio or television broadcasting to foreign markets.⁸ Public diplomacy is now empowered with the Internet, so it is difficult, if not impossible to censor its delivery system—media. This power, however, may have

negative consequences, such as perception gap, or a perceptual screen.

Among all powers of the media, public diplomacy has a special place. As stated earlier, public diplomacy is the idea of "direct communication with foreign peoples, with the aim of affecting their thinking, and ultimately, that of their governments."⁹ The notion of public diplomacy is similar to that of public relations, which is defined as an art and science of establishing and promoting a favorable relationship with the public, just as public diplomacy is public relations among nation-states.¹⁰

Amid forms of media, television news that combines picture and sound, in traditionally culture dominated societies, typically comprises immense amounts of propaganda.¹¹ In the study of anti-Americanism, factors such as cultural, religious, and value divisions are viewed as the primary source of negative perceptions of the United States. In fact, some claim that traditionally culture dominated nations typically comprise aggressive national news agencies, such as the Saudi Press Agency. Oftentimes, the media uses public diplomacy as a power tool. A "perception gap," occurs when an inaccurate belief is partially created by the foreign news media. The media creates an inaccurate belief, many times intentional, for its own benefit and to lead to the success of its particular agenda.

The "Al Jazeera Effect," as some call it, can serve as an example for the media's depiction of negative beliefs. The "Al Jazeera Effect" is a notion similar to the so-called "CNN Effect" that was the focus of much speculation during the 1990s. The "Al Jazeera Effect" refers to the networks comprehensive and graphic on-the-ground coverage of the US war in Afghanistan. Some argue that Al Jazeera raised the level of negative sentiment against the US in the Muslim world and created pressure on many Muslim governments to act against US policy in the region.¹²

The news media also characteristically differ from region to region.¹³ In some areas, the media displays more power than others. The Middle East has a very complex social structure, and it as culturally differs from Western society, so does its media.¹⁴ One example of the difference is in the media objectivity, in terms of the typical Western balanced reporting of conflicting perspectives. Media objectivity is viewed in another way in the Middle East, where certain sensitive topics are not subjected to such balanced scrutiny, such as Pan-Arabism and Islam.

Thus, from a Western perspective in the Middle East, one may not find "objectivity" when it comes to pan-Arab consensus. Moreover, it may also seem as though Middle Eastern news sources tend to have a "hyperpolitical nature." Pan-Arab news coverage places the focus on

security and political news, rather than its social or human interest topics, which are relatively more covered by Western news agencies. With the constant subjectivity of news agencies, a “perceptual screen” is likely to develop, as individuals are expected to use their underlying predispositions as a screen, accepting only those considerations featured in the news that are congenial to their own preconceived attitudes, rejecting aspects of the news that are not.¹⁵ It is also imperative to consider that most predispositions are developed as a result of previous experience with media products and preexisting beliefs that form in an individual’s social universe.¹⁶

DIGITAL DELIVERY

A fairly new power of the media is “digital delivery.”¹⁷ With digital revolution, the modern media may send information to people quickly, efficiently, and with any degree of accuracy. Advances in communication technology have made the online press a very powerful entity. These advances now allow the media to instantly deliver a message to millions of individuals via the Internet. Additionally, many individuals use the Internet as their main news source.

Furthermore, digital delivery provides the media with an “interactive” environment. The senders and receivers can exchange information back and forth simultaneously. With this method, opinion data can be collected much faster, making polls more accurate than ever before. This interactive environment or a two-way communication differs from traditional one-way communication and provides the media with even greater power and legitimacy.¹⁸

POLITICAL MOBILIZATION

Last but certainly not least, another influential power of the media is the ability of political mobilization. The media has the capability to mobilize the public on a specific issue, whether it is to go to war, address economic problems, or influence an individual’s opinion.¹⁹ The media also has an educational role, which is an important factor in political mobilization.

With the multimedia revolution and the growth of interactive media, the consumers and receivers of media now have power in terms of influencing the media as well as other members of society. Anyone with access to the Internet can use the online world to create breaking news stories of their own. The most dominant example of empowering the general public can be seen with the blogosphere. The blogosphere can be thought of as an interconnected social network on the Internet in which various “bloggers,” or members of the online community, post their own articles, commentaries, and suggestions.

With this, individuals throughout diverse societies can post their thoughts, feelings, and criticisms freely online for the whole world to see. This online interaction has many implications in terms of the media and those who are considered to be the professional media or “controllers.” Not only can the professional media read firsthand what their mass audiences worldwide think of their news coverage and programs, marketing businesses can receive feedback about their products. Audiences can communicate feedback or reinforce the demand for specific products, and the professional media can receive their audience’s preferences to better accommodate their viewers.²⁰

Political mobilization is essential to the health of any society, including the democratic ones. In larger democracies, however, political mobilization may be difficult to achieve. In order for individuals to mobilize politically, they must become emotionally involved.²¹ Symbolic politics have implications for human emotional involvement. Symbols such as the “9/11” attacks on the World Trade Center and the Pentagon, are clear motivational factors. Through film, television, books, and magazines these symbols are displayed by visuals. Visual information (e.g. pictures, images) presented in magazines, films or other aspects of the entertainment industry constitute an important underused and underestimated information resource.

Since the human brain processes information by the use of shortcuts, the media and entertainment industry utilize audiovisuals that have proved to be exceptional impact tools. The human brain extracts valuable information from audiovisuals more quickly and easily than from verbal sources. Visuals provide a less complicated and error-free grasp of information and better emotional involvement. The use of audiovisuals in some forms of media falls short of the medium’s potential to serve as a vicarious political experience and to offer benefit from the intimacy of the involvement.

The distortions through visuals may certainly impact foreign policy making process by the elite in addition to ordinary citizens’ opinions about international issues. In this regard, the notion of “audiovisual stimuli” plays a significant role when it comes to media distortions. The human brain is far more adept at extracting information from audiovisual stimuli than from verbal stimuli. Verbal stimuli are processed serially, one verbal unit at a time, whereas visual stimuli are processed simultaneously. This provides the reader or viewer with a more sufficient approach to information processing. Unlike the ability to process verbal messages, the ability to process visual information develops early in life. Therefore, youth and illiterate adults can learn from visual information with ease.²²

This gives the leaders in less developed countries, where there is higher illiteracy percentage, more power and the ability to take advantage of the segment of the population that cannot read but is easily influenced by visuals. However, visuals are often used effectively by both authoritarian leaders in the developing world or elected officials in the developed countries attempting to sway public opinion. With greater emotional involvement, comes greater political mobilization.

The film industries everywhere, especially in Hollywood, have expertise in dramatizing events, as practice makes perfect. Recently, visual imagery and advances in special effects have brought the entertainment industry to the same level of projecting reality as the news media clips of current events, especially in terms of the power of persuasion.²³ An emphasis on the power of visuals, however, does not mean to discredit audio information, such as radio. Poorer nations with little access to television and cinema still use radio as the dominant tool to spread their message.²⁴ Moreover, it is not fair to give credit only to the entertainment industry for their ability for political mobilization, since popular culture also has such a capability.

Among many types of media, the producers, distributors, and exporters of music generally have the most freedom in spreading their messages via songs. Music is considered an art, and is not restricted by most governments, even the authoritarian ones. Music can comprise strong political messages, such as "Rage Against the Machine", or strong cultural messages such as country music. With the internet and MP3 files, music can be downloaded and listened to across the globe within seconds.

Nevertheless, there are differences in this regard around the world. Downloading music is a larger phenomenon in Europe than in the United States. There are about 8 million users of the popular music file sharing Kazaa, compared to about 9 million in Europe.²⁵ In Africa, radio (which is often considered to be the poor man tool) is the main information source for both entertainment and news.²⁶ In many parts of the globe, the radio is also the most commonly used form of communication to spread propaganda and public diplomacy.

For example during the 1994 Rwanda genocide, the local radio station was the main tool used in order to spread propaganda throughout the country, which promoted violence and the killing of the Tutsi population. The Hutu government used the popular local radio station (which usually played "pop" music) to broadcast a message of hate and violence against the Tutsi population. The Hutu government went so far as to direct the Hutu population to kill their Tutsi relatives and neighbors on the local radio station. The radio can also access global listeners in addition to the national

audience. Furthermore, radio programs are able to impact children as well as the illiterate population, since the radio can easily reach them and reading is not required in order to understand the message.²⁷

THE DIGITAL DIVIDE

However, on the flip side of the idea that new communications technologies are empowering individuals, it is important to consider what is called the digital divide. For the purposes of this discussion, the digital divide is defined as those who have access to technology, such as the Internet, versus those who do not have access. Government officials and academic researchers now consent that there is a digital divide; the National Telecommunications and Information Administration's 2000 figures display that White and Asian American households with 46 and 57 percent access are double the access of African American and Hispanic households. With a world increasingly dependent on electronic technologies, such as the personal computer, or communication technologies, such as the Internet, it is obvious that anyone without access to these technologies is being left behind in the dust. To elaborate, because computers and the Internet are used today by society as if it were second nature, people rely on computer software, such as Microsoft Word, to complete school papers or reports for a professional job; the digital divide has more serious implications besides not being in the "in-group." With our dependence on using technology, not only for personal reasons, but in academic and professional life, having technological skills and knowledge of basic computer software is key in acquiring professional, decent paying jobs.

Overall, the research studies describing and measuring the digital divide report two assumptions: that not introducing computers to various parts of the world worsens inequality and that access to cyberspace gives freedom from certain social constraints to its users.²⁸

CONCLUSION

The mass media uses its powers of priming, agenda setting, selective processing, digital delivery, public diplomacy, and political mobilization in order to influence culture and communication, as well as political perceptions and opinions. The mass media also has the ability to influence the formation of the public's political perception and opinions. Since the mass media determines who is communicated to and what is communicated, it has the ability to effectively change and influence the outcome of group conflicts. The media can play a positive role in influencing public opinion and highlighting the benefits of intercultural communication in order to emphasize the need for peace and overall understanding. Given the power of digital media, we

must seriously consider the implications of the digital divide in parts of the world where access to the Internet and other media is limited or nonexistent.

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Presenting the LMS as Knowledge Management Base to Extract Information

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ABSTRACT

This paper focuses on the Learning Management System (LMS) from the point of present it as Knowledge Management (KM) base. There is huge information that can be extracted from any LMS that can be useful for many investigators. This information is not necessary to be only concentrating on the content of the LMS but it will cover also all parameters that are related to content, context, activities, and deferent types of users of the LMS. The extracted information will be presented in different format such as text data, tables, charts, and figures. Also this information is going to be useful for different information seekers from deferent specialties including higher management, financial department, quality assurance agency, registration, local accreditation, academic supervisors, and external examiners. A case study on using the LMS at the Arab Open University (AOU) will be presented including many samples of extracted information and its usability. In summery, this paper introduces how efficient the extracted information of the LMS as a Knowledge management base for different key players.

1. INTRODUCTION

The rapid evolution of Information and Communications technology (ICT) has positive effects in many areas, especially business, industry, social life, and education. Information and communication technologies which include newer electronic technologies such as computers and the Internet are considered potentially powerful enabling tools for educational change toward e-learning. Different ICTs help expand access to education, strengthen the relevance of education to the increasingly using of computing and online facilities [21].

The Internet has provided many more opportunities for education which leads us to the concept of e-learning. e-Learning has emerged as a tool for personal and business development, e-learning is the delivery of a learning and training by electronic means, e-learning involves the use of a computer and/or electronic device (e.g. a mobile

phone) in some way to provide learning content and educational tools; activities.[22]

Knowledge Management; KM; focuses on knowledge acquisition, storage, retrieval and maintenance. KM in its origin relates to business sector, and represents the "set of systematic disciplined actions that an organization can take to obtain the greatest value from the knowledge available to it" [1].

From an IT point of view, knowledge management means use knowledge offered by information technology and computing; this involves a lot of computer branches as: data mining, question answering systems, and natural web interfaces. Townley [2] points out that KM is "an emerging area of IT practice that developed from the disciplines of computer science, library information science, organizational psychology, and management". KM concerns with collecting, organizing and distributing information in such forms that it can be practically used [3]. Ion [4] assures that the development in IT domain supports KM through increasing storing facilities and updating of the information.

This enlarges the need of KM not only in educational domain but to be involved in wide areas such as: business, cognitive sciences, organization sciences, information sciences, document management, and decision support systems.

At the same time of supporting KM, information technology widespread, the growth of Internet speed, and usage of the internet move learning away from strict formal learning types towards more informal and collaborative learning and sharing [5]. This open horizon to adopt new learning paradigms such as: distance learning, e-learning, blended learning, and open learning. We can view these new trends as a tree, where open learning is the root, and other paradigms are the disciplines. Each of which differs in its roles and target users but all have a common goal that is to enable learning any where any time. Although LMS is used in different types of open learning but it is also used in regular learning including: class teaching; blended teaching.

Using computers and Internet as knowledge delivery and communication media consequently is known as e-learning approach. In this context, knowledge management is defined as "enabling organizational learning and it supports activities including knowledge

acquisition, generation, sharing and use" [6]. In order to share knowledge and make it available, the educational institutes use different technologies in which most of it focus on creation Virtual Learning Environment (VLE) or what is also known as learning management system (LMS). VLEs are computer-based environments that are relatively open systems, allowing interactions and knowledge sharing with other participants and instructors and provide access to a wide range of resources hosted on the system [7].

In this paper, we present the learning management system as a knowledge management base to extract various types of information in different forms. This information is very important for many key players in different specialties. We also present a case study on using the AOU-LMS as a KM base at the Arab Open University; AOU. In addition to the introduction, the definition of learning managements system and the terminology of knowledge management in the literature will be presented in section 2. A discussion on the capabilities of LMS content, tools, structure, and activities which information can be extracted from will be presented in section 3. After that, a case study on the LMS used at AOU as a KM base will be displayed in section 4. Finally, section 5 will conclude this paper.

2. LMS AND KM: A LITERATURE OVERVIEW

E-learning can be defined "as the use of ICT in higher education, which aims mainly the independent use of technology by students" [10]. The main elements in an e-learning process are: lecturer, content, student, place, time and interactivity [11]. e-Learning can be a very effective tool for educational institutes as well other organizations that need to improve students and staff development or provide training in new processes. It can also be of great assistance in compliance training; making sure that student/staff have the knowledge and skills they need to comply with relevant learning outcomes and regulations. [22]. Although there is a terminological difference between e-learning and LMS, but we will deal with them in this paper as one concept against the KM.

Plato argues that "knowledge is the food of the soul" [13]. Moreover, the [14] defines knowledge as a result or product of knowing; information or understanding acquired through experience; practical ability or skill; cognition [15].

Researchers distinguish two main categories of knowledge: explicit and tacit knowledge. Polanyi in, [18] points out that explicit knowledge can be articulated in formal language and transmitted among individuals, and tacit knowledge can be described as personal knowledge embedded in individual experience and involving such intangible factors as personal belief, perspective, and values. In [20] Rao specifies that tacit knowledge is personal, context-specific knowledge that is difficult to formalize, record, or articulate; it is stored in the heads of people. The tacit component is mainly developed through a process of trial and error encountered in practice, while the explicit knowledge is that component of knowledge that can be codified and transmitted in a systematic and

formal language: documents, databases, webs, emails, charts, etc.[17]

Accenture [23] views knowledge management functions as a six-step process:

- (1) Acquire,
- (2) Create,
- (3) Synthesize,
- (4) Share,
- (5) Use to achieve organizational goals, and
- (6) Establish an environment conducive to knowledge sharing.

Ernst and Young promote a 4-phase KM approach:

- (1) Knowledge generation,
- (2) Knowledge representation,
- (3) Knowledge codification, and
- (4) Knowledge application.

KM and e-learning evolution influence each other. Their development is according to information needs and requirement for knowledge acquirement, exchange and delivery. Specialists in both fields create and implement new advanced tools and techniques for creation, sharing, exchange and delivery of knowledge and learning resources. On the other hand enhanced capabilities of KM and e-learning allow educational institutes requirements and learners need to grow. Therefore it is important for knowledge management to be integrated with e-learning to allow knowledge and skills to be learned and practiced as competencies that could be applied in learners' professional duties[8].

3- THE RELATIONSHIP BETWEEN KM AND LMS

To be able to offer an online course, you need to have an e-learning platform or Learning Management System (LMS) to use, then create or upload learning contents for the course into the LMS, and finally, conduct learning activities by using the tools provided by the LMS. However, there are two more unique features that online can do much better than its physical counterpart which are learning community and knowledge management.

e-Learning activities, collaborative learning, peer learning and active social learning can be easily realized by running a successful e-learning platform. The challenge is how to run a successful learning community in an online learning environment; most teachers are still lacking skills and experiences and many issues are explored in [9]. An online course is delivered in the form of online content within LMS each in different format, every piece of online material can be archived and every activity can be tracked and logged. Therefore, it is very important to incorporate knowledge management in with LMS, such that online materials created at a specific semester can be accumulated from semester to semester for beneficial students. Teachers can document complete online teaching portfolios for better reuse of their online courses to enhance teaching efficiency and performance.

The evolution of LMS engages two different concepts [13]:

1. Learning KM Systems: LMS evolution due to social interaction, which entails into Personal Learning Environments and Social Software.

2. Learning Oriented KM Systems: LMS evolution at an instructional level.

The adaptation between knowledge management and e-learning process is the key point of ‘how can the organization learn faster’. Subsequently, “e-learning and KM are symptoms of new management style” [16]. The main focus on e-learning and knowledge management is how to allow organizations and people to optimize the knowledge acquisition process. KM and learning management are two complementary disciplines that are continuously growing closer and support an innovative and agile enterprise [19]. Both e-learning and KM strategies depend mainly on soft issues in organizations, people, motivation, trust, sharing, organizational culture and interpersonal networks and relationships [17].

E-learning delivers processed knowledge—it takes subject matter expertise, puts it through an instructional design process and presents the result in an obvious framework, KM delivers this processed knowledge in different forms including text, tables, charts, etc.

Knowledge management and e-learning are integral and closely associated parts within a single framework. Knowledge management allows effective control and management of the e-learning; the knowledge that is within the LMS.

LMS and KM have as primary goals the production of knowledge extracted from learning resources, how to connect people to quality knowledge found in LMS. Furthermore, LMS and KM share common processes, activities, tools, concepts, components and terminologies.

Similar to the knowledge creation process, learning is an action-oriented process and a social activity. To conclude this section, Chatti supported our vision of this relationship between KM and LMS by stating that LMS and KM have become essentially two sides of the same coin as the two fields are increasingly similar in terms of input, outcome, processes, activities, components, tools, concepts and terminologies [21]

4- Case Study: Extracted KM from AOU-LMS AOU

As we mentioned before, Knowledge management is "about creation, retention, and transfer of knowledge within the organization" [24]. LMS platform used at AOU allows us to present different knowledge obtained according to these three tasks.

4.1. Creation

There are many tasks that can be created within the AOU LMS, Online quizzes for example can be created, where random questions could be generated, and students can participate in the exam for different sections at different times. In almost all universities the mandatory modules are required by all university new students regardless of their majors. In such cases, the best solution is to create online exams. A data bank questions is built, where certain number of questions are generated randomly at different times. This policy is applied in even regular universities.

AOU LMS is user friendly and easy to be used by tutors to create their own online exams, see Figure.1.

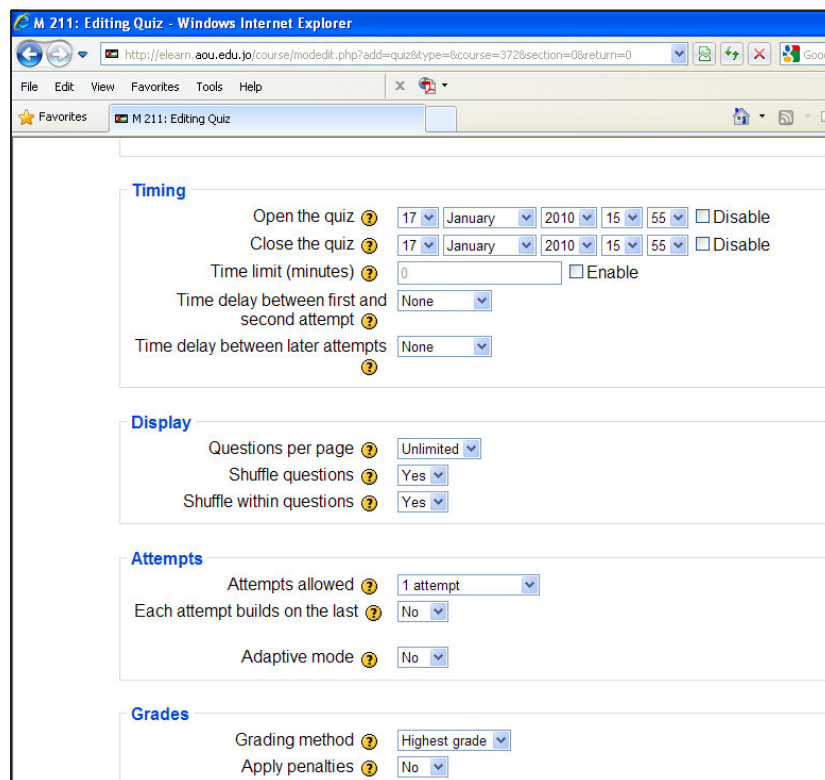


Figure1: Creation of an online quiz

4.2. Retention

There is a lot of KM information that can be obtained from the LMS which is useful to quality assurance department. Statistics about how tutor did in the course in terms of students' point of view, charts show who login to system, and how often they do so in terms of students and tutors. At AOU all tutors should login to system

frequently to reply to students requests if found, so the administrator who is in charge of monitoring this issue, can view such charts which help him to improve the work. The LMS can produce a detailed activity report for any user of the system, figure 2 show number of students who visited different activities and resources of a specific course.

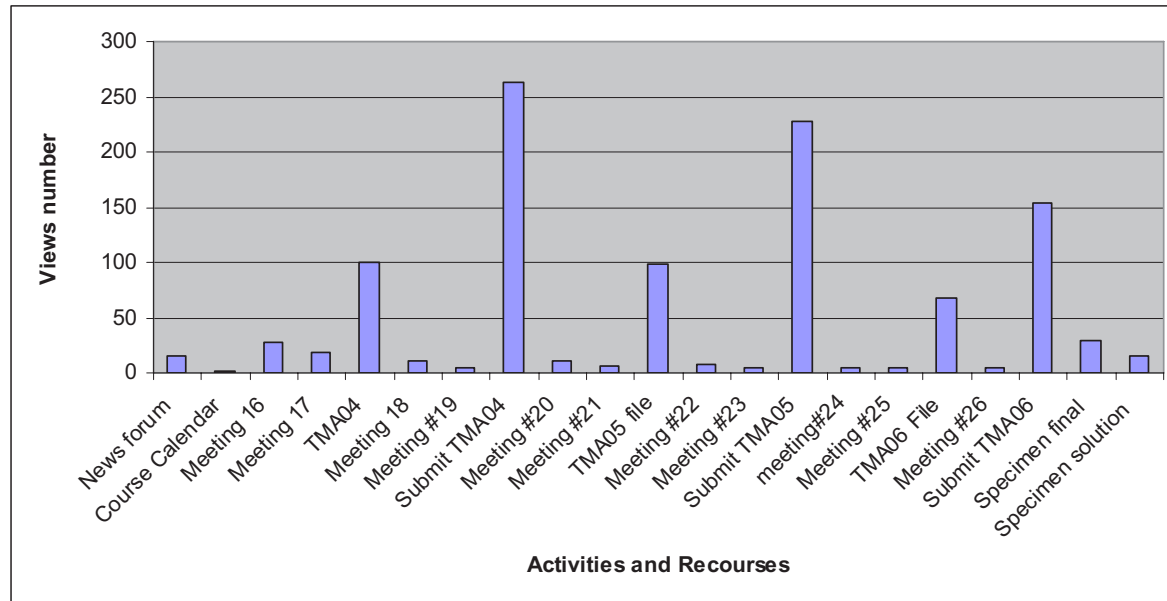


Figure 2: Number of students who visited certain activities and resources

4.3. Transfer knowledge within the organization

AOU LMS has been integrated with other computerized system such as Student Information System, Human Resources, Quality Assurance, Financial System, etc. One example is the student information system which is an Oracle based system that provides the necessary information such as students' information, courses registered, faculties, grades, etc. LMS integration with SIS (or LMS-SIS) is a system used inside the university to reducing efforts and produce automatically generating accounts, minimizing faults and errors to null, obtaining availability of requirements and simplifying registering, entering and generate many related reports.

All students' grades in TMAs, quizzes can be viewed in different forms: XML format and Excel sheet format, where a tutor could view the excel sheet for all the sections she/he is teaching or he could view each section separately. The Excel sheet has the first name, sir name, student ID, student department, student email, then the module TMAs and quizzes and shown in figure.3. The same data is transferred to SIS which saves time and effort in re-filling these grades again. The student information system is another computerized system.

LMS-SIS integration added a lot of facilities which reduce time and cost in the following ways:

- Automatic structure enrollment: each student is provided with a username and password which enable students to register automatically.
- Automatic course enrollment: students are automatically enrolled into LMS courses they have been registered.
- Automatic group enrollment: students are automatically enrolled into LMS courses group, as they registered this group in the university.
- Automatically withdraw students from courses where students want to drop or have some financial problems.
- Student semester grades: students are enabled to see their grades through the LMS rather than bringing it from registrar.
- Students registered courses: where students could see the registered courses information such as their groups, time, course names and short names.
- Student's financial issues: where students could see their financial status and payment schedule.

The screenshot shows a web browser window displaying the 'Grader report' page for the course '[T175A] Networked Living'. The page includes navigation tabs for 'Grader report' and 'My report preferences', and a 'Separate groups' dropdown set to '1'. Below these are options to 'Hide averages', 'Hide groups', and 'Show ranges'. The main content is a table with the following columns: 'First name / Surname', 'ID number', 'MTA (out of 30)', 'Submit TMA (12/12/2009)', and 'Course total'. The table lists 20 students with their respective scores in each category.

First name / Surname	ID number	MTA (out of 30)	Submit TMA (12/12/2009)	Course total
[060029] Amani Ali Ikfafi	060029	24.50	16.00	81.00
[060445] Alia Faleh Alhababbeh	060445	13.50	17.50	62.00
[080846] Husam Fuad Zarzar	080846	24.00	16.50	81.00
[050551] Abeer Hassan Al- Alamat	050551	14.75	10.00	49.50
[080776] Murshed Ibrahim Aldeiri	080776	28.75	19.00	95.50
[081114] Hala Joma'A Herzalla	081114	14.50	19.25	67.50
[070650] Afnan Kamal Ismail	070650	21.00	13.75	69.50
[060551] Saleen Khairy Sa'adeh	060551	10.75	10.00	41.50
[081016] Mai Khaled Ali	081016	17.50	15.00	65.00
[081064] Omar Lutfi Hussein	081064	21.75	17.00	77.50
[080246] Osama Mahmoud Charifa	080246	17.75	16.75	69.00
[071014] Hanadi Mohammad Adeili	071014	15.75	14.50	60.50
[070214] Ala' Mohammad Al Ojeami	070214	18.00	14.25	64.50
[081101] Amro Mohammad Alrabie	081101	22.50	18.00	81.00
[051169] Osama Mohammad Azzam	051169	21.50	18.00	79.00
[080042] Rana Mohammad Obeid	080042	10.75	12.00	45.50
[080552] Sereen Mostafa Al Talli	080552	13.75	14.50	56.50

Figure 3. Student grades extracted from AOU-LMS

Finally, the following are some but not all the KM information that can be extracted from the AOU-LMS:

- 1- A report about a specific user activities on a specific course or on the system as a whole with the optionally of selecting specific period of time
- 2- A report on the student grades in a course with different sorting and classifications.
- 3- A report on users' participations on a specified activity such as forum or dialog session.
- 4- A report on students results of a certain online exam such as placement test.
- 5- A report on student passing statistics on a certain exam according to different classifications such as there majors, gender, etc.
- 6- An analytical report on the factors of hardness, coefficient factor, and deficiency for every question on a certain online exam
- 7- An analytical report on users' questionnaires filled online for different purposes
- 8- A report on the accessibility and usage of e-library from users on different categories such as major, student level, etc

5- CONCLUSION

We have introduced in this paper the Learning Management System (LMS) as Knowledge Management (KM) base. There is huge information that can be extracted from LMS in different format such as text data,

tables, charts, and figures. These information is very critical for many key players in different specialties in order to do there work in more proper way. We have presented many cases of this information by presenting a case study at AOU LMS and its relationships with many bodies within AOU and also outside AOU. A literature overview on the relationship between KM and LMS and their integrity has been introduced also in this paper to conclude that there are enormous similarities between LMS and KM concepts

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Web Annotations in an Online Mathematics Course using UOCLET

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ABSTRACT

Communication is a key issue in the student learning process. In mathematics education, it is essential to overcome specific difficulties such as the learning of abstract concepts and its language of expression and communication; mathematical notation. At the Open University of Catalonia (UOC), students face the challenge in a somewhat “handicapped” way, since this is an online learning environment involving asynchronous communication. One of the problems students have to handle is that individual work, based on a set of well-organized learning resources, is physically separated from the “dialogue space” where they interact with fellow students and tutors. This separation makes it difficult to ask questions about some topics in the study material. Being aware of this situation, a web annotation tool called UOCLET has been designed and developed by the UOC. This tool, conceived for a pedagogical framework, enables students to highlight the text, add comments and share them. This communication tool has been incorporated in a mathematics course for online pre-engineering students during 2 semesters. This experience shows that it is difficult to introduce a new technology, as well as a new methodology, in a traditional learning process.

Keywords: web annotations, collaborative learning, interaction analysis, instrumental theory, online teaching and learning, mathematics education.

1. INTRODUCTION

How technological advances influence the student’s learning process is a key issue in distance and online mathematics education. In order to confirm that learning is supported using web technologies, the mode of communication is an important factor that must be considered, as pointed out by Han and Hill in [1]. They point out that this is one of the challenges in conducting research in theories related to collaborative learning. Moreover, maths contents pose communication difficulties for students (mostly due to the unique notation) and specific cognitive difficulties; both kinds of difficulties are augmented in an online context, since tutor-student communication is not

instantaneous [2]. In this study, we bear these difficulties in mind since it is carried out in an introductory course on mathematics for Engineering at the Open University of Catalonia (UOC).

The pedagogical model at the UOC is based on a virtual classroom organized into four independent sections: planning, communication, resources and assessment, see [3]. Hence, students interact with study materials following a working day schedule and, when a doubt arises or when they want to make a comment or ask a question, they contact the tutor through their personal e-mail or the forum of the virtual classroom. The channels of communication with the rest of the students are the same. Therefore, the individual work of a student is clearly separated from the dialogue space. Being aware of this situation, a web annotation tool called UOCLET has been designed and developed by the UOC. Specifically, this web annotation tool, created with an education purpose in mind, enables us to write comments and raise questions in the study material website, which are shared by students and tutor. Any Students and teachers in the class can read these annotations and edit them or contribute comments.

In this study, we analyze the introduction of this new communication tool in an online classroom and the influence of using UOCLET on questions relating to the learning process of online students. We look for possible improvements, due to the use of UOCLET, both in the student’s mathematics learning process and in the students’ self-confidence in their mathematical abilities.

We focus specifically on a course, *Introduction to Maths for Engineering* that has a twofold objective for students: 1) to acquire fundamental concepts, techniques and terminology in Algebra and Analysis; and 2), to facilitate the practical use of these contents. It is worth knowing that students are adults with professional experience, with not much time to study and with insufficient prior knowledge in maths.

The basic assumption of this research is that the integration of contents and communication spaces will lead to a significant improvement in the acquisition of basic mathematical competencies for pre-engineering students. There are two reasons for this expectation: on the one hand, it will allow the

teacher to better follow up the student's learning process and, therefore, a better personalization of this process may be achieved; on the other hand, it should contribute to increase the student's confidence in his or her abilities in the mathematical handling of concepts and procedures.

Our main research purpose is to analyze the didactic effectiveness of UOCLET and make interaction measurable. This information can help us in the future to include it in students' assessment. Therefore, the experience reported in this paper is a preliminary study and it has a threefold purpose:

- 1) To design, develop and implement a new communication tool, UOCLET.
- 2) To outline aspects that should be taken into account in introducing a new communication tool and strategies that should be considered in order to promote interaction.
- 3) To outline elements that enable us to produce an assessment tool based on interaction.

The paper is structured as follows. Section 2 presents the conceptual framework. Section 3 is devoted to introducing the main features of the web annotation tool UOCLET, designed and developed by the UOC. In section 4, the research methodology is stated. The results of the analysis of annotations and of the complementary data are presented and discussed in section 5. The degree and type of interactions, the interaction profile of students and the strategies to promote the use of the tool are discussed. Section 6 presents the conclusions and finally, the future trends are described in section 7.

2. CONCEPTUAL FRAMEWORK

The conceptual framework which supports this research is structured around three axes: interaction axis, instrumental axis and situational axis. In the interaction axis, we look into interaction and its analysis in a distance learning context. In the instrumental axis, we present a framework for questions referring to the instrumentation of a website annotation tool. Finally, in the situational axis, we briefly discuss the instructional inflexibility which occurs in distance and online learning.

Interaction axis

The theory of interaction in distance learning is one of the frameworks of this study. According to Roblyer and Wiencke: "research yields consistent indications that increased interaction in distance courses is associated with higher achievement and student satisfaction" [4]. According to Kozma, the technologies can offer unique opportunities for quality learning as long as the procedures are well substantiated in the cognitive and social processes by means of which knowledge is constructed. One of the objectives of the present research is to contribute evidence towards an empirical verification of the arguments given by Kozma, in the specific context that we deal with.

Roblyer and Wiencke also state that distance learning environments designed for the effective use of technology resources can be a chance to obtain the student's commitment and lead to gains in learning once this commitment is obtained, see [4]. In this sense, it must be stressed that the tool investigated here is used in conjunction with several other

technological resources (interactive applications, videos, symbolic calculators and self-evaluation tests).

The difficulties in going from theoretical benefits of interaction to practice are the complex nature of the interaction in distance learning courses and the difficulty of designing the evaluation of the interaction process, as pointed out in [4]. There are, then, difficulties in developing practical guidelines to make the interaction concept measurable and useful to teaching and research staff. Furthermore, Varsidas and McIsaac point out special difficulties in obtaining high levels of interaction in an asynchronous communication in [5].

Taking into account these difficulties, in [4] and [5], they study the characteristics contributing to the interaction and the factors influencing it. These aspects will allow us to obtain measurable variables in the analysis of the data gathered with the present study. In [5], the variables are established with respect to:

- the students: number of students in the classroom, quantity and kind of feedback given by the instructor to the students, experience in distance learning
- the instructor: knowledge level, experience in group management, facilitation abilities
- the messages: characteristics of the feedback, message content.

We have also taken into account Bales' categories for the interaction analysis, namely, the Interaction Process Analysis (IPA). Although IPA was put forward in 1950, it has been applied and justified in recent studies of computer-mediated discussions [6], where it has been considered as a useful tool to describe interaction processes in online groups.

Instrumental axis

A new communication tool (UOCLET) has been integrated in an online study material. This material includes contents, activities, different learning resources, study guides and complementary material. On the other hand, we must not forget that this experience has taken place in a specific context: students who hold a priori conceptions about curriculum content based on traditional methodologies (pen and paper) which do not integrate technological resources. In this context, regarding the instrumentation of the tool becomes of special relevance.

Artigue describes in [7] an instrumental approach derived from the analysis of questions involving the integration of computer environments in maths teaching. Furthermore, she develops a point of view about these questions which will also underlie the instrumental axis. In [8] she points out that for an individual, a given artifact -in our case, the new communication tool- does not have, in principle, an instrumental value. The artifact becomes an instrument through a genesis, i.e., through the construction or the appropriation of social schemes.

Artigue also argues that this process or instrumental genesis works in two directions; one directed towards the artifact, or "instrumentalization", and the other one directed towards the subject, or "instrumentation" [8]. The process of instrumentalization endows progressively the artifact with potentiality and transforms it for specific applications. The process of instrumentation leads the individual to the development or to the appropriation of the schemes of the instrumented action.

Finally, Artigue proves in [7] the contrast between the discourse sustained about the potentiality of the instruments introduced for learning mathematics, and the reality of their functioning in the observed students' classes. Likewise, she shows the unsuspected complexity of the instrumental genesis and discusses the real legitimacy of computer technology since the technical knowledge is foreign to the official curriculum. These results are taken into account in our analysis of the introduction of UOCLET.

Situational axis

From a situated learning point of view, "the construction of meaning is tied to a specific context", [1]. This is a virtual one in our study and we must focus on specific features of the context and their link with the learning process.

According to Barberà [9], in a virtual learning context, a certain instructional inflexibility is produced, since the teaching process often results in an accumulation of tasks with fixed deadlines. This can affect the learning process and even impede it. However, the integration of contents and communication should improve the follow-up and orientation of the student's learning process and, therefore, to overcome this inflexibility.

But from a sociocultural approach, the virtual learning context not only facilitates or impedes learning (van Oers, quoted in [10]), but also modifies the activity setting – in the sense of Gallimore and Goldenberg [10]–. One of the variables that determine an activity setting is the script for conduct that governs students' actions. It is worth noting that the introduction of the communication tool in this virtual learning context modifies the script of the students from an independent task to an instructional conversation ("classroom discourse that permits the coconstruction of meaning between teachers and students" defined by Tharp and Gallimore, quoted in [10]). Then, it will be important to consider how the introduction of a communication tool will change task demands.

3. TOOL DESCRIPTION

Once the theoretical framework is established in this section, we present the web annotation tool UOCLET which has been designed and developed by the UOC. This tool enables us to highlight a sentence on the online study material and write comments or raise questions about the content. Annotations are shared by all students and the tutor.

First of all, the student has to install the tool. Concise instructions are provided by the tutor. Once the student has installed the tool, a link in the bookmarks bar appears as shown in figure 1. When the student clicks on this link and introduces his/her personal password, the UOCLET tool bar appears on the website material (also highlighted in figure 1).

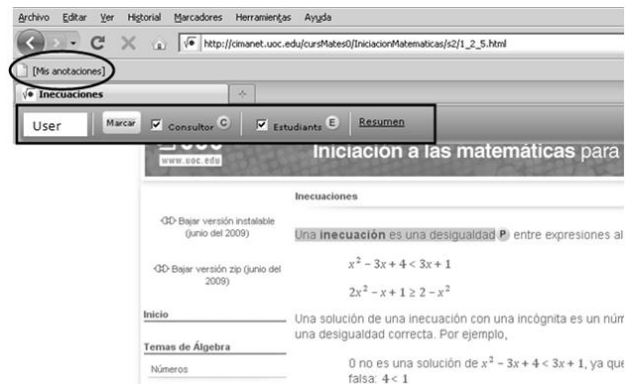


Figure 1. UOCLET link and tool bar.

An annotation in the material is shown in figure 2. It can be seen that the text is perfectly readable despite the tool: in the design, it was a priority not to disturb the reading.

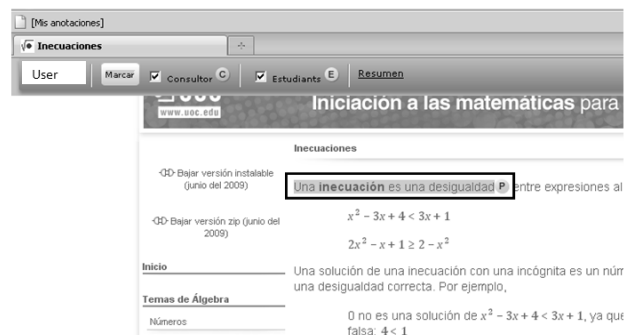


Figure 2. Annotation in the web study material.

Just by clicking on the letter behind the highlighted text, the annotation is fully displayed (see figure 3). The frame that pops up allows the user (students or tutor) to easily add a comment or response.

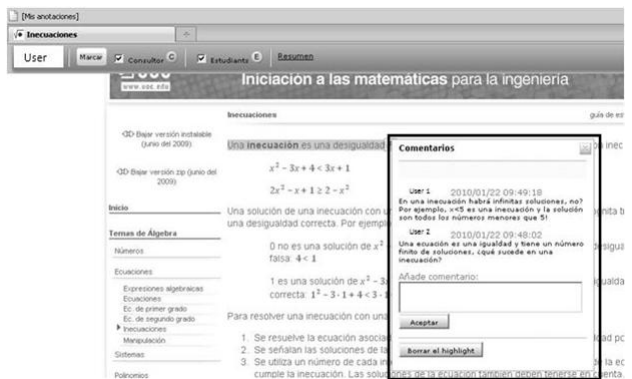


Figure 3. A comment on the material.

4. RESEARCH METHODOLOGY

Methodological Approach

In order to analyze the interactions produced via UOCLET, a combined model is used. This model includes quantitative data (who interacts, how much and where) and qualitative data (how one interacts).

Through quantitative analysis we will see: 1), who initiates the interaction; 2) among whom it is produced; and 3) which aspects of the contents of the subject are the reason for more interaction. A quantitative analysis is also proposed in order to evaluate the degree of interaction among the students and between them and the teacher and students' willingness to interact.

The qualitative approach of the model allows the investigating of the type of interaction that is produced. We analyze qualitatively the contents of the annotations and also of the messages in the forum or email. In these messages, the students state their opinion about the introduction and the use of the tool. The model for the analysis of the interactions presented in [11] has been used for this analysis.

Experiences in the virtual classroom

This study is based on the use of UOCLET in an introductory course on mathematics for Engineering at the UOC. The first experience in the virtual classroom was carried out during the second semester of the academic year 2008-09, and a second one, the first semester of 2009-10. Prior to UOCLET development, a preliminary experience was carried out using DIIGO [12]. This commercial and external tool is not conceived for pedagogical purposes, but this preliminary experience allowed us to specify the new tool design, to establish relevant aspects for UOCLET introduction and to define an interaction model [11].

The student profile of this subject is an adult with work responsibilities and often also with family responsibilities. Usually, students have insufficient prior knowledge in maths or there exists a gap of 10 to 15 years since they studied mathematics.

In every experience, students used the tool voluntarily and some students were asked explicitly for their voluntary collaboration in the research.

Data

Students and tutor annotations are the main data. Moreover, the student profile (mainly in relation to interaction), forum and email messages and students' collaboration messages are also taken into account in the analysis.

5. RESULTS AND DISCUSSION

In this section, we analyze the two experiences using UOCLET, taking into account the results obtained in the preliminary experience using DIIGO. Firstly, we shall offer the results of the quantitative analysis of annotations and forum messages, and then, the results of qualitative analysis of students' collaboration messages and annotations.

Annotations are the main data of this study. In a quantitative approach, our interest is to analyze the degree of interaction through observing who initiates the interaction (Table 1) and which aspects of the contents accumulate more interaction (Table 2).

Who annotates?	2007-08 (DIIGO)	2008-09 (UOCLET)	2009-10 (UOCLET)
Starting annotations	Students-tutor	Students	Tutor
Comments	Students-tutor	---	Tutor

Table 1. Who initiates the interaction?

In Table 1, we can observe relevant differences among the experiences since different strategies were carried out. In the preliminary experience, once we realized that there was a very low or null use of the tool during the first month of the experience, it was decided to force the use of the tool through the area of partial evaluation. Some students made annotations but in some cases, the rejection towards this decision was so great that the possibility to use the tool was blocked. An opposite strategy was raised in the first experience with UOCLET: the tutor introduced the tool and invited students to use it without putting pressure on their use of it. Then, few students annotated and there were not any comments or responses. This leads us to set out a half-way strategy for the last experience: the tutor often annotated the content with questions or comments that allow the students to reflect on contents and contribute comments. Although students appreciated it, there was not a noteworthy increase in the number of annotations.

	2007-08 (DIIGO)	2008-09 (UOCLET)	2009-10 (UOCLET)
What is annotated?	Solutions of proposed problems and examples	---	Solutions of proposed problems

Table 2. Aspects of the contents that accumulate more interaction

In table 2, we can observe that the process followed by students in interacting with the tool starts at a basic procedural level. Students intend to solve those more practical questions that worry them when interacting with the study material: procedures in examples or in solutions of proposed problems. In the first experience using UOCLET, the diversity of aspects annotated does not allow us to emphasize any one of them.

Forum messages are complementary data and allow us to observe the predominant topics when students interact publicly with their usual communication tool. Analyzing forum messages also allows us to study characteristics of each experience in depth.

	2007-08 (DIIGO)	2008-09 (UOCLET)	2009-10 (UOCLET)
Predominant topics	Technology Relational Math procedures	Relational Technology Math procedures	Technology Relational Assessment
Is the tool a source of debate?	Yes	No	No
Are there any technological questions about the tool?	30%	4%	45%

Table 3. Forum data

The three predominant topics, sorted by the number of messages related to them, are shown in Table 3. It is worth noting that students do not use the forum a lot to make questions about the contents. They usually prefer to ask the tutor through email or to search information on their own. Then, the introduction of a web annotation tool in order to do these questions requires a change of learning methodology.

Technological questions are clearly predominant, mainly at the beginning of the semester. The introduction of the new tool increased this sort of questions. In table 3, the percentage of technological questions with regard to the whole of the technological questions is shown. In the preliminary experience,

students must register as a DIIGO user and join the subject-matter group and a lot of questions arose. The percentage decreases in the first experience when we introduce UOCLET with easy instructions and no registration was required. In the last experience, there was some external trouble.

It is also worth noting the importance of the pedagogical strategy in order to introduce the tool. As is shown in table 3, only in the preliminary experience, the tool was a source of debate due to the pressure exerted. It is also shown in table 4, where the results of the qualitative analysis of students' collaboration messages are reported. As well as using other strategies, we make promotional videos with positive students' evaluation and then, the tool was naturally assimilated in the experiences with UOCLET.

	2007-08 (DIIGO)	2008-09 (UOCLET)	2009-10 (UOCLET)
Do students show contempt for introduction of tool?	Yes	No	No
Evaluation of promotional videos	---	Positive	Positive

Table 4. Results of collaboration messages

Although different strategies are carried out in each experience, a low use of the tool is a common feature. Analyzing the students' collaboration message, we observed some reasons behind the low use of the tool, collected in table 5:

	2007-08 (DIIGO)	2008-09 (UOCLET)	2009-10 (UOCLET)
Feeling of lack of time to understand the contents of the subject	Yes	Yes	Yes
The moment in which the tool was introduced	Yes	Yes	No
Specific time is needed to learn tool functionalities	Yes	Yes	No
Reservations about the pedagogical legitimacy of the tool	Yes	Yes	No
Technical hitch	Yes	Yes	Yes
The need to work online	Yes	Yes	Yes

Table 5. Reasons behind low use of the tool

First of all, we wish to stress the importance of the moment of the introduction of the tool. In the preliminary experience and in the first experience with UOCLET, the tool was introduced in the middle of the semester, at the beginning of the second block, at a different time to the rest of the resources. Then, students questioned the need to learn to use a new tool when they were already immersed in learning the subject:

I battle more in trying to understand how the tool works (it took me an hour last Friday) than understanding the subject of mathematics itself which is the whole purpose of it(...). I'd prefer to spend time on understanding maths than on how the tool works.

and, in some cases, with the added feeling of a lack of time to understand the contents of the subject and to respond to its instructional structure:

I would be pleased if this proposal would have appeared on dates that were less stressful for me (...).

As is shown in table 5, reservations about the pedagogical legitimacy of the tool and the need of specific time to learn tool functionalities disappear when the tool is introduced at the beginning of the semester with other resources in the last experience.

Nevertheless, the feeling of lack of time is an important factor that appears in all the experiences. This feeling is due to both the profile of the students, with professional and family responsibilities,

(...) I've been very tied up and on top of that, I've had a business trip and this has left me with very little time.

(...) Nowadays, I'm trying to find time from nowhere, taking into account that work and family take up most of my time.

and the low priority of the subject so it is not in a syllabus of a career but it is preliminary:

I've decided to put this subject off and devote time to the core subjects of the degree.

Technical hitches are also a common reason in all experiences. Although we took a great deal of care over easy installation and tool use in the UOCLET design, we only achieved a certain reduction in technical problems.

The need to work online is another factor that influenced the use of the tool in all experiences. Some students were reluctant regarding the possibility of studying with the support of the computer and manifested the need to work exclusively with "paper and pencil".

I follow this subject more in pdf format (which I have printed on paper) than using the online materials (Which I have already installed) (...)

Some resistance appears here to a change in a traditional learning process that was already taken on board by the students in former educational stages, and which was probably deprived of any technological tool. Some students do not appreciate the advantages of a process enriched by a diversity of technological resources.

Finally, we set out the results of the analysis of the interaction and of the interaction profile of the students in relation to the annotations carried out. This analysis was carried out following the model of interactions provided in [11] and based on three dimensions: instrumental dimension, interlocutive dimension and thematic dimension. All the students analyzed throughout their experiences are situated in an intermediate or low level. A low level means that the student starts to use the tool but does not go into its potential in depth. An intermediate level means that the student starts to incorporate the tool in his learning process in a practical and reflective way.

In the preliminary experience, the poor level is mainly due to a low level on the thematic dimension: students did not exploit the possibilities of interaction that the tool potentially provides and the annotations mainly referred to the evaluation questions and not to the contents of the study material. In the first

experience with UOCLET, the lack of discussion and comments is pointed out as a reason for the low levels obtained. Students did not collaborate on the learning process of fellow students. This is clearly observed in the last experience too, where students always addressed the tutor. Then, specific mediation is necessary in the promotion of collaboration among students.

6. CONCLUSIONS

In this section, the results of the experiences carried out are discussed in terms of the conceptual framework. Therefore, the ideas that have been presented will follow the same structure: firstly, we shall offer some conclusions in relation to the interaction axis, next in relation to the instrumental axis, and, finally, on the instructional axis.

In the interaction axis, we exposed Kozma's position, according to which the technologies can offer singular opportunities for learning as long as the instruction is well supported in the cognitive and social processes by which knowledge is produced. We also presented the stance of Roblyer and Wiencke, according to which the technologies can also offer unique opportunities for achieving the students' commitment. Although we have obtained only minor evidence of this influence on the students' learning and commitment, but we have been able to ascertain that the technologies do not lead to the achievement of these opportunities in a spontaneous and immediate way. We have stated the special importance of the promotion of interaction that has to take into account different strategies and factors. Furthermore, specific mediation is also necessary to change the traditional learning process of students.

With respect to the instrumental axis, the unsuspected complexity of the instrumental genesis pointed out by Artigue has been reflected in this study of the multiple factors that have influenced the incompleteness of the instrumental process. And in relation to the question of the pedagogical legitimacy of introducing technical knowledge which is alien to the official curriculum, we have stated the importance of the moment of introduction of the tool. In our context, this question disappears if the tool is introduced at the beginning of the semester since the students assume that specific technological requirements will be given at the beginning of each subject.

Finally, in referring to the situational axis, it has been shown that the instructional inflexibility has consequences in the process of the students' learning and in their capacity to accept and use the new communication tool.

7. FUTURE TRENDS

The aforementioned results lead us to state two main future trends in order to advance in the integration of contents and communication: on the one hand, the technological development of UOCLET and, on the other hand, the revision of the assessment model.

In relation to UOCLET:

- to check the web annotations tool requests and reformulate them
- to improve the application's interface
- to revise the user's guide
- to allow the annotating of pdf files

In relation to the assessment model:

- to revise the current assessment model
- to validate effective strategies in order to promote interaction among the students
- to obtain effective and useful elements to assess the interaction in order to add them to the assessment model.

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An Interactive Experience Of Ecological And Environmental Education In Italy: BEL SIT Project

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ABSTRACT

BEL SIT is an educational project, coordinated by the CSSAS (Soil Analysis Experimental Centre), whose aim is to update and disseminate information about the natural and cultural assets of an area lying in the Bologna Apennines through the creation of a geodatabase using a specific Geographical Information System (GIS).

Survey data regarding important environmental features, such as monumental trees, noteworthy species of plants, characteristic lithological formations, singular geomorphological aspects, mineralogical and paleontological rarities, natural springs and animal habitats are furnished alongside data concerning building types, with the aim of highlighting, among other things, the ways in which man adapted rural settlements to ecosystem conditions up to the middle of the 20th century.

The results of the BEL SIT project are available at the website http://www.geolab-onlus.org/BEL_SIT/.

The geodatabase, downloaded from the website, will provide users with in-depth insight into the natural and cultural resources of the Bolognese Apennines and enable them to conveniently visit any place of interest using a modern GPS tracking system. BEL SIT is a physical and cultural atlas designed as a tool for disseminating information about the natural and cultural heritage of this area using modern communication systems (websites, publications and CD ROMs) which are useful for conveying knowledge at all levels (schools, cultural associations, local authorities,...).

Keywords: Geographical Information System (GIS), tourist itinerary, cartography, environmental and cultural resources, Bologna Apennines

1. PROJECT AIMS AND BACKGROUND

1.1 Aims

With this experimental study, the ISEA (Institute for the Economic Development of the Northern Apennines), following the guidelines furnished by the Regional Department of Agriculture – Rural Land Office of Emilia Romagna, implemented a series of initiatives aimed at disseminating

knowledge and information on the most important hilly and mountainous areas of the Emilia-Romagna region, based on the conviction that “knowledge for knowledge’s own sake” is not sufficient.

The overall project was conceived with the aim of defining a series of tourist itineraries in different valleys that would serve to highlight the environmental and landscape features, historical and cultural attractions, the variety and quality of typical local products, the level of accommodation and services offered by hotels and so forth, all aspects illustrated using traditional graphic-cartographic systems managed, however, with the aid of suitable geographic information systems.

The aim was firstly to collect, in a systematic manner, the materials resulting from numerous analogous studies and research projects, in order to create a veritable physical and cultural atlas comprising all of the valleys of the Emilia-Romagna Apennines; and secondly, but equally importantly, to disseminate the information thus gathered on a mass scale using modern communication tools, such as publications, websites and CD ROMs.

Such tools can be used to convey knowledge at all levels, so that information can be targeted at public authorities, schools, cultural associations, tourist institutions and organisations, local businesses, etc. in order to achieve the broadest possible dissemination of the documents prepared.

In this context, BEL SIT (Territorial Information System for Local Environmental Assets) was created as part of an educational project coordinated by the CSSAS (Soil Analysis Experimental Centre), whose aim is to update and disseminate information about the natural and cultural assets of the Bolognese Apennines by creating an up-to-date geodatabase relying on a specific Geographical Information System (GIS).

BEL SIT is a physical and cultural atlas designed as a tool for disseminating information about the natural and cultural heritage of this area using modern communication systems (websites, publications and CD ROMs) which are useful for

conveying knowledge at all levels (schools, cultural associations, local authorities,...).

Using GIS tools enables real geographical coordinates to be attributed to each item of information. BEL SIT could be used either at school by teachers as an aid to disseminating culture and knowledge about the Apennine area or by students as a tool for learning about specific cultural and environmental topics concerning this mountain area, which is not very well known.

The research team was coordinated by Professor Gilmo Vianello, director of the CSSAS, Soil Analysis Experimental Centre of the University of Bologna Faculty of Agriculture, who is specialised in theme mapping and the use of GIS (Geographic Information Systems) and has for years devoted his efforts to education and the dissemination of tools and methods for territorial and environmental assessment and analysis, with a special focus on landscape elements.

This project has also benefited from the collaboration of Giacomo Buganè, coordinator of Geolabotario Santerno, a non-profit organisation, and the architect Vittorio degli Esposti, who carried out a survey on the Immobile Cultural Property of the Province of Bologna, as well as contributions from veterinarians, geologist, geo-pedologists and naturalists. Special thanks go to Pietro Fabbri, who captured the beauty and distinctive features of the study area in photographs taken from an unusual point of view, from his small aircraft.

1.2 Knowledge of the past

In the 1970's cultural property survey campaigns were carried out in the provinces of Bologna, Forlì and Modena. The photographic documentation collected during these surveys is now of historical interest. It was partly disseminated through publications such as Territorio e Conservazione (*Territory and Conservation*), issued by the I.S.E.A. and Ministry of Public Education, Edizioni ALFA, 1972, Bologna and the Carta dei Beni Culturali e Naturali della Provincia di Bologna (*Map of Cultural and Natural Assets of the Province of Bologna*), issued by the Provincial Authority of Bologna, Edizioni ALFA, 1977, Bologna.

The Regional Institute for Cultural Heritage subsequently converted the photographic catalogue into an electronic format and constructed a database with around 5,500 pictures taken around the province of Bologna between 1970 and 1975.

This database represents the most important record of historical buildings since the documentation

produced by Luigi Fantini in the 1930s and in the early post-war period.

In 1972 Lucio Gambi stressed that “...every initiative aimed at preventing the decomposition or degradation of this ‘territory’ must be resolved on and undertaken as a public service for the benefit of those who live there, with measures of protection and social enjoyment fitting strictly within the framework of a policy for the readjustment of inhabited areas”.

A concept that is equally relevant in our own times, one that should stimulate feelings of pride within mountain communities and a commitment to conservation and restoration of the cultural heritage and historical vestiges of rural civilisation.

Today, a majority of historical buildings have undergone changes, often poorly executed, or have fallen partly into ruin, as revealed by recent surveys conducted both in mountainous and plain areas. Only precise planning aimed at protecting what still remains of historical buildings, supported by documentation of their former state, can serve both as a tool for cultural conservation and for the purposes of enjoyment underlying the concept of “environmental quality”.

The dissemination of environmental information also permits greater insight into the mountain environment, and visits are made easier thanks to theme-based tourist-environmental itineraries described and identified by means of GPS tracks that are simple to use.

2. METHODOLOGICAL APPROACH

The project focuses on the need to safeguard the existing natural and cultural heritage of the Bolognese Apennines. Steps have thus been undertaken to complete the catalogue of natural and cultural assets by setting up a georeferenced database supported by a suitable geographic information system.

The results of the BEL SIT project are available at the website http://www.geolab-onlus.org/BEL_SIT/. The project has an educational purpose, in that it aims to disseminate knowledge about the cultural and environmental points of interest surveyed and studied, but it also deals with technical and scientific aspects, providing in-depth data available for viewing.

The most important characteristic of this study and learning tool lies in the georeferencing of each asset (cultural and environmental) included in the database, i.e. each place or object of interest can be

located on an interactive map, thanks to which users can easily navigate within the study area and click on links to access information files, photographic documents and practical details. This interactivity is made possible with the aid of geographic analysis tools such as GIS.

The georeferenced database made available via the website will enable users to gain considerable knowledge about the natural heritage and mountain communities of the Bologna Apennines. At the same time, they can easily visit the places they are interested in thanks to the aid of a modern GPS tracking system.

From the BEL SIT website users can also download GPS tracks to be used directly on the ground in order to follow the chosen route they previously saw on the maps: a description is provided for each point of interest.

This digital catalogue was created by integrating the existing archive of photographs (5,800 pictures dating from the years 1970-75 and regarding the whole of the province of Bologna) with more recent photographic materials (1980-90 and 2005-07, pictures of the Apennine area only) so as to effectively document the changes (or features that have remain unchanged) in settlement patterns over a period of nearly forty years.

Survey data regarding important environmental features, such as monumental trees, noteworthy species of plants, characteristic lithological formations, singular geomorphological aspects, mineralogical and paleontological rarities, natural springs and animal habitats are furnished alongside data concerning building types, with the aim of highlighting the distinctive aspects.

These land survey data are studied for the purpose of evaluating how man adapted rural settlements to ecosystem conditions up to the middle of the 20th century.

3. BEL SIT CONTENTS

The BEL SIT website is organised into several sections:

- the chapters making up the atlas, which consist in PDF files containing easily downloadable text and pictures;
- a catalogue itemising the individual environmental and cultural assets plus a collection of photos in PDF format;
- individual text files in PDF format providing

details about the four municipalities studied (Borgo Tossignano, Casalfiumanese, Fontanelice and Castel del Rio) and including an illustration of the municipal coat of arms, a brief description of the history and several representative pictures of the area, as well as a cartographic analysis of the dynamics of urban development in the principal towns or villages;

- interactive map;
- cartographic tools (software) for managing the information, which can be downloaded and installed on a personal computer.

This layout is clearly presented on the homepage of the website by means of user-friendly graphics. The most important features of each section will be illustrated and analysed below, along with a description of the contents and uses for the dissemination of environmental and cultural information.

3.1 Environmental and cultural data of BEL SIT

3.1.1 Environment and Territory

The first chapter “Environment and Territory” describes and explores the environmental and landscape features of the entire study area.

The area analysed falls within the Region of Emilia-Romagna, is located around 40 km east of the city of Bologna and comprises the four municipalities of Borgo Tossignano, Casalfiumanese, Castel del Rio and Fontanelice. Their respective territories include a hilly zone and a higher Apennine zone, with a further distinction being made between “upper” and “middle” mountain areas.

The Santerno river, which flows all along the valley in which these four municipalities are located, represents the most important feature of the area: flowing from south to north, the river crosses the four municipal territories. The digital elevation model (DEM) serves to highlight the orographic configuration of the Santerno river basin and the neighbouring basins of the Sillaro and Senio rivers, which fall within the territories of the municipalities concerned (Figure 1). The area is described first from a hydrographic and climatic point of view, then in geological and pedological terms. It is worth pointing out that the geology of this land area is among the most complex in the Apennines, a factor which explains both the presence and variety of local flora and fauna.

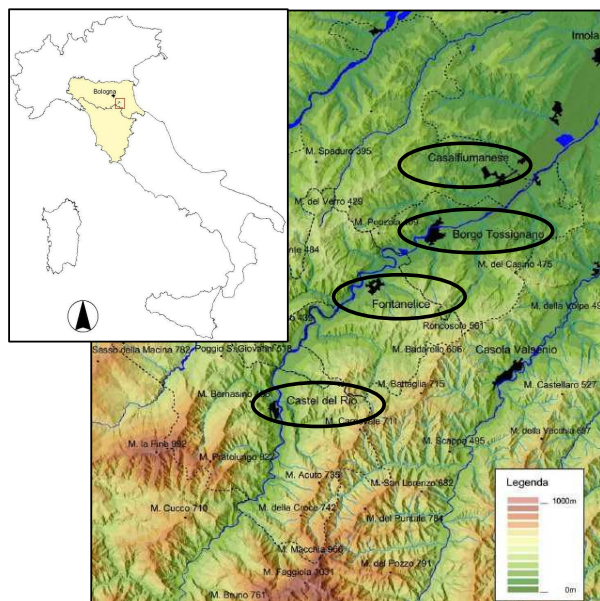


Fig. 1 The four municipalities analyzed and the DEM of the study area

Of interest, in particular, is the Vena del Gesso or “Gypsum Vein”, cut by the Santerno river, and consisting of gypsum and salt cycles alternating with clay layers: this is one of the most characteristic geologic features of the valley (Fig. 2).



Fig. 2 The “Gypsum Vein”

The morphology of this environment is also dominated by the *calanchi*, characteristic gully landforms: the clay they are made up of soaks up water and tends to slide and erode away, thereby creating ridges and pinnacles.

In addition to preparing text content and photographs, the project team has constructed theme maps – altimetric maps, hydrographic maps, geological maps, pedological maps and land use maps – which enable users (teachers, students or

anyone who is interested) to pinpoint geographical locations within the study area, according to theme. Environmental aspects are further addressed through a detailed naturalistic description of the variety of fauna and flora present within the area.

3.1.2 Historical signs of human presence

A second chapter dedicated to historical themes provides an overview of the events occurring in the places studied from prehistory to the modern age, highlighting the presence of signs and traces of historical importance that have survived up to our own times: archaeological areas, artefacts, historical buildings.

In addition to displaying noteworthy landscape features, the study area has proven to be especially interesting and rich from a historical viewpoint. It offers important relics of the past, which are not well known to the public, such as furnishings and earthenware dating from the Neolithic period.

3.1.3 The municipalities

Essential geographic and demographic data are given for the municipalities of Castel del Rio, Fontanelice, Borgo Tossignano and Casalfiumanese, along with an illustration of the municipal coats of arms and their official explanations.

The urban development of each town is illustrated by comparing the topographic map of 1892 with present-day ones and by means of aerial photographs taken at low altitudes. Information regarding historical and urban planning aspects is also provided and the main cultural venues are identified.

3.1.4 Tourism offerings and events

The BEL SIT environmental and cultural atlas also includes this section geared more specifically toward tourists, which completes the information intended to promote and disseminate knowledge about the area. A description is thus also given of the most important annual events, often tied to historical commemorations or agricultural fairs.

This part of the atlas is further completed by information about where to find hotel accommodations and other details useful for tourists (establishment opening hours, telephone numbers, type of lodging, services provided).

3.1.5 Landscape itineraries

All of the information relating to landscape, environmental, naturalistic and historical aspects described in the previous sections is brought together in this file and organised into four different suggested itineraries designed to guide tourists and help them discover the landscapes and natural and cultural attractions the area offers.

This section provides a detailed text description of the entire route and the points of interest, along with photographs showing the objects or places catalogued and different views.

BEL SIT offers users an important innovation: the routes forming the four itineraries have been organised into GPS tracks that can be easily downloaded and used to make touring the various places easier.

Tourists can thus be sure of following the route described on the website and easily visit the sites of interest by referring to the waypoints shown on the navigation tracks.

Using a specific software application that can be downloaded free of charge (ozyexplorer) from the "Strumenti" section of the website, the routes can be easily displayed on a PC (and printed out if so desired) or on a GPS screen.

3.1.6 Images and views

An additional section features PDF files containing photos and views of the local landscape. The aim is to give an idea, albeit a limited one, of what sensations may be enjoyed by those who venture into the midst of the ecosystem of the upper and middle Santerno valley and adjacent areas.

A numerical indication appears alongside each picture: the reader will find the same indication on the map and on the GPS tracks next to the camera icon, which is intended to highlight panoramic points.

3.1.7 Cultural and environmental catalogue

Within the study area an inventory was taken of some particularly valuable cultural and natural assets: it is by no means a global survey, but rather aims to point out places that deserve to be visited and observed.

The resulting catalogue is intended to stimulate the interest of tourists, who can complete the files with their own personal observations and pictures.

The catalogue is organised into 63 files in PDF format.

Each file is identified by an alphanumeric and graphic code, that may be interpreted as follows:

- the first capital letter identifies the municipality (B = Borgo Tossignano, C = Casalfiumanese, F = Fontanelice, R = Castel del Rio);
- the next two capital letters define the type of place or object (AM = monumental trees - ED = defensive buildings - EM = artefacts - EN = historical settlements - ER = religious buildings - ES = scattered buildings - RF = rocks and fossils - SF = natural springs and sources);
- the number reflects the sequence of files based on the code of the municipality and the type of place or object concerned.

The actual UTM – WGS84 coordinates are provided for each "object" described. Readers are thus able to pinpoint its precise location on the topographic map or, using a GPS system, directly on the ground.

The object itself is represented by one or two photos, accompanied by a brief description and directions on how to reach the site.

The text content and photos relating to each asset have been organised into two different theme layers (text files, views), which the user can download free of charge and view with Google Earth, a popular software application used for taking virtual tours via satellite images.

4. THE MAP

The most important feature of BELSIT map is that it is interactive: using buttons on the left bar, the user can navigate inside the area occupied by the four municipalities and zoom in to view details.

The map is a GIS resource containing all the information described in the text files.

A legend explains the icons used to distinguish each cultural and environmental asset catalogued (rocks and fossils, artefacts, defensive buildings, scattered buildings, religious buildings, natural springs or sources, historical settlements, monumental trees, views).

Every single place or object is georeferenced, i.e. its location is identified according to precise geographic coordinates and a link is provided to allow access to the relevant information.

Simply by clicking the icon on the interactive map users can open the corresponding catalogue file, which includes an identification of the asset, its geographical data and a description; or else, in the case of views, which are identified by the camera icon, they can download the images (Figure 3).

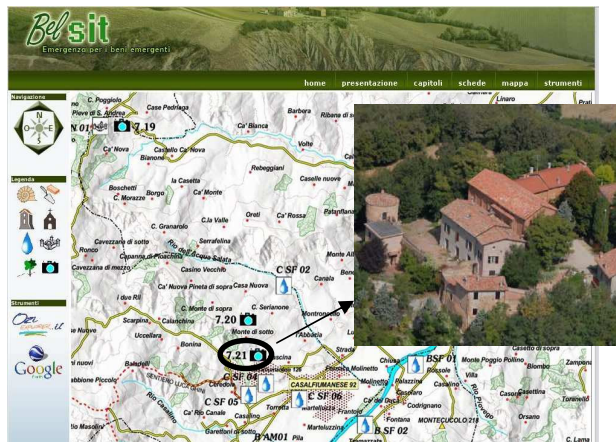


Fig. 3 A particular of the interactive map with the image 7.21 charging.

5. CONCLUSIONS

BELSIT is a new educational project aimed at cataloguing cultural and environmental assets. For this purpose it relies both on traditional descriptive texts and geographic analysis tools and modern technologies.

The use of an interactive computer-based approach should be seen as method of study, of disseminating knowledge about a specific area and the various aspects characterising it. In this case the study has focused on four municipalities in the Santerno valley and seeks to highlight the natural and cultural resources they offer.

Users who navigate through BEL SIT not only learn about the environmental and cultural features of the Bologna Apennines through their acquaintance with the catalogued places and objects, but they also acquire computer skills and familiarity with tools whose use is increasingly widespread, such as Google Earth, which provides a “bird’s eye view” of an area by means of satellite images or software applications for viewing, editing and creating GPS data (tracks and waypoints).

It is the very fact of being able to download, on a GPS or PC, the tracks of the proposed itineraries for discovering the area concerned which makes this a new and intelligent method of promoting tourism and appreciation of the area itself, one that enables visitors to reach all of the points indicated along that precise route confidently and in complete freedom. Possible prospects for the future include an extension of the catalogue for these areas, as well as a translation into other languages.

Moreover, we hope to apply the method followed

for BEL SIT to other areas of study as well, perhaps together with European or international partners, with the aim of disseminating a new sustainable and conscious approach to promoting knowledge of our cultural and environmental heritage.

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Investigation of the Use and Benefits of Online Social Networking (OSN) in Higher Education

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Abstract

Online social networking (OSN) is a range of activities enabled by social technologies and operationalised by a group of people. More recently, social technologies such as blogs, wikis, photo and video sharing, podcasts, social bookmarking, social networking sites, instant messaging and online discussion boards have been widely used to facilitate OSN. OSN is popular mostly for non-educational purposes among young generation of students categorised as the Digital Natives. It can be appropriated and repurposed to support teaching and learning delivery. Despite the availability of implementation cases, studies on the effectiveness of the deployment are still lacking. Therefore, based on a critical literature review, this study analyses which OSN activities are relevant in the education context and what social technologies can support these activities. Specifically, four OSN activities that have been identified and relevant in the education context are content generating, sharing, interacting and collaboratively socialising. Furthermore this paper highlights the benefits that can be obtained from the appropriate deployment of social technologies in the education context. The study finding provides a general guide for academics who want to use OSN in improving their teaching and learning.

Keywords: Online Social Networking (OSN), Social technologies, Web 2.0 tools, Educational activities, Higher Education

1. BACKGROUND

The widespread use of social technologies (software and/or applications that are used for social purposes), in particular Web 2.0 tools is relatively a new phenomenon [1]. Web 1.0, the precursor of Web 2.0 is static, centralised, content-based, readable, rigid and individual. On the other hand, Web 2.0 is dynamic, distributed, service-based, writeable, loosely couple and social [2]. Web 2.0 popularity can be credited to highly utilised services like blogging, video sharing and social networking sites. To some extent, online discussion board stemmed from Web 1.0 is also frequently included in Web 2.0 discussion [3]. Although Web 2.0 technologies have only been around for about five years, yet they are already having a noticeable impact on higher education [4, 5].

2. APPROPRIATION AND REPURPOSING SOCIAL TECHNOLOGIES FOR HIGHER EDUCATION

Conceptually and practically, OSN enables its users to socialise and create networks or communities online. In the higher education sector, these publicly available social technologies for OSN have started to be appropriated and repurposed for educational activities [6-8]. In this context, appropriation and repurposing refer to the process of appropriating originally designed social technologies and pedagogically repurpose them for educational purposes [6].

Previous works especially by Kennedy et al., [9, 10] who studied the general use of information technologies by young students, and Hemmi et al., [6] and Jones et al., [11] who studied the use of social technologies informed this research that the appropriation and repurposing of social technologies are not an easy and straight forward process. As the higher education deals with digital natives who are perceived to be familiar with OSN and social technologies, the literature has shown evidence of some efforts made to use these technologies to support educational activities with a certain degree of success. However, at this stage, the effectiveness of appropriation and repurposing of the social technologies is not well understood. To address the gap, this paper analyses not only the phenomenon of Web 2.0 use in higher education but also how higher education can deploy OSN appropriately with consideration being given to pedagogical aspects. Therefore, the research questions addressed in this paper are:

- (1) What online social networking (OSN) activities are relevant in the education context?
- (2) What social technologies can support these activities?
- (3) What are the benefits and challenges of OSN to support educational activities?

This paper, guided by the analysis of literature review is aimed at providing some insights and preliminary answers to the questions posed above. At the later stage of this research, empirical data would be collected from the field in order to explore and substantiate further the initial findings from the reported critical literature analysis reported in this paper.

3. DIGITAL NATIVES AND HIGHER EDUCATION

Characteristically, the “Digital Natives” (youngsters who are born roughly after 1980) are said to be very familiar with the most recent and up-to-date ICTs. They also spent their time and lives with high tech devices such as computer, video games, digital music and mobile phones [12] to the extent they get fully immersed in Web 2.0 in living their online lives and at the same time, seamlessly meld with their offline world [13]. They typically have low tolerance for lectures and also prefer to receiving fast information, being on multi tasking, being active learners, having non-linear access to information, and relying on ICT to access information as well as to carry out their social and professional interaction [12, 14].

On the other hand, Prensky [12] refers to lecturers in higher education as the “Digital Immigrants”. They are considered as foreigners in the digital lands of the digital natives and lack of technological literacy. The differences in the characteristics are speculated to create some degree of incompatibility between the two generations [12]. Since the potential of OSN in the formal academic setting is always tempting for educators and policy makers alike, therefore some have already started to incorporate OSN in the higher education context. However, Kennedy et al [15], Grosbeck [16] and Bennett et al., [17] suggest that careful planning must be made prior to adoption of the online technologies in classroom. This is because based on their research, not all young people categorised as digital natives are keen to have such technologies in classroom for various reasons: diversity of experiences, familiarity, attitudes and expectations of the students towards online technologies [15].

Bennett et al., [17] argue that this “digital native debate” has created an ‘academic moral panic’. To balance the arguments between supporters and critics [10, 17, 18], Bennett et al., [17] suggest there is a need to have more systematic research with sufficient evidence into these young students’ needs, skills and use of technologies in higher education. On the same note, Selwyn [19] also cautioned the educators to be wary of simply introducing new information technologies such as Web 2.0 applications into the classrooms on the assumptions of fulfilling the needs of these young students. The move also should be preceded with some forms of open dialogues between the young students and educators in gauging the students’ opinions [19].

Therefore, ‘one size fits all’ approach to the integration of ICTs into university curricula needs to be carefully reconsidered. In addition, it remains unclear what the users’ behaviours are in using OSN for higher education and it is essential to understand how educational activities can be supported by the social technologies. Ensuing to these arguments, scholars [6, 20-22] have proposed that educators need to adjust

their pedagogical models if they were to use social technologies for teaching and learning in order to suit this kind of new generation students [17, 23].

4. LEARNING 2.0 AND OSN EDUCATIONAL ACTIVITIES

Beyond the users of the technology, it is also important to look at how learning has evolved with the advent of Web 2.0 in higher education. The concept of delivering educational activities using Web 2.0 is termed Learning 2.0 by some researchers. It is basically an innovative online learning space used to deliver teaching and learning [24]. The preceding concept, Learning 1.0 simply reproduces the old models of teaching via a spectrum of tools and applications like courseware, online discussion fora, online testing, course management system and virtual learning environments (VLEs), making Learning 1.0 essentially a teacher-centred approach. On the other hand, with the newer social technologies like Web 2.0, it is the enhancement to the Learning 1.0 enabled by Web 2.0 technologies with a more flexible and student-centred approach. Learning 2.0 facilitates and stimulates collaboration and sharing [25]. Specific applications like real-time online discussions are used to improve active learning and discussion board threads are employed to foster cooperation among students [26].

Learning 2.0 is creating a new kind of a participatory medium that is ideal for encouraging multiple types of learning [27], in particular social learning and constructivist learning. It is based on the assertion that students’ understanding of content is socially constructed through conversations about the content and through interactions around problems or actions. Social learning permits not only “learning about” the subject matter but also “learning to be” full participant in the field. The nature of Web 2.0 is very much supportive of socialisation. Hence, OSN activities through online social technologies could potentially create a more engaging classroom climate and participation among students.

Based on the literature analysis, the following activities have been identified as the common OSN educational activities performed by students and lecturers:

Content Generating

Most of the social technologies allow users to easily create their own content and also to actively share information, opinion and support across networks of users. For example, podcasts can deliver educational materials in addition to music while blogs can be used as reflective diaries and to develop online communities of practice [28].

Sharing

Another educational activities that can be supported by social technologies is sharing of information. Students are able to put up their contents on the public space for others to view and download. For example, the produced multimedia files are shared on file sharing

websites such as Flickr, YouTube or Slideshare, bookmarking certain websites or tagging keywords for users with similar interests to peruse [15, 24, 28-32]. Hence, sharing contents and information using social technologies means much more than just publishing them online.

Interacting

Social technologies also support interactions among students by allowing them to actively participate in a discussion. They can leave comments on blog or discussion board and ask for more detail explanations, adding someone as a friend and initiate communication by leaving a message [6, 13, 31, 33].

Collaboratively socialising

This activity involves working collaboratively in online social environment to solve certain issues or problems with members of the groups, or organising social events through social networking sites [5, 6, 13, 15, 24, 30, 32-35].

In reviewing the existing literature regarding the various social technologies’ potential benefits for educational purposes, we can map the technologies to specific OSN activities. Based on the identification of various educational activities and social technologies through our literature analysis, Table 1 provides a matrix summarising various OSN activities that can be potentially supported by specific social technology and the related references.

Table 1: Matrix of OSN Relevant for Educational Activities and Social technology

Social Technologies	Online Social Networking (Educational Activities)			
	Content Generating	Sharing	Interacting	Collaboratively Socialising
Blogs	(Sandars & Schroter, 2007) (Hargadon, 2008) (Churchill, 2009) (Murray, 2008) (Ushuel & Mazman, 2009)	(Ushuel & Mazman, 2009)	(Churchill, 2009) (Ushuel & Mazman, 2009)	
Wikis	(Ras & Reeh, 2009) (Sandars & Schroter, 2007) (Hargadon, 2008) (Kane & Fichman, 2009) (Murray, 2008)	(Kane & Fichman, 2009) (Ras & Reeh, 2009)		(Kane & Fichman, 2009) (Sandars & Schroter, 2007) (Ras & Reeh, 2009) (Rhoades, Friedel, & Morgan, 2009)
Photo sharing	(Sandars & Schroter, 2007) (Hargadon, 2008) (Ajjan & Hartshorne, 2008)			
Video sharing	(Sandars & Schroter, 2007) (Hargadon, 2008)		(Mason & Rennie, 2008)	
Podcasting	(Sandars & Schroter, 2007) (Minocha & Thomas, 2007) (Hargadon, 2008)	(Sandars & Schroter, 2007)		
Social bookmarking	(Sandars & Schroter, 2007) (Oradini & Saunders, 2008)	(Eysenbach, 2008) (Churchill, 2009) (Oradini & Saunders, 2008) (Minocha, 2009)		
Online discussion board	(Hemmi, Bayne, & Landt, 2009)			(Wuensch, Aziz, Ozan, Kishore, & Tabrizi, 2009)
Instant messaging	(Sandars & Schroter, 2007)			(Sandars & Schroter, 2007) (Mason & Rennie, 2008)
Social networking sites	(Murray, 2008) (Virkus, 2008) (Sandars & Schroter, 2007) (Hargadon, 2008)	(Murray, 2008) (Oradini & Saunders, 2008) Virkus 2008	(Murray, 2008) (Minocha, 2009)	(Murray, 2008) (Supe, 2008) (Oradini & Saunders, 2008)

5. BENEFITS OF ONLINE SOCIAL NETWORKING IN HIGHER EDUCATION

Besides understanding the potential of social technologies for supporting educational activities, it is also important to understand the benefits that can be derived from using OSN in Learning 2.0. Five major benefits have been identified from the literature which are discussed next:

Improving Engagement

OSN activities have the potential to improve student engagement and increase their participation in classroom, in particular among quieter pupils. They can work collaboratively online, without the anxiety of having to raise questions in front of peers in class – or by enabling expression through less traditional media such as video [36]. Quieter students may feel reluctant and hesitant to participate and interact actively in class. However, once they cast their shyness away through the use of online technologies (be it blogs, wikis, or SNS), they are likely to become active participants. As

part of creating a sense of engagement while using OSN, students may also create a sense of belonging and ownership when they are given the freedom to publish their work online (for instance in the personal blog related to the course) or contribute in class’ blog by simply joining the class’ group in any popular SNS.

Enhancing Learning Motivation

Learning using social technologies can further boost students’ motivation, encourage their attention to detail and an overall improved quality of work. A study by Rifkin et al.,[37] indicates that when the students publish their work online for multiple audience, their input are mostly original, interesting and engaging for others to see. This in turn will lead to a more positive assessment from the peers and lecturer. In addition, lecturers have also reported that the use of online technologies can encourage online discussion amongst students outside school which is beyond the traditional classroom setting.

Offering Personalised Course Material

Personalisation is what appeals the most to both students and lecturers from social technologies. In the case of social networking sites or even blog, when students put their user profiles and personalise their respective pages, they can provide comprehensive information about themselves (i.e full name, date of birth, address, educational background, hobbies, social, and even political or religious affiliations). The academics who are using such technologies in their classroom will then be able to learn more about the students they teach simply by viewing the students profiles [29]. In response to this, lecturers can personalise the course material based on the students' profiles [38].

Developing Collaborative Skills

Some social technologies such as wikis and to some extent blogs, encourage inquiry-based and collaboration activities among students. This opens room for active participation and hence creates effective learning. Linked with this principle of collaborative production, there are additional facilities including sharing and publishing the artefacts (i.e course materials such as course syllabus, course notes, assignments, test cases, etc) produced as a result of the learning activity and inviting feedback from peers. By

publishing and presenting their work to a wide audience through blogs, wikis, or podcasts, learners benefit from the opportunity to appropriate new ideas, and transform their own understanding through reflection [39, 40].

Appealing to Digital Natives

Another benefit of OSN activities is the compatibility of the technologies with the traits of digital natives [41] who are comfortable with the latest technology available in the Internet space [42]. As highlighted before, they are highly comfortable and familiar with using such tools which already integrated into their daily practices, mostly outside of school context. For instance, embracing online technologies and being engaged in OSN activities are part of their daily routines. According to Gaston [43], learning to teach digital natives does not necessarily require advanced studies in technology but rather the desire to engage students in the learning process and make learning fun to them.

The mapping of the benefits and the relevant social technologies briefly discussed above, complemented by a more extensive literature analysis yields the Table 2 below.

Table 2: The Benefits of OSN Facilitated by Social Technologies

Key: *BLG*=blog; *WKI*=wiki; *PS*=photo sharing; *VS*=video sharing; *PD*=podcast; *SB*=social bookmarking; *ODB*=online discussion board; *IM*=instant messaging; *SNS*=social network sites (Note: due to space constraint, reference lists for the Table 1 and Table 2 above are available upon request)

Benefits	References	Social Technologies								
		BLG	WKI	PS	VS	PD	SB	ODB	IM	SNS
Improving engagement	Grantt, 2008					√				
	Murphy & Lebens, 2008	√	√		√					
	Wheeler & Boulos, 2008	√	√	√	√					√
	Boulos, Maramba, & Wheeler, 2006	√	√			√		√		
Enhancing Learning Motivation	Dohn, 2009	√	√							√
	Motteram & Sharma, 2009	√	√							
	Rafkin, Longnecker, Leach, Davis & Ortia, 2009	√			√	√				
	Ajja & Hatshome, 2008	√	√							√
Offering personalised materials	Dale & Pymm, 2009					√				
	Usluel & Mazman, 2009		√							
	Griffith & Liyanage, 2008									√
	Ferdig, 2007									√
Developing collaborative skills	Dale & Pymm, 2009					√				
	Minocha, 2009						√			
	Usluel & Mazman, 2009	√	√							√
	Brown & Adler, 2008	√	√							
Appealing to Digital Natives	Grantt, 2008					√				
	Mason & Rennie, 2008	√	√	√		√				
	Salmon & Edirisingha, 2008					√				
	Gaston 2006	√	√						√	√

In balancing the arguments of the benefits of OSN with its disadvantages, Harris and Rea [44] identified the following four disadvantages: (1) computing resources must be made available; (2) web resources can be vandalized or sabotaged; (3) plagiarism; and (4) levels of openness of social technologies to the public. We posit that these disadvantages be acknowledged and duly addressed during the process of appropriation and repurposing of OSN.

6. DISCUSSION AND CONCLUSION

Harnessing on the social technologies in particular Web 2.0 offers both opportunities and challenges for higher education. Opportunities arise because there are a number of potential benefits that have been identified from the application of the technologies in higher education and because of the students' backgrounds which typically are classified as the digital natives. However, it poses some challenges as well because

there is little empirical evidence to showcase how social technologies are used to facilitate OSN activities and what benefits can be derived from each specific activity. Therefore, in this study, we address these challenges by reviewing the existing literature to identify and show how social technologies can support educational activities and the likely benefits obtained in order to understand the impact of OSN on the teaching and learning delivery and processes.

We set this study out based on the premise that various OSN activities that can be performed on social technologies are appropriate for the educational context. In particular, four educational activities have been identified, which include content generation, sharing, interacting and collaborative socialising. However, as the Internet keeps changing and developing, we expect that there will be additional activities that will emerge in the near future. In addition, we have also identified various benefits that can be obtained from the use of social technologies to support educational activities.

To complement the findings of this study, further work is required to better understand the actual benefits and disadvantages of OSN derived from each educational activity and facilitated by a specific social technology. At this stage, no previous study has been done to map the use each social technology for supporting educational activities to any particular benefits. Yet, it is important to understand this because by consciously knowing which application is the most appropriate for a particular activity, the teaching and learning can be designed to be more effective, fun and engaging. It will also boost students' interest in knowing more about the subject by not limiting their window of knowledge to a certain medium only but opening up the opportunities wider into the realm of wisdom made possible by the Internet.

Harnessing the technological capabilities is only logical as the digital natives are familiar with these technologies. Also, since the demographics of current and future students in higher education are likely to be digital natives, the delivery of education must be tailored to their interests as well.

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An Attributes Correlation Based Learning Guidance Model

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ABSTRACT

Using the theory of Web Data Mining, this paper proposes a physics discipline personalized learning evaluation system model based on decision tree algorithm. The overall structure of this system model, which is applied to the network-based education, is presented. The key part of the model, data collection module and personalized evaluation module are introduced. The advantages and disadvantages of the ID3 algorithm and the C4.5 algorithm are analyzed respectively. Taking the comparison of the two algorithms and the unique characteristics of the personalized learning system into consideration, a new_C4.5r decision tree rule simplification algorithm based on attributes correlation is proposed in this paper. The results from a set of experiments shows that the new_C4.5r decision tree algorithm outperforms the previous ones in running time, the size of the rule sets and overhead.

Keywords: Web data mining, personalized learning, decision tree algorithm.

1. INTRODUCTION

Nowadays, network education is mostly in the state of sharing teaching resources. Patterns of traditional classroom-based education have changed dramatically. With the emergence of network and computer, a network-based education called E-learning can do the same or even more things as traditional education dose. Although anybody authorized can access the teaching resources, the number of people who can benefit from the network-based education doesn't increase correspondingly, as the current teaching system pays little attention to users. It can neither provide appropriate, personalized and interactive learning environment according to learner's level and learning situation, nor automatically track the learner's interests to provide the personalized content. By taking advantage of the knowledge acquired from the analysis of the user's behaviour as well as other information such as structure, content and user profile data, Web personalization customizes a Web site to the needs of specific users [1]. Personalization has become a reality and is possible by using efficient methods of data mining and knowledge discovery [2]. Focuses have been put on developing e-learning systems with personalized learning mechanisms to assist on-line Web-based learning and to adaptively provide learning paths [3]. Most of the research in this area mainly focuses on resource recommendation, while overlooked the

overall requirement of different users. Based on the current development in both data mining and personalized education system, the users can benefit more than before. In this paper, a learning guidance model based on Data Mining technology in a network environment is proposed and implemented. This model will apply data mining technology to the excavation of the student learning information database, try to discover the weakness in the student learning process, and then abstract the strategy which might guide the learning process efficiently.

This paper is organized as following. First of all, in section 2, it is necessary to give a preview about data mining technology. In section 3, the learning guidance model is presented in detail. In section 4, the mining algorithm used in this paper and its derivation are introduced. Finally, the experimental results and conclusions are listed in section 5 and 6, respectively.

2. WEB DATA MINING

Web Data Mining is an application of Data Mining technology under the web environment. It is a model that can excavate implicit, unknown and special patterns which have potential values. As the diversity of the web varies the duty of Web Mining. Web Mining can be divided into three parts: Web Content Mining, Web Structure Mining and Web Usage Mining. Web Content Mining is regarded as the combination of Web information retrieval and web information extraction. Web Structure Mining is usually used for mining the hyperlink structure of the Web page in order to discover the information included in the hypertext structure. Web Usage mining is a technology which can predict a user's browsing behaviour by mining the information from the Web server's log files.

3. MODEL DESIGN

3.1 The Improvement of the Traditional Network Teaching Environment

The structure of the current network-based education platform, as shown in Figure 1, is generally composed of three parts: Teaching Resources Library, Learning Platform and Users.

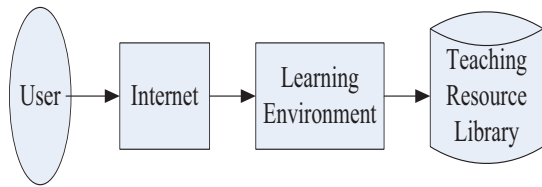


Figure 1: Traditional Network-based Teaching Environment

The personalized network-based teaching platform not only improved original functions, but also introduced personalized analysis and evaluation module into the system. As shown in Figure 2, after login and status confirmation, the information-gathering module of this system begins to collect the user's requests and track the user's behaviour, then sends the information collected to the database, processes the personalized analysis and evaluation, and finally sends back the analysis results to the user. This set of processes gives the platform the ability to provide specific teaching resources according to the personal characteristics of each student. Although this system concentrates on providing personalized learning for those who study physics, it is not constrained. Thus, it can also be applied in different teaching domains without great modification.

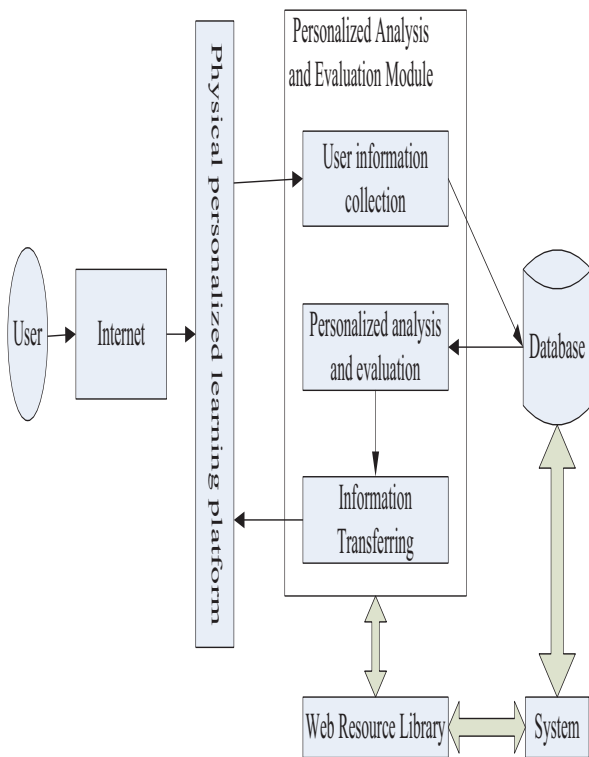


Figure2: The model of physics discipline personalized learning evaluation system based on the network

3.2 Data Collection Module

The personality of each user is mostly abstracted from the sheer volume of data collected previously. The precision of the learning guidance highly depends on how accurate the system can recognize the personality of each user. Data collection module is mainly responsible for collecting data from students' learning behaviour online and storing them into the database. In conclusion, this module is the basis of the entire physical personalized teaching platform. As it is also the data source of the personalized analysis engine, the quality and quantity of the information collected will directly affect the accuracy of personalized system analysis.

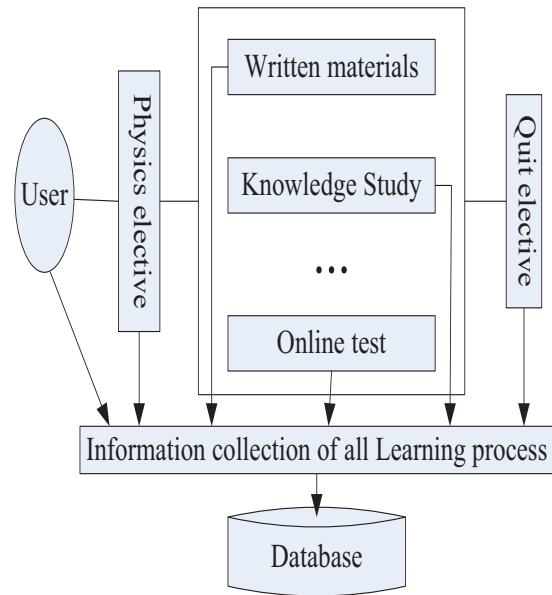


Figure 3: Data collection module

As shown in Figure 3, the system collects the information from multiple sources, including written materials, knowledge study, online tests and so on. The preference and the whole learning process are also recorded for the subsequent mining. The information collected from different sources should be correlated to meet the requirement of getting an overall view about each user. By doing this, the learning guidance can be achieved.

3.3 The Design of Physics Discipline Personalized Evaluation Module

The main task of personalized evaluation module is to select an appropriate Data Mining algorithm, to establish a personalized learning effect model, and to evaluate the student's learning online in physics. The model of Physics discipline personalized evaluation module shows in Figure 4.

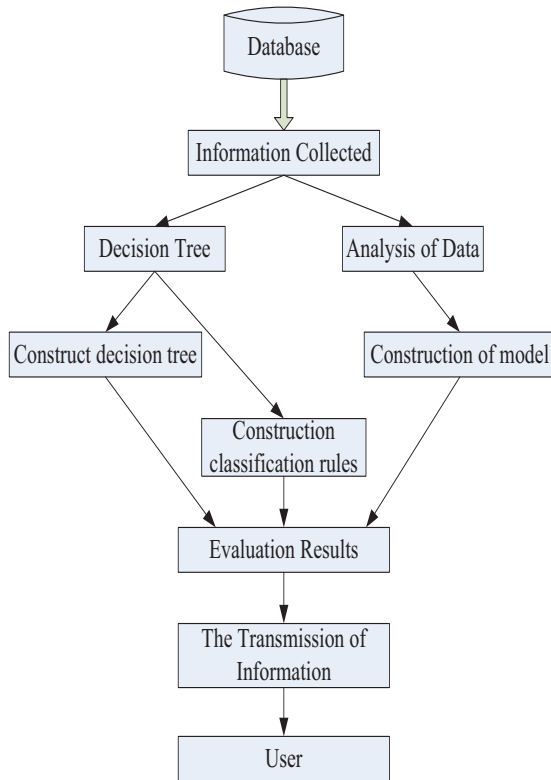


Figure 4: Model of evaluation module

4. ALGORITHM DESIGN

4.1 Comparisons of ID3 Algorithm and C4.5 Algorithm

In the process of constructing a decision tree, the Information Gaining method is usually used to help generate branches according to the values of different attributes. Suppose S as a set of samples whose attribute information has been calculated. Next, select the attribute with the largest gain as the test attribute of the given set S, and then produce the corresponding branch nodes [4][5]. Step by step, ID3 [6] refines the decision tree until a completely correct decision tree through the constant cycle treatment is found, and finally conduct a top-down induction to form a group of rules in the format of IFTHEN.

In summary, the ID3 algorithm has two major advantages. Firstly, the objective function is limited to a supposed search space, and there is no risk of having no solution. Secondly, the training data is entirely absorbed, which means that the statistical character of the whole training examples will be taken into account when making the final decisions, in order to resist the noise. Nevertheless, the ID3 algorithm has shortcomings as well. First of all, only one solution is maintained in the process of searching. In addition, there is no backtracking while do

search, and the algorithm may converge to a partial optimal solution rather than the global optimal solution. At the same time, it is a kind of decision tree algorithm with only a single variable, which means that it is difficult to express complex concepts.

The C4.5 [7] is a decision tree generating algorithm developed from the basis of the ID3. This decision tree algorithm can be divided into three parts [8] according to the basic principles of C4.5 algorithm: decision tree generation algorithm (C4.5tree), pruning algorithm (C4.5pruning) and rules generation algorithm (C4.5rules). Compared with ID3 algorithm, C4.5 algorithm adds the capability of processing continuous attributes and the situation where property values absence. This greatly improves the efficiency of the algorithm. C4.5 algorithm is widely used because of its quick classification and high precision. In this system, the majority of data samples used in data mining have continuous attribute values. Therefore, C4.5 algorithm is selected as the algorithm carried out by the learning behaviour evaluation module.

The following are some other decision tree algorithms which are usually used: CART algorithm [9], SLIQ algorithm [10], and SPRINT algorithm [11].

4.2 Improvement of Algorithm

When applying C4.5 algorithm to classify some unknown samples, the system may encounter the "over-fitting" problem. As a result, it is necessary to simplify the samples before they are classified.

The following are the processes of the improved algorithm, named new_C4.5r:

Use C4.5tree to construct a complete decision tree T .

T will be converted to the rule set R . The rule r corresponds with a path from the root node to a leaf node in the T .

$R: \{r_i \mid \text{if } Cond_1 \wedge Cond_2 \wedge \dots \wedge Cond_n \text{ then class } C_x\}$.

Simplify each rule r_i of R as following:

$i=1$;

While ($i \leq n$)

{

$t_{i,i+1} = P(Cond_{i+1} \wedge Cond_i)$;

if ($t_{i,i+1} \geq \lambda$) then

$i=i+1$;

else

{

delete $Cond_{i+1} \wedge \dots \wedge Cond_n$ in r ;

break;

}

}

In the above process, introduce the parameter λ as the threshold value of $P(Cond_{i+1} \wedge Cond_j)$. It is similar to the concept of the Minimum Support in the Association Rules. Its default value is 0.15% [12]. The value of λ is controlled to eliminate the over-fitting part of the rules. Merge and simplify the same rules in R , and get a new rule set R' .

Establish an attribute-associated matrix $(T_{vs})_{n \times n}$.

If $t_{vs} = 0$, Attribute A and Attribute B are irrelevant.

If $t_{vs} = 1$, Attribute A and Attribute B are relevant.

Simplify each rule r' of R' as following:

$i = 1$;

while ($i \leq n$)

{

for ($j = i + 1; j < n; j++$)

{

if $t_{vs} = 0$ then

continue;

if $t_{vs} = 1$ then

{

Calculate the condition probability in the training set:

$$P(Cond_j | Cond_i), P(Cond_i | Cond_j);$$

if $P(Cond_j | Cond_i) \geq P(Cond_i | Cond_j)$ then

Tag and eliminate Cond_j;

if $P(Cond_j | Cond_i) < P(Cond_i | Cond_j)$ then

Tag and eliminate Condi;

break;

}

}

$i = i + 1$;

while (Cond_j is tagged)

$i = i + 1$;

}
In this process, at first, the correlation between attribute A_v and A_s , which are belong to $Cond_i$ and $Cond_j$ respectively, is judged. If A_v relates to A_s , $Cond_i$ and $Cond_j$ in rules will be kept, otherwise, both conditional probabilities are calculated, and $Cond_i$ or $Cond_j$ will be eliminated according to the confidence. The same rules of R' are merged and simplified, and a new rules set R'' is obtained [13].

5. EXPERIMENTAL RESULT ANALYSIS

At first, by using C4.5tree algorithm, the complete decision tree was structured with the data in test data set. And then two rule sets were produced based on the C4.5rules algorithm and the new_C4.5r algorithm. The data in Table 1 are the mean values of the results from ten experiments. The size of the rule set, the number of rules, running time and classification error rate of two algorithms are compared under the circumstance that the size of training set is fixed.

In Table 1, during extracting and simplifying of complete decision tree rules, the classification error rate of the new_C4.5r algorithm is close to that of the C4.5rules algorithm. The size of the rule set and the number of rules are smaller than those of the C4.5rules algorithm. Therefore, when extracting and simplifying the complete decision tree rules, the systems with improved algorithms can not only maintain the classification precision, but also produce simpler rule set and improve the speed and efficiency of the computation.

Table 1: Comparison of C4.5rules algorithm and new_C4.5r algorithm

	C4.5rules algorithm	new_C4.5r algorithm
the size of training set	20000	20000
running time (S)	73	42
classified right (%)	89.2	87.7
the number of rules	43	27
the size of the rule set	195	113

6. CONCLUSIONS

On the basis of Web Data Mining theory and the current development in personalized educational system, this paper establishes a model of the Physics discipline personalized learning evaluation system using decision tree algorithm. The advantages and disadvantages of ID3 algorithm as well as C4.5 algorithm are analyzed and compared. Then a new C4.5r decision tree rule simplification algorithm based on attribute correlation is proposed. After applying it to the personalized learning evaluation system, the experimental results proved that the new C4.5r algorithm outperformed the traditional C4.5 algorithm in running time, the size of the rule sets and overhead. On future, more functions will be included in this system by using heterogeneous data mining algorithms. Meanwhile, more parameters, not only running time, the number of rules et al., should be considered to give a scientific evaluation to this system.

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Calliope: Web-based poetry on demand

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ABSTRACT

This paper for interdisciplinary communication presents a technology-based solution to a real-world classroom problem. The author describes her experience as a secondary English/Language Arts teacher and Program Director for the Poetry Out Loud (POL) National Recitation Competition and the need for a tool that could aid students in the selection of a collection of personally relevant poetry with similar attributes that fulfills each student's individual goals for competition and other classroom use. The instructor proposes the development of a digital library platform, modeled after the Pandora Radio web-based engine, that will assist student users in accessing and manipulating the information available in the online anthology.

Keywords: Web-based platform, Technology and Language Arts,

INTRODUCTION

Each year, thousands of students across the nation participate in the Poetry Out Loud (POL) National Recitation competition, which is sponsored by the National Endowment for the Arts and The Poetry Foundation. The recitation competition requires students to select a poem from its database of eligible poems for memorization and oral recitation in a competition format. POL maintains a web-based digital anthology of eligible poems on the competition website (www.poetryoutloud.org).

My own experience with the recitation competition stems from implementing the competition structure and accompanying lessons within my own classroom. After the first year that I had successfully implemented the program within my own classroom and had a student advance to the State Finals, I was named District Director for the program, and was in charge of encouraging and supporting participation in the competition across campuses and grade-levels within the District.

One issue of concern during classroom implementation of the program involved students interacting with the online poetry anthology. The program suggested that students select poems that appealed to them, or that they felt a connection with, in order to make the poem easier to memorize, and to produce a desirable recitation effort. Nationally, program funds and resultantly, resources were limited. So, each school was only provided with two print copies of the anthology containing that year's eligible poems. In an effort to work around the lack of physical resources, teachers would suggest that student participants try to find poems that appealed to them by browsing the online anthology. Since online anthology contains thousands of poems by hundreds of poets, it could take students multiple days to find poems suitable to their interests and personal goals. Often, students find a poem that they liked, but

they felt wasn't a perfect fit in the context of the competition, or that wasn't exactly what they were looking for. The students naturally then ask their instructor for help in locating similar poems. However, this presents a daunting task to any individual not possessing of an encyclopedic knowledge of all of the poems and poets included in the online database. Thus, this real-world situation presented a legitimate educational technology research question: What technology could be developed to help students quickly and accurately identify poetic works with similar attributes?

Hypothesis

I posit that the Pandora Radio web-based engine could serve as a model for a similar platform that would relate to poetry and utilize information in the POL online anthology. As Pandora helps users design a "radio station" containing music of similar qualities, this platform would be designed to help students create "collections" containing poetry sharing similar qualities. Named after the Muse of epic poetry, Calliope will interface with the POL's online anthology to help students select poems of similar interest. Given that teachers and students are already familiar with the Pandora format, along with its widespread popularity, it is expected that potential users will readily accept Calliope. It is also likely that such a tech-savvy design will add to the popularity of the (POL) program as a whole and continue to help it grow, in turn helping to advocate for the goals of the National project: increasing the awareness and appreciation for great poetry.

Review of Literature

Pandora's foundations lie in what has come to be known as the Music Genome Project (MGP). MGP's founder says he started the task thinking he could "do a kind of Myers-Briggs for music and tell people what songs they'd like based on musical similarities [allowing] the Internet [to] solve the problem of access." The goal was to help people find music they liked, based on the particular musical qualities they liked. From vocal timbre, to kick-drum patterning, the MGP breaks down each song into essential elements (it's musical 'genes'), then builds a unique, descriptive ('DNA') profile for each song in the database (Tischler, 2007). Each song can have any number of the hundreds of descriptors defined by the MGP, and the full list of descriptors identified by the MGP has yet to be disclosed. In order to derive these musical profiles, a team of over 30 people first went through rigorous reliability training, and then worked to individually analyze the over 400,000 songs in the initial database (Machrone, 2006). "Pandora is nothing less than a mechanism for filtering and shaping the chaos of an exploding supply of digital music" (Tischler, 2007).

This mechanism consists of a Flash-based interface that interacts with the MGP database. Since it's web-based, users need access to a broadband connection. While the online player was originally launched free-of-charge, there is now an advertising-free subscription version also being offered (Castelluchio, 2006).

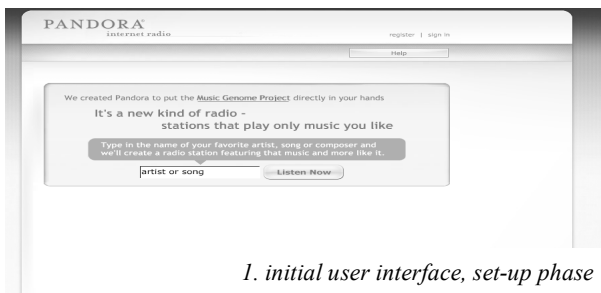
Other, earlier versions of online music-matching services and applications were based on consumer purchase habits. Pandora, while linking to purchasing options (iTunes, Amazon), doesn't require users to purchase an entire album since the sorting hierarchy takes place at the 'gene' level rather than the genre level.

The Pandora experience begins with a user entering the name of a singer or band (presumably, that he or she likes or is interested in). Pandora then plays a song at random from that artist's catalog. If you like a song, you can give it a 'thumbs up' and Pandora will search for more songs that particular song's attributes. If you dislike a song, give it a 'thumbs down' and the station promises never to play that song again, while re-aligning your search attributes to make sure that songs like the one you just reviewed don't show up on your playlist again. User rating options, along with the ability to add additional musicians or (sample) songs, allow users to users' Pandora stations to continually evolve over time (Castelluchio, 2006).

2. APPROACH

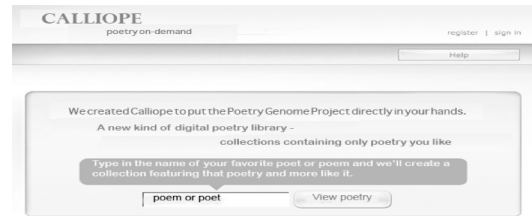
The first step involved in the overall process of designing a working prototype would involve outlining the attribute parameters that will be used to analyze the poems contained in the POL database, creating the basis for a Poetry Genome Project (PGP). The development of the PGP is critical to implementation of Calliope. However, since the creation of the Poetry Genome Project is outside the scope of this class and assignment, a sample set of poems with similar attributes has been created for the purpose of demonstration. The sample set consists of two poems, Walt Whitman's "Beat! Beat! Drums!" and Dylan Thomas's "Do Not Go Gently Into That Good Night."

From here, we move to the design of the Calliope interface. This phase involves designing the structural components of the web-based engine. Since the goal is to have Calliope's user experience will heavily mirror the Pandora user-experience, I utilize the Pandora platform as a design model.

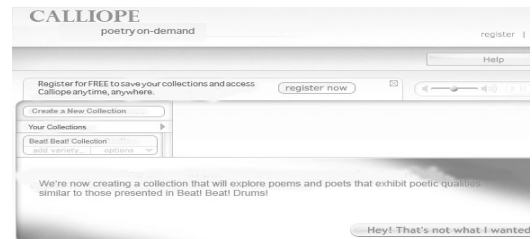


1. initial user interface, set-up phase

Figure 1 illustrates the Pandora interface in the initial, set-up phase of the user interface. Here, a user is directed to enter the name of an artist or song that he or she likes. The interface then builds a "radio station" featuring songs that share attributes similar to that input. Similarly, Calliope's initial display pages will prompt users to enter the name of a poet or poem that he or she likes. The interface will then build a "collection" of poems that share attributes similar to the user input.

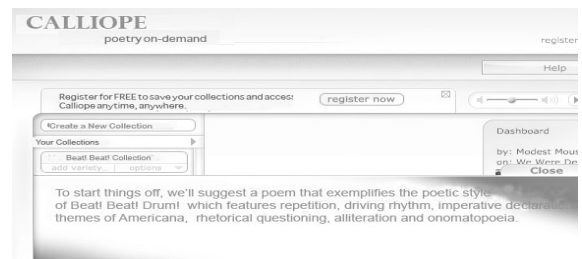


2. Calliope's interface



3. interface working with user input

Figure 3 shows the interface's "working" screen that is displayed after initial user input. Here, we see that the user has input the poem "Beat! Beat! Drums!" by Walt Whitman. On the left hand side of the figure illustration, you can see the display tabs that indicate a new collection, titled "Beat! Beat! Collection" is being created and will be stored under a "Your Collections" section. This indicates the organization structure for created collections. Figure 4 then indicates the attributes attributed to the user input, offering the user an early chance to re-set parameters (by choosing a new poem or poet) if he or she does not agree with the indicated attribute list upon which the collection will be based.



4. interface displaying PGP-based attributes for user input

In Figure 5, we see a possible initial result based on the user's search parameters'. The returned selection is Dylan Thomas' "Do Not Go Gentle Into That Good Night", which is indicated visually by title, author and visual image in the center of the screen. An audio version of poem will begin to automatically play as this page appears.



5. Calliope interface with sample initial search result

As more poems are added to the collection (based on the initial parameters and any additional modifications by the user), they too will be represented visually to the right of this initial image. What results is a horizontally-oriented list of returns through which the user may scroll to see what he or she has previously viewed or heard. Also on this centrally located visual representation of the returned result are the user feedback buttons (thumbs up or down), which allow a user to further modify future search parameters, allowing the resulting collection to continually evolve over time. Toward the bottom of the screen, you will notice five tabs labeled: Poet, Publication, Style, Poem, Fans. The 'Poet' tab (as shown in Figure 5) will display images and biographical information related to the poet. The 'Publication' tab will display publication information for the displayed poem, while the Style tab provides a full list of PGP-based descriptors for the displayed poem. By selecting the 'Poem' tab, a user may view the poem itself (the Pandora platform would display lyrics here) and selection of the 'Fans' tab would result in a list of other Calliope users who indicated that they liked this poem. This last feature, the 'Fans' tab, helps to bring in the social-networking connection that help to get and keep students engaged. The 'Suggested Poets' feature located in the bottom right hand side of the screen functions as a way to help users widen their scope and either create new collections or modify the existing collection.

3. Evaluation and Expected Results

Evaluation of the prototype would likely occur in a small-scale release to less than three campuses. User (teacher and student) feedback through survey and direct response (i.e. email) would be collected. Interviews may also be conducted with the teachers, since they would be able to give feedback on their perception of student use and satisfaction as well as their own satisfaction.

Calliope is expected to adequately address the charge of the study. It should provide a way to help students quickly and accurately find poems sharing similar attributes. The Calliope interface should also provide the added benefits of increasing student interest in poetry, by engaging their technological savvy in its application of a current trend. By virtue of its many features and novel format, Calliope is expected to be used by students beyond classroom project-based use. So, it would also be helpful to have user-tracking data that showed how often and how long individuals used the system.

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A Development of a New Flash Card System by Using Interactive Card Data

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ABSTRACT

Learning opportunities have increased for the spread of the e-Learning and the mobile Learning (m-Learning). However some Japanese university students are not forward enough to study utilizing these learning environments. There is considerable discussion about the need for somehow break through this real situation. In this research, we focused attention on portable devices caring those students anytime and anywhere. We have been developed an electronic flash card that run portable devices in recent years. General electronic flash cards such as "MEMORIBO" that is one of popular electronic flash card in Japan can use text data. On the other hand, this flash card system cans use text data but also image, sound, and multimedia data. We are improving on a function of it.

It's understood that these data that is used for electronic flash cards are static data. It is just as many cards as these data. This means if a student wants to learn another thing, he/she must make new card data of it. In our new flash card, the student will operate a front of a card. And then back of it will be changed by the result of this front operating. This method makes it possible to extend a limit of old flash cards.

1. Electrical flash cards and its problem

In general electronic flashcard as shown Figure 1, turn over operating of a card is represented by cards switching at the click of a mouse or the key type operation. By using this card, students can learn how to read a time of the clock.



Figure 1. An example of electrical flash card (front and back)

However, they can't learn how to read the other time. In this way, information that indicated on a card is inflexible information for students. Therefore, they could not study by using these flash

card except given piece of information. They need a lot of cards, if they hope to study more and more.

2. Our new flash card

Therefore, we make a recommendation to improve the flash card. If students can set a clock to they want to learn in the card, they can continue to study with out adding new cards. Of course to do that, back of this card work in conjunction with this operation of front card as shown figure 2.

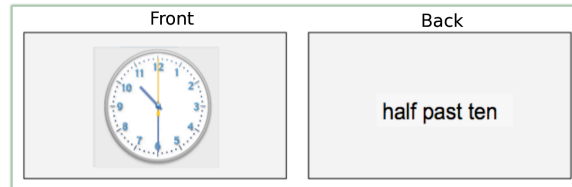


Figure 2. An example of our new flash card

Additionally, we developed abacas flash card based on electronic Japanese abacas emulator that running the Android mobile phone [1]. Student can move a bead to touch it and check the value that shown these abacas by watching the back of this card in no time at all. We think this made much progress in efficiency of study that how to operate Japanese abacas, because students can study any time any where by using computer supports without actual Japanese abacas.

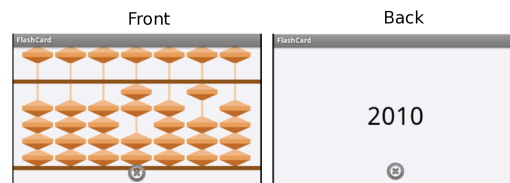


Figure 3. Overview of our Japanese abacas flash card

Acknowledgment

This work was supported by KAKENHI Grant-in-Aid for Scientific Research (C) (20500845).

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The University Educational Portal: the purposes, architecture, technologies of design

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ABSTRACT

Nowadays many universities solve problems associated with the usage of E-Learning technologies in educational process. A number of universities use the mixed form of training. In addition, Universities have accumulated considerable internal digital educational resources, which were developed by the University professors. The various control systems of educational process, monitoring systems of knowledge, control systems of student population, control systems of methodical work and so forth are used to manage educational activities. Modern universities actively use external educational resources, for example, electronic catalogues from the foreign publishing houses, which support only an authorized connection of users to their own resources.

As a result, the outstanding problem is as follows: the creation of the integrated information-educational environment of the University, which fits the requirements of different forms of training, providing access to various educational resources (external and internal) and realizing functions of management of educational process on various levels. The importance of an educational portal will increase in this situation as a sole point of an entry to the integrated information-educational environment of the University.

The purpose of this work is to consider using the systematic approach to creation of the educational portal of the University. The description of the life cycle of the educational portal, the purposes of the portal, architecture of the portal (service-oriented architecture, SOA), technologies of development of the portal is provided.

The research results are gathered during the development of the educational portal at the Russian State Humanitarian University (Russia, Moscow, RGGU).

Base platform of the educational portal of RGGU is IBM WebSphere Portal.

Keywords Educational portal, Architecture of the portal, Technologies of development of the portal.

1. INTRODUCTION

The information-educational portal of university (later - educational portal) represents the means of organizing and managing of the educational process.

From the architectural point of view the educational portal is the system which integrates multiple functional systems, developed

on various platforms, programming languages and hardware applications.

Successful creation and implementation of such multiplatform and multipurpose systems depends on many factors.

Before starting the project on creation of a portal it is necessary to define positions on the following aspects.

1. What approaches are used during organizing of management in educational institution?

Nowadays the increasing number of universities use the process approach in management of their activity. The basis of the process-focused approach is the idea that the purpose is reached more effectively if various kinds of activity and corresponding resources are operated as a process. In standards and instructions ENQA (European Network for Quality Assurance in Higher Education) there is a definition and classification of the basic processes of educational establishment. As a result, before the beginning of creation of a portal, it is necessary to define: what process will be provided and supported by the portal facility.

2. On what model of an educational portal will the portal being developed by you will be focused?

Let's choose some of the educational portals, considering such criteria:

- supported forms of training: distance (remote) and mixed;
- categories of users: students, teachers (tutors), employees.

Model 1. An educational portal for maintenance of processes e-Learning [3]. The form of training: distance (remote). Groups of users: distance students, tutors.

Model 2. An educational portal for maintaining the processes of e-Learning with the consideration of the forms of training. The form of training: distance, mixed. Groups of users: distance students, tutors; the students receiving mixed training, teachers.

Model 3. An educational portal as means of maintaining the processes of e-Learning and improving the quality of the educational process. The form of training: mixed. Groups of users: the students receiving mixed training, teachers, employees.

Goal:

- The overall objective of Educational portal RGGU is improvement of quality of educational process by using of modern information and communication technologies.
- The portal should be focused on supporting the process of the scientifically-educational activity of the university

"realization of the basic educational programs" (according to classification ENQA).

- Portal is focused on model 3.
- Creation of the portal will be focused on service-oriented architecture (SOA).

2. THE PROCESS APPROACH TO INTEGRATION OF APPLICATIONS

The meaning of the word «integration» comes from the Latin word «integratio», which means restoration, completion. The basis of the word «integer» is the word «whole», i.e. the basic meaning here is the reception of the whole from separate parts.

Modern approaches to integration of program applications include the following directions.

1. Integration at a level of access to applications (from above-downwards):
 - integration based on a principle – «uniform point of an input to untied applications»;
 - integration based on a principle – «uniform point of an input to weakly connected applications»;
 - integration based on a principle – «uniform point of input to applications with various degree of connectivity».
2. Integration at a level business-processes (from below-upwards):
 - integration based on a principle – «one to one» (according to which data exchange or association of logic of functioning of several systems is considered only between paired applications);
 - integration on the basis of the centralized structure – trunks, integration platform and so forth (according to which certain centralized structure, responsible for data reception and transmission of all united systems and also for their teamwork, is allocated).
3. Reintegration. The integration as compiling of monolithic applications, i.e. technological splitting business-systems into separate services.

Process of integration of applications demands the use of modern methods IT Service Management (ITSM), which are based on service and process approaches (fig. 1).

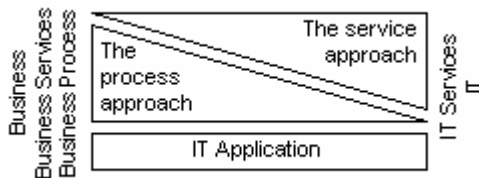


Fig.1. Organizational management approach.

IT service – it is a complex of IT of decisions and the activities, which provides realization of certain business-processes.

The process is a sequence of tasks logically interconnected (kinds of activity), and directed on achievement of the purpose.

The process is characterized by the following properties:

- organization of activity in accordance to precise requirements and problems;

- division of functions;
- precise regulation of activity;
- cycle of improvements (organization constantly optimizes the processes with the purpose of improvement of quality);
- measured result (organization estimates received results and uses them for quality improvement).

Let's allocate the basic characteristics of process of integration.

- 1.The field of process integration:
 - internal business-processes;
 - internal and external business-processes;
 - internal business-processes and space Web 2.0;
 - internal and external business-processes and Web 2.0.
- 2.The method of process integration:
 - dynamic integration (dynamic configuration of integrated functions);
 - static integration (static configuration of integrated functions).
- 3.Structure of integrated informational resources:
 - structured resources;
 - unstructured resources.
- 4.Integrated IT-systems platforms:
 - industrial (duplicated);
 - unique.
- 5.Methods of process management:
 - capability for the «manual» process regulation;
 - process management through regulated means.
- 6.Methods of content support:
 - binding of informational streams to concrete business-process;
 - binding of informational streams to integrated IT-systems.
- 7.Methods of content management:
 - centralized (specialized tool means, Content Managers);
 - distributed (means of functional IT-systems).

It is necessary to make classification of services in utilizing the service approach in management and designing of service-oriented architecture IT-application.

Classification of services:

- from the point of view of owners of services: internal, external;
- from the point of view of structure: atomic, composit (homogeneous, heterogeneous);
- from the point of view of functions: single-functional, multipurpose;
- from the point of view of type of development: industrial (duplicated), individual (custom-made);
- from the point of view of interactivity: low level (question-answer functions), average level (settlement operations of function, visualization of data), high level (performance of transactions), absence of interactivity (information functions);
- from the point of view of access: open access, personal access at the level of group of users, personal access at the level of roles of users, personal access at the level of the separate user;
- categories of service users: internal, external;
- from the point of view of stability of business-processes: classification is carried out by taking the following characteristics into consideration – level of stability, factor

of dynamics of changes, factor of demand, factor of reaction on the level of innovation of IT-technologies, factor of aging;

- from the point of view of use of resources: classification is carried out by taking the following characteristics into consideration – site of a resource (address); factor of affinity to other resources; time of the reference to a resource; form of presentation of the information.

3. LIFE CYCLE OF THE SERVICE-ORIENTED ARCHITECTURE OF THE EDUCATIONAL PORTAL

Life cycle of the IT-project, regardless of the chosen model, includes the following stages: Initiation of the project, defining the requirements, designing, development, debugging and testing, introduction and support.

Choosing the SOA for the portal causes changes in the maintenance of life cycle stages of the IT-project. IBM SOA governance and management method (SGMM) [1] is a new method of management of life cycle stages of the IT-project.

The unified governance and management process is divided into four phases: Planning; Defining; Enabling; Measuring.

In the Planning phase, the goal is to understand, capture and document the needs and priorities of the business, along with the role of the IT organization in meeting those needs.

The activities discussed in the planning phase include:

- Project Initiation (requesting documentation; conducting methodology customizing workshop; conducting project kick-off);
- SOA business discovery (determining existing governance structures; identifying SOA business principles; creating IT governance baseline);
- Determine IT readiness (understanding the current environment and creating a baseline for it; measuring and evaluating existing governance capabilities; determining the SOA change readiness).

In the Defining phase, the detailed governance plan is put in place for the current cycle: the processes to be governed are specified and prioritized and the decision rights, policies and measures for these processes are defined.

The activities discussed in the Defining phase include:

- Refining the SOA principles and standards (updating the SOA business principles; updating the SOA IT principles and standards);
- Defining the SOA governance framework (defining service ownership model; establishing the SOA governance mechanisms; refining the SOA governance processes; refining the metrics; documenting the SOA governance mechanisms; refining the roles and responsibilities for SOA governance organization);

- Defining development and operational aspects (defining policies for service reuse, IT compliance and security);
- Defining the SOA governance tools and infrastructure;
- Creating the plan.

In Enabling phase, roles are assigned, staff is trained, the decision rights can be automated in workflow tools, and the metrics collection and report mechanisms are put in place.

In Measuring phase, the governance approach is executed and refined.

The activities discussed in the Measuring phase include:

- Executing the measurement (measuring effectiveness of the SOA governance process; measuring effectiveness of organizational changes; reviewing and refining the operational environment);
- Measuring milestones (initiating the governance mentoring plan).

What is needed in order to get started with service-oriented architecture from an architectural view?

IBM suggests describing the key elements of the SOA:

- Reference Architecture (includes the components and middleware services used by applications in the runtime environment);
- The SOA Life Cycle (model, assemble, deploy, manage);
- The SOA scenarios (quickly communicate the business value, architecture, IBM open standards-based software used in the SOA scenario).

The SOA Reference Architecture of the portal showing on Figure 2.

Basic steps creating of the SOA Reference Architecture:

- Identifying the business processes and business services used by business users (consumers of the processes and services);
- The business processes treated as combinations of other business processes and services;
- The business processes decomposed into their subordinate sub-processes and services;
- Service and business processes are detailed into service components, which include a detailed set of definition metadata used to describe the service to the information system;
- Services can be aggregated into module assemblies;
- Identifying of interconnection between service components and custom application, IT-services, elements of operations systems.

The IBM SOA Life Cycle includes the following life cycle phases [1] (fig. 3):

Model. Business requirements are translated into a specification of business processes and goals in order to provide a basis for creating a business model. The model of business process then will have to be simulated using various parameters.

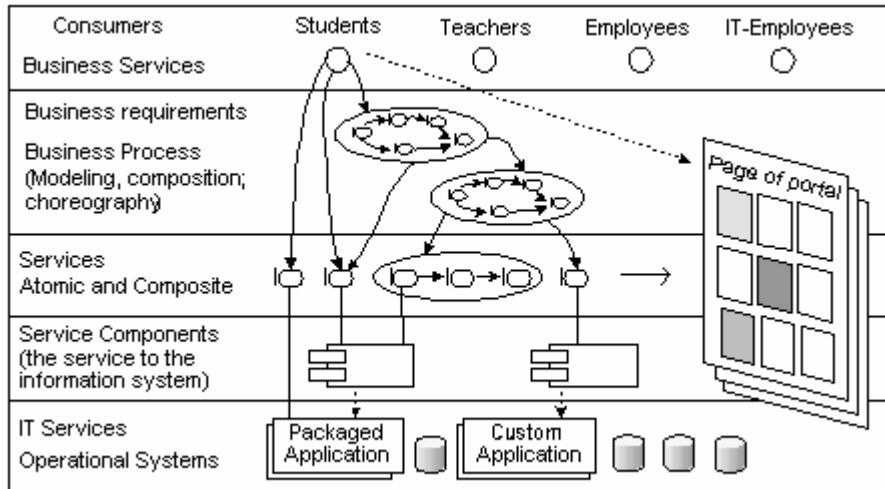


Fig. 2. The SOA Reference Architecture of the portal (the logical architecture of the portal).

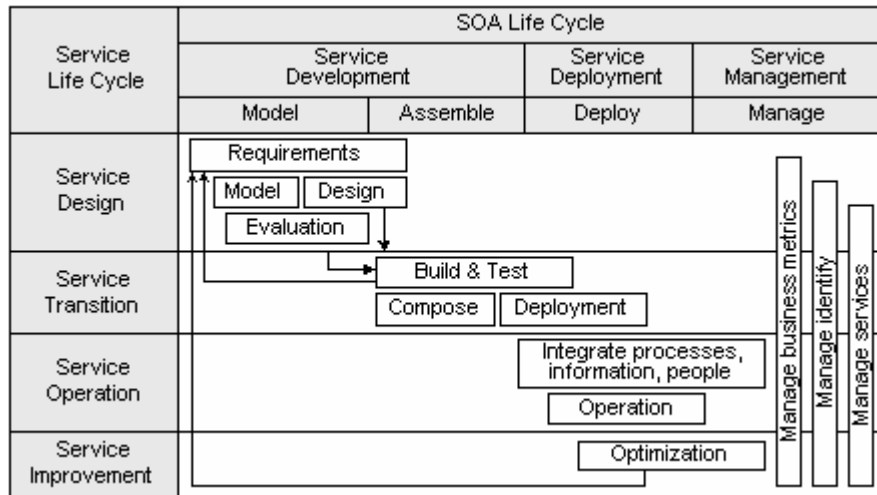


Fig. 3. Mapping of the SOA Life Cycle coordination and the service of life cycle.

Assemble. The model of business process is used to derive the required services. Some services are already in existence, and they must be rendered as services for assembly into composite applications. The new services that are required by the business design have to be created. This phase includes applying a set of policies and conditions to control how application operates in the production runtime environment.

Deploy. This phase includes resolving the application's resource dependencies, operational conditions, capacity requirements, degree of integrity and level of access.

Manage. This phase includes the tasks, technology and software used to manage and monitor the application assets, such as services and business.

4. A SOFTWARE PLATFORM OF THE EDUCATIONAL PORTAL AND EXAMPLES OF REALIZATIONS

The platform for construction of the educational portal: WebSphere Portal. The basic platform for formation of a content of a portal: IBM Lotus Notes/Domino. The basic platform for support of educational process: IBM WorkPlace Collaborative Learning. The basic platform for modeling of the business-processes: IBM Rational Software Architect (UML).

The categories of portal users: students; teachers; employees; IT-employees.

As an example of the used approach we will use some screen shots of the Portal.

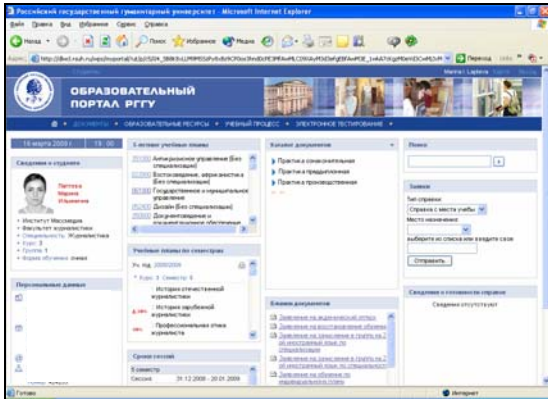


Fig. 4. Integration of the portal data with various levels of personification (access at a level of a concrete student, educational group, a specialty).

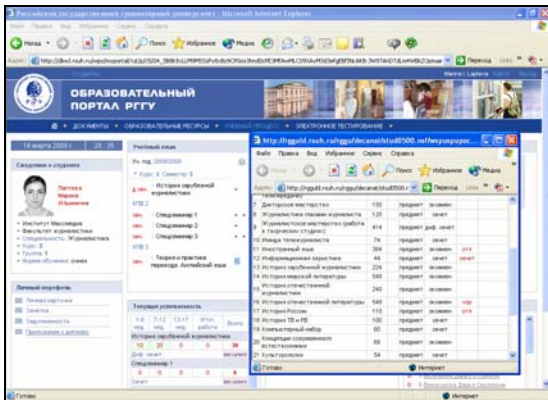


Fig. 5. Integration of the portal with various databases (various sources of data).

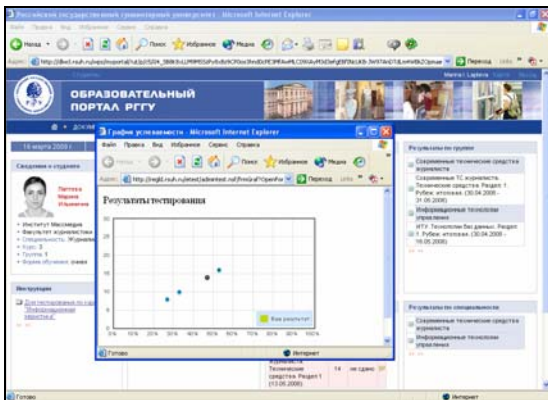


Fig. 6. Use of the standard Web-services.

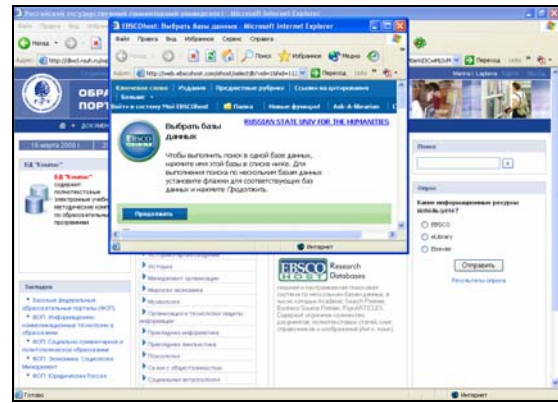


Fig. 7. Integration with external informational resources (services) within the limits of the portal.

4. CONCLUSION

In this article we have considered the methods used during creation of the educational portal of RGGU. SOA is a new approach to the formation of concepts and construction of the web-portals.

SOA offers the support of the business-functions and the processes in such a way, that they will allow IT- system to react more quickly and to be ready for the changes of the requirements.

Many professionals associate with SOA such properties, as a reuse, free connection and interrelations between services, communication between business-services and IT-services. Besides, SOA allows to create additional mechanisms by means of which the various IT-processes become manageable and operational.

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Measuring the Effect of Using Simulated Security Awareness Training and Testing on Members of Virtual Communities of Practice

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ABSTRACT

Information security (Infosec) has become a major challenge for all private and public organizations. The protecting of proprietary and secret data and the proper awareness of what is entailed in protecting this data is necessary in all organizations. How does simulation and training influence virtual communities of practice information security awareness over time and with a variety of security scenarios. Can members of a virtual community be significantly changed in how they respond to routine security processes and attempts to breach security or violate the security policy of their organization? How does deterrence play a role in this prevention and education? A study is planned that will train and test users of a virtual community of practice over a 3 month period of time, via a web interface, and using simulated events, to see if the planned security awareness training will be effective in changing their responses to the events and further testing.

Keywords

Communities of Practice
Information Security
Security Policy
Simulation
Virtual Communities

I. INTRODUCTION

We live in an information age that is dominated by virtual communications through such mechanisms as online affinity and network groups (e.g. Facebook, MySpace,

Twitter, etc.), virtual online communities, virtual worlds (e.g. Second Life), and other related computer enabled mediation of communication and sharing of knowledge (Wikis, Blogs, etc.). This treatise will focus on security breaches within virtual communities of practice (V-CoP), and will include such areas of security as password creation, data sharing and security, and computer viruses and how they are responsible for massive data losses and untold hours of employee work hours in repairing the damages. In 2003 alone, viruses cost companies an estimated \$45 billion (Kjaerland, 2006). The creation of these virtual communities, and the massive amounts of data that are exchanged, managed, and stored in these environments, has posed a predicament for organizations. On one hand, these groups are being leveraged as a new medium for intra – and inter-organizational knowledge sharing. On the other hand, there has never been a more organized underground of computer hackers waiting to take advantage of this target rich environment. Even connections to organized crime have been made by the FBI (Richardson, 2008). Virtualization of communication and sharing of knowledge and data are being handled by many companies through virtual communities that link people together from all parts of the globe.

Balancing the necessity to share information and to control access to this same information has been and will continue to be a challenge among the world's businesses, government agencies, and other organizations. These companies and organizations collect and store

a vast quantity of data about their customers, products, employees and partners. Much of these data must be safeguarded and yet still be made available. Cost is the driving factor in this battle, and organizations must balance the costs of securing these data with the costs of losing access to and possession of their information in both quantitative and qualitative terms.

It is difficult to assign specific financial costs to information, but much of the data that is collected and stored by organizations is its lifeblood, and proper protection and security is critical to ensure its continuity and accuracy. In a study conducted by the McAfee Corporation, it is projected that companies worldwide lost more than \$1 trillion to computer security breaches in 2008 alone (Knights, 2009). The problem of losses due to hacking has been exacerbated by the current economic downturn, and the study reports that two out of five organizations surveyed were now more vulnerable to breaches. Furthermore, Forrester Research estimates that an average computer security breach can cost a company between \$90 and \$305 per record (Gaudin, 2007). Since most breaches do not just involve tens or even hundreds of records, but rather hundreds of thousands or even millions of records, the cost of the breach and the cost of repair can be in the millions of dollars. For example, TJX Companies Inc. was hacked in 2007 and a reported 46 to 215 million customer records were stolen (Hakala, 2008). So the cost to TJX could theoretically be as high as \$65 billion (215 million records at \$305 per record). Questions arise about the causes and remedies of these breaches. In this virtual world of computer transactions, how does an organization adequately protect its valuable information assets?

Organizations all over the world need to learn how to create and implement security policies

and procedures to protect organizational data and to make sure that their employees are not only aware of these policies but tested on these policies as part of an ongoing process to ensure that they do not unnecessarily open themselves up to attack. Security issues are particularly challenging in a V-CoP, where members may be internal employees, external partners, the general public, and even competitors. Users are a large cause of security problems within organizations, and the major cause of most of the worst breaches in 2007 was not from outside hackers, but rather from employees' carelessness (Hakala, 2008).

Furthermore, a large number of information security breaches are caused by human error or human failure when employees fail to follow the specified information security (infosec) policy. Human caused error represents a significant threat, requiring the implementation of controls to reduce the frequency and severity of such mistakes (Whitman, 2004). Lastly, when companies do not meet the specified requirements for data security, whether that shortcoming is willful or negligent, they have failed in their obligations to their stakeholders (Wilson, 2009). Not only is the organization liable to its own internal users but, it is also liable to those parties with a financial interest (e.g. stockholders).

Key to this problem is awareness of security risks and the necessary education and training about information security. Organizations need to increase employee training and awareness to avoid accidental and careless mistakes and to increase the effectiveness of their security policies (Whitman, 2004). Information security awareness can be described as the state where users are aware of, or attentive to, their security mission as expressed in end-user guidelines or the security policy (Siponen, 2000). In the 2009 Computer Security Institute's (CSI)/Federal

Bureau of Investigation (FBI) survey, 53 percent of the respondents say that their organizations allocate 5 percent or less of their overall IT budget to information security, and 42 percent spend less than 1 percent of their security dollars on awareness programs which is an alarmingly low expenditure rate when you consider the cost of dealing with security breaches (Richardson, 2008). The fact that approximately \$0.50 for every \$1,000 is spent on information security reveals the need for more focus on awareness education, training, and continuous and random testing. Simulation can be a cost-effective way to implement a solution to end-user training in proper computer security practices. Included in this simulated training would be a proper understanding of the common security policies that are part of the company's standard operating procedures.

According to Whitman, a security policy is the single most important issue for protecting a computer system or network (Whitman, 2004). Also, Sword and Shield Security Consultants (2001) find the implementation of a security policy as the number one recommended action for protecting an organization's IT systems. The policy should outline both individual and corporate responsibilities, define authorized and unauthorized use of systems, report threats and breaches, and define penalties for violating the policy. The policy should also include a method for updating the policy. Key to these policies is the balance of providing confidentiality, integrity, and availability (Blake, 2000). The cornerstone of the information security policy is ensuring that data are kept private (confidentiality), that the data can be relied upon to be accurate (integrity), and accessible only by authorized (and authenticated) individuals in a timely and available manner. Security policies have long been seen as the key to identifying and managing the security threats and the

resources needed to secure information and the systems that hold that data (Anderson, 1996).

In a virtual environment, security poses a serious challenge as part of the problem is the enormous amount of data that are available. Proper utilization and assimilation of collected data can be accomplished through the informal and formal organization of employees in virtual groups that are connected through a shared practice. Such a group, as coined by Wenger and Lave (Wenger, 1999), is called a community of practice (CoP). A CoP is a group of people informally bound together by some shared passion for a joint enterprise (Wenger & Snyder, 2000). A Virtual Community of Practice (V-CoP) is a community of practice that is convened and meets in a virtual environment where members may never meet in person.

Ultimately what is needed is a model that incorporates current security policy models like Bell-Lapuda (Bell, 2005) and Clark-Wilson (Blake, 2000), but incorporates the nuances from a V-CoP where the boundaries, topics of discussion, and membership of the CoP may change on a daily basis (Wenger, 2000). A new model would include a comprehensive security awareness program that incorporates initial training for individuals that are members of a V-CoP and ongoing monitoring and periodic testing. Included with the random testing of members of the V-CoP would be mock security incident testing (Baker, 2008) of the process to make sure that the members are adhering to the security policy they agreed to, are educated about and tested on. Part of this process would be to educate the members of the V-CoP on the potential threats and damages that can be caused by careless behavior that compromises computer security, and may lead to financial and other losses.

The simulated mock security events would be part of the training and would consist of a simulated security incident, such as a counterfeit email, which asks the member of the V-CoP to reveal confidential data or other proprietary information. The member would then have to properly respond to the simulated scenario within the web-based environment. This simulated mock security incidence would be a planned part of the initial training and then would consist of follow-up training events that would occur periodically on an ongoing and irregular basis to test the end-users "awareness" of the security policy. If they do not respond appropriately to subsequent events, they will be presented with follow-up training tips via the web portal to remind them of the security policy. A sufficient passing rate would be determined by the type of organization that the end-user works for and the level of data access associated with the end-user. For example, in a classified environment like military intelligence, or the research and development department of a corporation, the passing rate may be 100%. However, in another environment where the data are not as sensitive, the passing rate could be lower.

II. PURPOSE OF THE RESEARCH

The purpose of this study is to determine and measure the effect that is made on members of a V-CoP when they are provided with security awareness training by means of a simulation on proper security procedures and then presented with several mock security scenarios where they are to apply what they have learned. However, practical security balances the cost of protection and the risk of loss (Lampson, 2000).

Four groups will be used in the study, three control groups (labeled B, C and D), and an

experimental group (A). Groups A, B and C will receive a pretest to check their knowledge and understanding of normal security procedures, and more specifically from a security policy derived from their organization, group D will not. A link to the member of the V-CoP's security policy will be posted so that they can read the policy. Control group B will receive no advanced awareness training but will be presented with the mock security scenarios to see how they respond. Control group C, will receive the initial training but will not receive any further training. The experimental group and control group C will receive the security awareness training, approximately one to two weeks after the pretest and then will be presented with the mock security scenarios/testing. Groups A and B will be evaluated on their responses to the security scenarios/tests and how they fared in relation to the standard procedures and policies of an organization. Approximately 3 weeks after the initial training and test, groups A and B will be presented with another mock security scenario/test and responses will be measured and recorded. The responses will then be compared with the responses recorded in the initial pretest post-test scenario. It is assumed that the users who receive the pre-scenario training will have a higher success rate when responding to the scenario. Users who did not receive the training will respond in a similar manner from the first scenario. Follow up interviews will be performed after the study with subjects where anomalous data is found. For example, if a user does well on the periodic security testing, but still fails to recognize the security compromise attempts, it may be revealing to find out why this happened. Also, data gathered from the tests and events could be presented to the institutions involved to provide feedback on how they may need to change their security policy and procedures.

III. RESEARCH HYPOTHESES

The following are the research hypotheses for the study:

Initial training

Users who receive the security awareness training will show a positive significant difference in how they respond to the post test on computer security in comparison to the users who received no training.

3-weeks after initial training

Users who received the security awareness training will show a positive significant difference in how they respond to mock simulated security events 3 weeks after the training in comparison to the users who received no training.

6-weeks after initial training

Users who received the security awareness training will show a positive significant difference in how they respond to mock simulated security events 6 weeks after the training in comparison to the users who received no training.

9-weeks after initial training

Users who received the security awareness training will show a positive significant difference in how they respond to mock simulated security events 9 weeks after the training in comparison to the users who received no training.

IV. CONCLUSION AND FUTURE WORK

The overarching purpose of this research is to determine the efficacy and sustained benefit of information security awareness training using

simulated events in a V-CoP environment. The results of the study would provide useful feedback that organizations can use to determine if awareness training in a web-based simulated environment can help to reduce computer security incidences, particularly from viruses. Proper adherence to security guidelines should help to promote a safer environment. Also, when users are made aware of the risks and potential damages from viruses and other forms of computer security breaches that can occur when these guidelines are not followed, they should be more likely to follow these guidelines. Knowing the risks in any environment is helpful in producing desired responses.

Contributions to the field of computer security could be the longer term impact of training and retraining of members of a V-CoP. This would include the longevity of the training as it relates to retention of information security procedures and policies and the factor of simulated mock incidence events and how these events are handled by users who are exposed to computer security awareness training and users who are not. There has not been enough research into V-CoP and security and this research may lead to further studies being performed.

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A Web-Based Course Management System

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ABSTRACT

Based on the analysis to the development of the CMS (Course Management System), this paper proposes a novel Web-based CMS system (WCMS) by using the MVC and some programming tools along with the developed educational requirement. The whole system is divided into four components: course management, teaching management, personal information management and system management. Each component is further classified into several modules. The course design is presented as an illustration. The overall system evaluation is according to the standards listed in Edutools. The difference between the WCMS is listed in this paper and the Edutools are summarized.

Keywords: CMS (Course Management System), WCMS (Web-based CMS), E-learning.

1. INTRODUCTION

From a global point of view, the development progress of every walk of life has been accelerated by Internet and its great power [1]. Being the headstream of new ideas and technologies, education industry pays more and more attention to the tremendous potential benefit of Internet. Many top-ranking colleges and universities have applied Internet to eliminate the obstacles during teaching activities and to enrich the teaching experience of both teachers and students.

E-learning was born under such a background. It firstly came up in 1990 in North America with the definition of learning and interacting based on Internet and other information technologies. It takes full advantages of the learning environment that has a whole new communication mechanism and abundant materials supplied by modern information technologies, which result in a completely new learning method. This method would change not only the role which teachers used to play in traditional education but also the relationship between teachers and students, which would eventually influence the architecture and essential of education. So the need for developing an E-learning application system is becoming more and more urgent.

Web-based Course Management System is such a system which meets the demands of E-learning. A typical Course Management System (CMS) is a network system which is able to organize, present, manage, evaluate the contents of the courses and the teaching activities, and to promote the interaction between students and teachers [2]. It focuses on helping the colleges and universities build a truly interactive web-based learning environment where everyone is able to browse the contents, obtain resources, evaluate education effect and cooperate with each other at any time.

The teaching method of Moodle system is based on the concept of social constructivism. It attracted many users by its powerful functions and free of charge. Blackboard provides a powerful

virtual learning space with high price. Dokeos has a unique management for learning path. Claroline provides an easy way for teachers to build a course. Besides these, there are many other similar systems and each of them has its own features and specific users.

Although CMS seems to have gained vigorous development, there are still many problems. First of all, no available CMS can lighten the burden of teachers in their work. Teachers are responsible for building, maintaining and updating the courses, at the same time they have to rely on traditional teaching method for certain work. Secondly, different courses are not treated differently. The courses highlighted by its presentation of vivid images and materials are much more suitable for CMS systems than ones that are mainly composed by logical reasoning subjects. The current CMS systems pay no attention to this obvious difference. Finally, a unified standard for evaluation of CMS does not exist. Of course we can use Edutools standards to evaluate the function of each system, however, besides the learning effects, the evaluation of web-based education should depend on the effects and positive response of students who take part in it. By taken above problems into consideration, this paper presents the design and implementation of a new Web-based CMS.

2. COURSE MANAGEMET SYSTEM

Web-based course management system makes E-Learning possible. Ease-of-use and enterprise architecture are its main characteristic. What makes the system unique is a set of integrated solutions provided. It optimizes and strengthens the application of every module to the max, such as teaching management platform and resource management platform. The open environment for developing web-based education system as well as its adaptability and collaboration with the industry standard make various organizations capable to extend or customize their functional modules according to requirements, which brings an interconnected and interactive web-based learning environment to reality.

Focusing on courses, web-based course management system integrates teaching and learning environment. Teachers can set up online courses on the platform and students can choose courses and study by themselves. Discussion and Communication can take place between students or students and teachers. This provides a powerful online virtual environment for teachers and students, and makes it the most important application system for remote education. The web-based course management system has following advantages:

1) Student-centric.

It changes the traditional educator-centric education mode, which pays little attention to the activities of students [3]. In WCMS, one of the things an educator needs to do is to gather statistic information of student behavioural trait, such as: how much do they like the course? Do they work hard on it? Whether they have any difficulty in learning the

course? In this way, students can gradually develop an effective learning method of their own.

2) Improved working efficiency for teachers.

With the help of teaching management tools provided by WCMS, teachers may find it much more convenient to build up online courses and interact with their students.

3) Flexibility.

Students are free to choose what to learn, according to their own conditions, studying purpose and learning methods, which supplies them with more control over the time and location for studying and makes it very convenient for them to have a test of what they have learnt and get feedback promptly.

4) Interaction.

Interaction is regarded as a major vantage of traditional face-to-face education, but in a remote web-based education environment, "Interaction", on a larger scale, provides a new method to help stimulate students to study. In a network environment, people can communicate with each other by email, voice mail, mail list, RSS, chat room, BBS, web conference or other two-direction medium. Sometimes other methods like the immediate feedback, inquiry and answer, control of pace, control of frequency are also used. These procedures make collaborative learning between students or interactive communication between students and teachers come true.

3. REQUIREMENT ANALYSIS AND DESIGN OF WCMS

3.1 System architecture design of WCMS

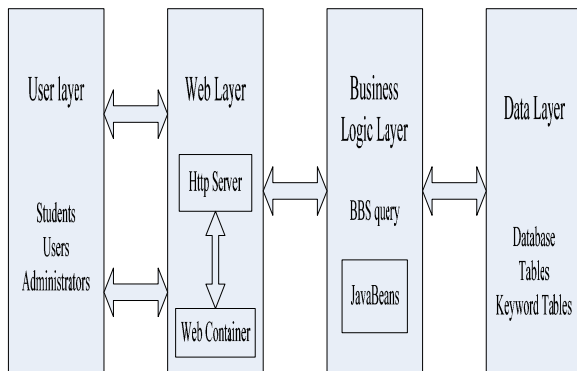


Figure 1: System architecture of WCMS

WCMS creates an integral teaching environment. Students can browse the courses on the Internet web sites, register courses, choose textbooks, select studying schedule and so on, which represents a complete teaching process. Teachers are able to manage their teaching work, prepare courseware, arrange online test, examine students' homework, answer students' questions online and gather statistics on students' learning. The platform is a powerful learning tool which supports customization by students' need. And students can choose the courses they want to take, arrange their learning plans, submit their homework, cooperate with others, check out the scores and take part in the community discussion. The platform is also a bridge of communication between students and teachers. WCMS should be a system that can help teachers issue information, accomplish routine management, and make some modification to the database according to their needs. Considering these system requirements, as shown in figure 1, MVC model is adopted to design the architecture of WCMS.

1) User interface implementation in user layer.

It provides a visual interface for information gathering and data presentation.

2) Web layer.

Web layer delivers user's request to business logic layer for analysis and process and then transmits the results back to the user.

3) Business Logic layer.

This layer responds to the request delivered by Web layer, queries the database about the information on user's demand and returns it back to Web layer.

4) Data layer.

This layer is mainly responsible for data definition, maintenance, access, updating and management. It also responds to the request from business logic layer.

3.2 Function design of WCMS

According to the requirements of WCMS, the functional architecture of the WCMS system is as shown in figure 2.

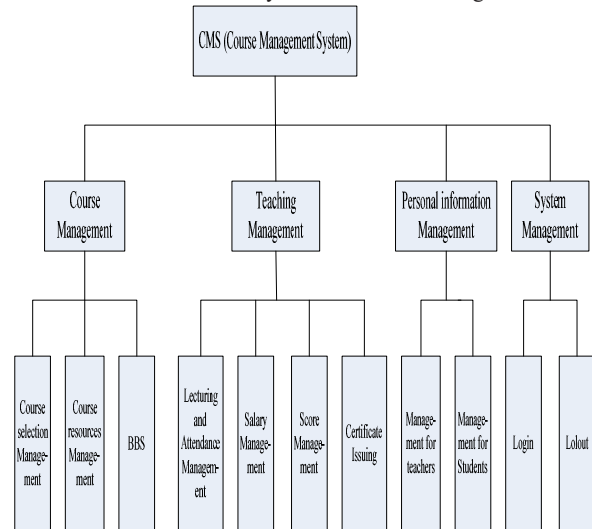


Figure 2: Functional architecture of WCMS

1) Course management

Course selection management. Students choose courses according to their interests and they are free to make any changes before they pay relevant fees. Administrators can maintain and manage these choices students make. Teachers can see the students who have selected their courses.

Course resources management. Course resource information includes course title, classification, total class hours, chapters and sections, etc. All registered users can browse and query information. Administrators and teachers are responsible for the maintenance of information.

Teaching bulletin board system. Administrators can issue announcement and discussion on the homepage. The items of the announcement should include the course title, delivery time, the name of the teacher, etc. A more detailed introduction of the course can be accessed through the link on the homepage. Apart from the functions an ordinary BBS has, the discussion here can be customized, that is to say teachers are allowed to initiate, open or shut down a discussion.

2) Teaching management

Lecturing and attendance management. The statistics record of lecturing (for teachers) and attendance (for students) are gathered by relevant administrators.

Salary management for teachers. The salary a teacher should get for each course he or she gives is calculated by the administrators.

Score management for students. This includes adding, modifying, querying and gathering statistics of students' scores. Students are only allowed to launch queries.

Certificate issuing. After a student has finished a course and passed the exam, he can see the certificate issued online. The administrator announces the names of students who have gained the certificate online.

3) Personal information management

Management for teachers. This may contain the adding, updating, query and deletion of a teacher's information which includes his or her education background, research direction, research achievements, published papers and obtained awards [4]. Only the teacher has the permission to modify the above information while only the administrator can delete a teacher's information.

Management for students. Teachers can add, modify or delete a student's information here.

4) System management

This part is for users to login and log out.

3.3 Database design

WCMS deals with large amount of data, so a good scheme for the database becomes quite important [5]. Since the users of this system could be located anywhere, the real-time property and running speed are taken into consideration when the database designed. The SQL Server 2000 has the following advantages: high efficiency both in running and data storage, highly distributed, multiple threads concurrency, combined with reasonable data storage allocation and classification. All those advantages make it running stable.

As a tool for communication and collaboration in WCMS, the design process of BBS is quite representative. Apart from the fundamental functions an ordinary BBS has (such as starting a topic, editing or deleting an existing topic, responding to a topic, etc) the BBS in WCMS can be customized, which is a specific character of WCMS. A particular BBS is subordinated to a course and it allows the teacher to create, open and shut down a discussion in BBS. Based on this requirement analysis, figure 3 presents the E-R (Entity-Relationship) diagram of the database of a customizable BBS. The database contains four entities: Course, BBS discussion place, Discussion topic and Response to topic, three relationships: Setting, Issuing and Responding.

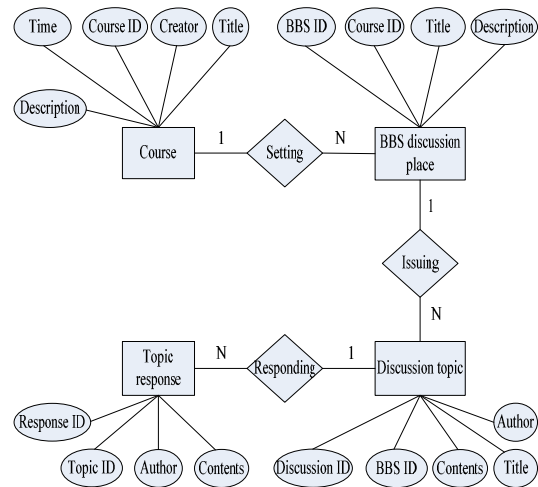


Figure 3: E-R diagram of BBS

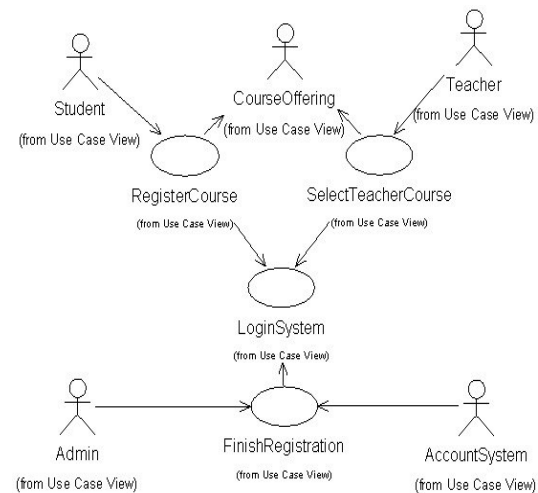


Figure 4: Use case diagram

3.4 Course selecting

Course selecting is the most valuable module. Figure 4 below is the use case diagram. This module allows students to select the courses they want to take at the beginning of a semester. Course catalogue presents all the courses offered in a certain semester. Students can modify or delete a certain course they have selected. The objects communicate with each other. The behaviour model depicts the dynamic behaviour of the system by connecting the objects who communicate with other objects. Figure 5 shows the state diagram for course selecting module.

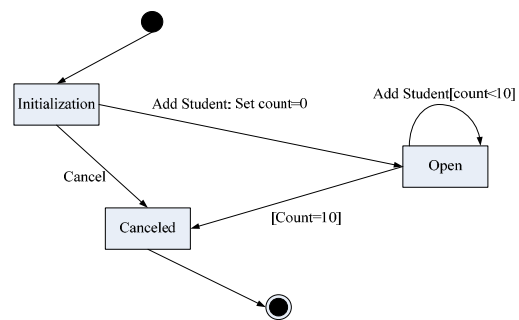


Figure 5: State diagram

4. IMPLEMENTATION AND EVALUATION OF WCMS

By applying MVC architecture, a system is designed and implemented in this paper, WCMS, which partially satisfies the demands of E-learning platform using developing tools such as Rational Rose, Rational Application, etc.

The goal of testing WCMS is to make sure that the system can run smoothly. The test is aimed at each function of WCMS. It builds up an online education platform which simulates the

whole process of online learning and online management in an objective and real way so that each function is tested and also some experience can be gathered before the system is deployed.

WCMS is a comprehensive web-based education platform which provides various functions. There have been a lot of people working on the evaluation model for the systems like WEAS [6] and LMS [7]. And this paper here compares and analyzes the functions of the system according to the standards given by Edutools. Edutools pays a lot of attention to education-supported tools and it compares the function and performance of around 35 course management systems.

Table 1: Evaluation result according to Edutools

Functions evaluated	Functions implemented in WCMS
Communication Tools	Discussion Forums File Exchange Internal Email Real-time Chat Video Services Whiteboard
Productivity Tools	Bookmarks Orientation/Help Calendar/Event notification Searching Within Course Work Offline/Synchronize
Student Involvement Tools	Group work Student Community Building Student Portfolios
Administration Tools	Authentication Course Authentication Hosted Services Registration Integration
Course Delivery Tools	Automated Testing and Scoring Course Management Online Grading Tools
Curriculum Design Accessibility Compliance	Course Templates Curriculum Management Customized Look and Feel Instructional Design Tools Software/hardware

The table 1 contains the detailed implementation of the CMS system presented in this paper. The evaluation is mainly classified into six categories: communication tools, productivity tools, student involvement tools, administration tools, course delivery tools and curriculum Design Accessibility Compliance. The CMS system designed and implemented in this paper generally meet the evaluation standard except the following points: online journal/notes are not considered when it comes to the communication tools; when it comes to productivity tools, calendar and event notification are implemented, which receives a positive feedback; the self-evaluation component is deleted from the student involvement tools part for simplicity compared with the Edutools; the instructor helpdesk is replaced with other functions in course delivery tools; and finally, the curriculum design accessibility compliance part took the hardware and software environment into consideration. All above modification makes the system running efficiently and smoothly. The detailed evaluation should be based on a longer period of observation, especially the feedback of students and teachers, this may take some time.

5. CONCLUSIONS

This paper analyzes the requirements and functions of web-based course management system, introduces the system design and implementation. According to the result of the test, compared with the existing E-learning platforms, the one used in WCMS has many advantages, such as platform-independent, multiple databases, etc. As it concerns about lots of practical problems and technical details, E-learning platform requires a great deal of complex and heavy work. Like many other course management systems, there is still room for WCMS to be improved and perfected.

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Providing an Effective and Efficient Learning Environment: Meeting the Challenges of Multiple Diversities

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ABSTRACT

In this paper, I identify some major challenges faced by university lecturers teaching classes that contain a mix of local and international students from different programs and then introduce and discuss the tools and techniques used by me to address these challenges. Using these tools and techniques, I provided an efficient and effective learning environment to the satisfaction of almost all students in the two classes I taught during Semester 1, 2009. I provide evidence of the success in the form of informal as well as formal anonymous feedback from students, the pass rates and grades achieved by the students as well as the Blackboard and wiki sites that are accessible to those who possess the usernames and passwords required to access these sites. I also discuss how my experience correlates with published literature.

Keywords: Effective Learning Environment, Multiple Diversities and Challenges.

1. INTRODUCTION

As the world gradually becomes a global village and universities and other tertiary institutions devise ingenious ways of attracting not only students from their own districts and countries, but also from around the world, the teaching staff face new challenges, trying to provide a learning environment in which most, if not all, students make significant progress and are satisfied with the level of education and support provided.

Those of us who teach these students during their first semester at university face the toughest of these challenges. In my institution, this challenge is even greater as many classes consist of a mix of students from three separate programs, each with its own entry requirements and learning expectations.

Based on my experience and using some ideas from published literature, I devised a very successful strategy to meet these challenges in Semester 1, 2009. I am so excited by the results obtained in the two first semester classes in which I used these tools and techniques, that I consider it worth reporting and discussing these in the light of published literature.

I believe that many lecturers in several tertiary institutions around the world face similar challenges and hope that the tools and techniques used by me will help in some way. I also look forward to hearing their views to add to my toolbox as well as to further improve the techniques used by me.

2. BACKGROUND

My Experience as a Student

I sat my university entrance examination more than four decades ago, in 1965. During that era, students who wanted to pursue a degree in mathematics and science-based courses had to study mostly courses in mathematics and the basic sciences such as physics, chemistry and biology for at least five years before sitting the university entrance examination. Those who wanted to study engineering at university had to study mathematics, physics and chemistry while those who wanted to study medicine at university had to study botany, zoology, physics and chemistry to a significant depth in their last two years of school.

My Experience as a Lecturer

My experience teaching engineering and computing in five tertiary institutions in Australia, New Zealand, Singapore and the USA has been varied. Some universities recognize the advantages of having students with approximately the same level of basic knowledge, language skills and even learning aptitudes in each class. They also have students follow a fairly restricted, but well thought out curriculum so the students progress as a cohesive learning community throughout their university years, helping each other build their knowledge.

Other institutions, however, are either unable or unwilling to recognize the advantages of populating each class with students having approximately the same level of basic knowledge, language skills and learning aptitudes. They sometimes talk about the advantages of populating each class with students having different levels of basic knowledge, language skills and learning aptitudes.

My Experience as a Parent, Student Advisor and External Observer

Looking at the entry requirements for various courses that lead to similar degrees at bachelor, master and doctorate levels it is not hard to see the huge variation in the quality of the degrees conferred by the various institutions. For example, some universities would admit students to a degree in medicine without the students having studied biology or physics, while others would not admit students who have not done both biology and physics. Similarly some institutions would not admit students to study computing unless the students have a good grounding in mathematics while others would gladly do so.

Whereas a music department in a recognized university would not admit students into their PhD programs unless the student has a masters qualification in music from a recognized university, a lesser known institution may admit candidates into a PhD program in a specific field even when the candidate does not have a masters qualification in that field or a closely related field.

3. THE BUSINESS OF EDUCATION AND THE CAUSES OF DIVERSITY

Funding

Most universities are now run as businesses, as they receive very little or no funding from the governments of their countries, or other sources. This is the cause of many of the tensions that exist within most contemporary universities. The need to balance the budget in an environment where even some of the top universities advertise and compete for students often means enrolling students with varying levels of basic knowledge, language and other skills into the same classes.

International Students

Even when they get adequate funding, universities find it worthwhile attracting foreign students and charging them tuition fees that are often much higher than the fees paid by local students. These students often have poor language skills, cultural barriers and a number of other factors that adversely affect their learning. *"In this assignment, I will write a shell script that will execute the root user"*, wrote one of my students in his assignment on shell scripting.

Classes with Students from Different Programs

As universities try to keep up with the changing trends in the relevant industries and keep themselves financially viable they design programs that will attract students. Often the programs are designed to make use of some existing courses that were designed for other programs. Students from different programs often have different levels of basic knowledge and expectations.

4. STUDENTS IN MY CLASSES IN SEMESTER 1, 2009

The two classes I taught in Semester 1, 2009 are the classes I discuss in this paper. Each of these classes consisted of twenty-four students. The students in either of these classes were not

homogeneous in any sense of the word. There was wide variation in the language (spoken, written and comprehension), mathematics, analytical, computing and communication skills amongst the students in each of these classes.

Several of them used English-Chinese or English-French dictionaries during class. Often, I had to ask the students who had a good knowledge of English to translate some words, phrases or sentences for the benefit of the students who were not fluent in English.

Some of them were shy, or had other inhibitions that made them reluctant to participate in classroom activities as well as in asynchronous communication with other students.

Some of these students were young and straight out of school. Others have been in the workforce for some time and have decided to study again – these students have not done any studies for a long time, sometime as many as twenty years.

Some students had just completed a six month certificate course in the previous semester, while some others were direct entries to the degree program.

The rest were graduates from overseas universities enrolled in the Graduate Diploma in Computing program.

Some students were willing to give and receive help from other students, while others were worried that they may lose out if the institution used a Bell curve to standardize the marks as the students whom they helped may get better grades than them.

Some were there only because they wanted to collect the student allowance provided by the government or qualify for migration.

Others were there because their parents or grandparents would only pay the course fees if they were enrolled in the degrees that these sponsors wanted them to do.

Although we live in the new millennium, the above are some of the realities of the actual classrooms in several universities around the world, not just my institution.

Cognitivism [1] is one of the three major philosophical frameworks under which learning theories are developed. According to cognitivism prior knowledge plays an important role in learning [2]. Given the large variation, especially in the prior knowledge possessed by the students in these classes, how to provide effective and efficient learning for most, if not all these students was my biggest challenge.

5. HOW DID I MOTIVATE THESE STUDENTS?

Understanding the Students and their Needs

I found out as much information as possible about each student, during class and in individual meetings with the students. What made them enroll in the program? Why are they doing this particular course? Can they construct simple sentences in English? Can they understand spoken and written English? Do they have any problems with my accent? What can I do to help them? Are they visual learners? Are they auditory learners? How can I get them to actively participate in classroom activities?

How can I encourage them to engage them in asynchronous communication and collaborative knowledge building?

"Instruction begins when you, the teacher, learn from the learner. Put yourself in his place so that you may understand what he learns and the way he understands it." - Kierkegaard

'Preaching'

At appropriate times during the first two weeks and then on other appropriate occasions, taking cultural sensitivities into account and pushing the boundaries where possible, I 'preached' the value of learning, the importance of time, time management, how helping others and explaining something to others enhances one's own learning, and other such values that have helped me in my lifelong learning.

Observation and Pairing

Not only did I preach, but I was also willing to observe and listen. I encouraged them to stop me anytime and ask questions. During the practical sessions, I often paired students considering how the pairing is likely to benefit both students. For example, I paired a student whose language skills needed improvement with a student whose programming skills needed improvement and expected that they help each other. Making my expectation clear was a very important factor in the success of this technique. Observing the interaction between the students in each 'pair' and making better choices in future pairing was also important.

Selecting Appropriate Tools

Noting the different learning styles, I had to come up with a number of tools to support as many as possible of the learning styles.

Content Management System (CMS)

I used Blackboard as the CMS. On Blackboard, I provided a set of notes that 'grew' as the weeks progressed. Blackboard was also used to post the slides used during class, the exercises done during class and the exercises the students needed to do as homework. At appropriate times, solutions to the exercises and practice questions were also posted on Blackboard.

Book

Some students learnt better using a 'text book'. I wrote a book especially for my students. The first seven chapters of this book were relevant to this course, while the rest were for the next higher level course. I saved the entire book as a pdf file and made this available for free download on the CMS.

Class Wiki

I created a wiki on wikidot.com and students were asked to join the wiki. There were two sections on the wiki. One section was an authoritative section where I posted verified material relevant to the course. The students could open the wiki in one window

from anywhere in the world and open the server on which they can do the practical exercises in another window (or another computer) and work thorough the exercises and read the relevant course material. The material was presented in small modules. The other section of the wiki was where students could post questions to each other and help each other, building their knowledge collaboratively, writing their notes or even a 'book'.

Classroom Management

Managing the classroom to keep a group of students with so many diversities busy is a very difficult task. I found that lecturing in the traditional sense could hold the attention of the entire class for only about half an hour in any one continuous spell. Even during that period, it was necessary to use some short answer questions, as well as to encourage questions from students to keep the focus.

The rest of the contact time was used to help the students build knowledge in a collaborative manner, sometimes as one big group and at other times in small formal or ad-hoc groups. It is worth noting that once the critical numbers of students engaged themselves in learning and helping each other, others quickly followed suit. Those who were inclined to 'switch off' during a traditional lecture often become quite active and not only engaged in learning but also volunteered to help others.

Given that I had two sessions of two hours for each class per week, I had to plan every session with a mix of short lectures, collaborative knowledge building, tutorial and practical sessions. For the practical and collaborative knowledge building sessions, I often grouped the students in such a way that all members of each group benefited by helping each other.

6. RESULTS

Informal Feedback at the End of Each Session

At the end of each session, I asked the students what they learned during that session, how they benefited from the help from their peers and how I could improve future sessions. I made it clear that I have taught for so many years and am happy to change what I do to suit their learning. Needless to say, students need to really believe that the lecturer is really sincere when he or she says this, before they open up and suggest ways of improving the sessions.

Informal Feedback at the End of Three Weeks

I handed out a sheet of blank paper to each student at the end of week three and asked them to write, anonymously what they liked and what they disliked about the course and how it could be improved. This provided some valuable feedback and I acted on every one of the things that could improve the course. In the case of suggestions that for one reason or other were not practicable, I explained why I could not implement it.

Student Evaluation of Quality: SEQUAL

SEQUAL is the acronym for the formal instrument used by my institution for gathering anonymous student feedback.

The SEQUAL for my two classes is shown Fig. 1a, 1b, 1c and 1d. This was one of the best SEQUAL reports I received in my thirty-five years of teaching and included many positive comments and just one comment on what can be improved.



SEQUAL TEACHING EVALUATION SURVEY REPORT

LECTURER: 20CG
 TERM: Semester 1 - 2009
 COURSE:

TEACHING EVALUATION SURVEY - SUMMARY

Number of Respondents:	16	MEAN	ST DEV
This Lecturer:			
1. Communicates ideas and information clearly		3.88	1.20
2. Is well organised and well prepared		3.81	1.17
3. Is enthusiastic, with a responsive and interactive style of teaching		4.38	1.15
4. Encourages me to learn and study		4.19	1.11
5. Demonstrates a sound knowledge of the topic		4.25	1.13
6. Overall, this lecturer enhances my learning		4.13	1.15

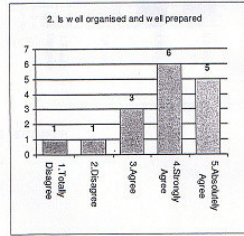
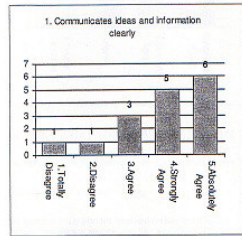
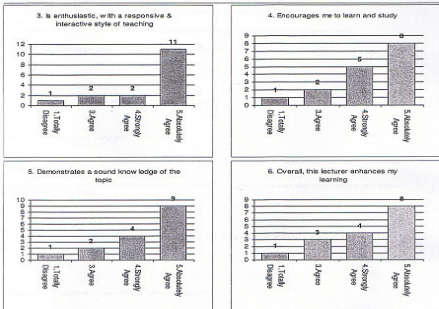


Fig. 1a.



SEQUAL TEACHING EVALUATION SURVEY REPORT



OUTLINE WHAT YOU LIKED MOST ABOUT THIS LECTURER

He explains well, He tries to answer every question, very helpful
 Fun, makes the lecture interesting
 always has a smile on his face and makes learning fun, taking time helping anyone who has a problem
 he knows the subject and his helpful, encourages us to study

n/a

Fig. 1b.



SEQUAL TEACHING EVALUATION SURVEY REPORT

I enjoyed the cutting edge approach to operating systems and link to other courses
 He is very enthusiastic and brings a humorous attitude into class, which makes learning enjoyable.
 He is very friendly and able to answer questions that I have.
 He spend time with student one to one.
 He makes the learning environment fun.
 And he provide all the notes we need for the test and exam.
 He is a funny and easy going guy.
 He is quite a patient person.
 He has the best teaching principals out of all the lecturers I have had this semester and also in comparison with Auckland University.
 He has a good sense of humour which makes learning very enjoyable. He is also very approachable and helpful when asked questions.

WHAT COULD THIS LECTURER IMPROVE TO ENHANCE YOUR LEARNING

after careful thought and deliberation... I can think of nothing..

nothing

n/a

More tricks

Nothing, he is excellent.

Nothing.

N/A

Fig. 1c.



SEQUAL TEACHING EVALUATION SURVEY REPORT

Nothing to note on really.

more practical

Fig. 1d.

Student Performance

As mentioned earlier, I taught this course to two classes. Each of these classes had twenty-four students at the beginning of the semester.

Fig. 2 shows the grades obtained by the students in one of these two classes.

1	2	3	4	Final Mark	Final_R Mark	Final Result
95	84	100	100	95	95	A+
80	92	84	54	76.2	76	B+
55	48	72	32	50.6	51	C-
70	48	88	35	58.5	59	C
60	28	20	12	27.6	28	E
100	96	88	85	91.5	92	A+
50	72	100	10	56	56	C
60	52	36	29	42.7	43	D
90	84	92	62	80.6	81	A-
0	0	0	0	0	0	W
90	92	80	85	86.5	87	A
55	0	0	0	11	11	E
45	80	84	14	54.2	54	C-
80	76	80	52	70.6	71	B
60	72	48	29	50.7	51	C-
35	64	56	17	42.1	42	D
80	72	84	72	76.6	77	B+
55	4	0	0	12	12	E
60	96	92	34	69.2	69	B-
95	96	80	84	88.2	88	A
60	52	56	30	48	48	D
85	88	76	79	81.7	82	A-
75	40	96	55	65.5	66	B-
DNC	0	0	0	0	0	E
40	64	44	14	39.2	39	E

Fig. 2.

Fig. 3 shows the grades obtained by the students in the other class.

As can be seen from these figures, the students in both classes performed very well in the assessments and tests.

1	2	3	4	Final Mark	Final_R Mark	Final Result
85	52	44	54	57.2	57	C
75	52	68	49	59.7	60	C+
85	56	68	59	65.7	66	B-
40	36	28	0	24	24	E
55	48	48	37	46.1	46	D
75	48	84	32	57.6	58	C
95	100	100	87	95.1	95	A+
65	52	68	34	53.2	53	C-
55	68	84	35	59.5	60	C+
60	64	64	40	56	56	C
70	64	84	15	55.5	56	C
75	72	76	52	67.6	68	B-
80	52	52	35	52.5	53	C-
95	100	96	82	92.6	93	A+
45	88	72	20	55	55	C
80	24	20	17	32.1	32	E
0	0	0	0	0	0	W
60	28	44	34	40.2	40	D
100	100	80	100	95	95	A+
85	100	100	65	86.5	87	A
90	80	68	55	71.5	72	B
75	72	48	35	55.5	56	C
95	100	80	79	87.7	88	A
90	84	88	67	81.1	81	A-
65	88	88	44	70.2	70	B

Fig. 3.

7. DISCUSSION

In this section I discuss my results in the light of published literature.

“Students have different levels of motivation, different attitudes about teaching and learning, and different responses to specific classroom environments and instructional practices. The more thoroughly instructors understand the differences, the better chance they have of meeting the diverse learning needs of all of their students.” [3]. The key is for the instructor to understand the differences. As I mentioned in the previous pages, I believe the time and effort I put in at the beginning of the semester to listen, observe and understand these differences was a major factor in the high levels of student satisfaction and learning in my two classes.

Felder and Brent identify the following three categories of diversity as those that have important implications for teaching and learning:

1. *Differences in students’ learning styles (characteristic ways of taking in and processing information),*
2. *Approaches to learning (surface, deep, and strategic), and,*

3. *Intellectual development levels (attitudes about the nature of knowledge and how it should be acquired and evaluated).*

The classes I taught had other major diversities.

Meeting the needs of students with learning difficulties is a challenge for even the most experienced teachers (Ingersoll, 2001, 2003). Although the diversities I faced amongst my students may not technically be called 'learning difficulties', the challenges are not too dissimilar. Even with my decades of teaching experience, I find meeting the learning needs of students with so many diversities a major challenge.

Educational paradigms have evolved and changed continuously. From the *Gurukulam* [4] system of education practiced in India thousands of years ago to the apprentice system to current systems many changes have taken place. The supervision of PhD students is still an apprentice system of sorts.

Educational philosophers and practitioners have developed many theories and practices based on these theories. The paradigms range from the behaviorist paradigm to which Skinner contributed much in the fifties to the socio-constructivist paradigm.

I believe that the success of my students resulted from the use of a number of ideas drawn from the various learning theories and the use of some of the latest technological tools. I employed a combination of some of the ideas and theories found in behaviorism, cognitivism, constructivism, connectivism, open communication, collaborative learning, knowledge construction, multimedia learning, the Sudbury model [5] and social constructivism.

For example, the idea of giving some autonomy to students to learn anything they like, albeit within a limited subject area in some sessions was taken from the Sudbury model.

As a teacher excited about new technologies, needless to say, I used multimedia and a wide range of technological tools in my teaching.

Another example is to encourage, at appropriate times, for each student to build his or her knowledge with the help of teachers and other students during class times. Based on my previous work [6], I used the student editable part of the wiki among other things to engage the students in asynchronous collaborative knowledge building.

Managing the classroom and keeping the students motivated and engaged in learning while using a mix of number of paradigms, tools and resources meant a lot of careful planning, not only of each lesson, but also of what resources needed to be provided and in what form (paper, authoritative area of the wiki, student editable area of the wiki, Blackboard, notes, slides, etc.).

A 2005 paper by academics from an Australian university "outlines how a wiki can be used as part of social constructivist pedagogical practice which aims to develop advanced ICT literacies in university students" [7]. Cress and Kimmerle [8] suggest that "Individual learning happens through internal

processes of assimilation and accommodation, whereas changes in a wiki are due to activities of external assimilation and accommodation which in turn lead to collaborative knowledge building". In one of my earlier papers [6], I described how I used wikis to facilitate collaborative knowledge building amongst my students. I used some of these techniques in these classes.

8. CONCLUSION

Teachers in universities face many challenges in providing effective and efficient learning to most, if not all students in classes consisting of students with multiple diversities. Making use of the relevant ideas, theories and paradigms developed over the centuries in combination with the tools and technologies available today can go a long way in helping to meet these challenges. Meticulous planning is needed to achieve good learning outcomes for most, if not all students. I spent considerable amount of time and had a great and satisfying semester. I hope the readers find this paper useful and build on these ideas and thus improve the learning experience of their students.

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Five, Basic, Creative, Problem-Extension Methods for a Fixed Syllabus

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ABSTRACT

We provide five basic methods for creatively **extending** a given **base** problem. For a given **base** problem, each of the five methods provides a distinct technique for **extending** the base problem to a more challenging level. The five methods may roughly be called *plug-in*, *reversal*, *multi-step*, *comparison* and *iteration*. We illustrate application of these five methods in a variety of levels of course difficulty: elementary arithmetic, high school algebra, geometry, college English, and actuarial-financial courses. These five methods can also be used as a basis for differentiated instruction. These five basic methods naturally arise from certain common features of all computer languages and provide a uniform model of cybernetic flow between syllabus topics and problems.

Keywords: problem posing, problem writing, problem extension, base problem, differentiated instruction.

1. PROBLEM POSING AND WRITING

In the past few years there has been a focus on creative problem writing, on the part of both students and instructors, as a method of enriching course pedagogy. This focus has taken several directions. Some papers focus directly on methods of creative problem writing [2],[3],[4] while other papers focus on the nature and attributes of good problems [4],[10].

The “creative problem writing” approach has branched in two directions. One direction advocates creativity through exploration, relevant real-world settings, experimentation, and a skillful study of changing problem hypotheses [2]. Typical exercises in creative problem solving could, for example, involve hypothesizing patterns in a sequence of numbers or a geo-board, or modeling a real-world setting. A particularly interesting technique for creative problem solving is the *what-if-not* approach, for example, studying how variation of theorem hypotheses alters theorem conclusions. Interestingly, there is a direct 1-1 correspondence between the life-cycle methods of such explorations and the life-cycle methods of writing [7]. This 1-1 correspondence facilitates combining writing and exploration in the same course.

A second branch of the “creative problem writing” approach seeks to classify general methods of changing a *base* problem [3],[4]. This more modest approach to creative problem writing complements broader problem-writing methods involving exploration, experimentation and what-if-not analysis.

We emphasize four important benefits for studying specific focused methods of extending a base problem vs. pursuing

broad general methods of exploration:

- First, although many instructors are aware of the need for a problem solving component in courses, their own understanding of what good problem solving is, and how to create good problems, is often vague and unclear [10]. Consequently, a collection of specific methods to creatively extend base problems is welcome.
- Secondly, even instructors who are gifted in encouraging exploration and creativity, must devote time to *completing the syllabus*. The syllabus typically consists of fixed topics, fixed theorems, fixed formulae or fixed methods which the student must master. It consequently becomes important for every instructor to have a repertoire, or scheme, of methods by which fixed syllabus topics, methods, theorems and formulae can be creatively taught using semi-mechanical methods of problem extension and enrichment.
- Thirdly, time for exploration and creativity is not always available, particularly, in more technical courses, such as advanced calculus, advanced English style, or actuarial courses. These courses typically prepare students for career paths requiring highly complex skill competencies; course time is precious. The methods of this paper are especially useful for such advanced courses since it affords an opportunity for creativity and challenge.
- Fourthly, by presenting a uniform standardized description of challenge levels in variations of a base problem we facilitate differentiated assessment and differentiated instruction in the classroom [8],[11].

An outline of the rest of this paper is the following. We begin, in the next section, with a 3rd grade arithmetic example. This example exposes us in a simple setting, understandable to readers with any background, to the five basic methods by which base problems can be extended. This is followed in sections 3 and 4 by illustrations from high school algebra and geometry courses. In sections 5 and 6 we add to our illustrations, depth and breadth by applying the **problem-extension** methods to actuarial mathematics and college English, respectively. In the final section, we suggest an overall, unifying, cybernetic scheme for the methods of changing base problems using universal concepts from computer science.

Throughout the paper, the examples are expressed in a non-

technical setting in order to provide exposure to the widest possible audience. It is hoped that the presentation of the same scheme in so many settings will support the idea of an overall unifying scheme of problem creation.

*The central thesis of this paper is that all creative **problem extensions** of a **base problem** use a core of five methods – plug-in, solve/reversal, compare, multi-step and iteration. Furthermore, these five core methods can be applied to any discipline and at any level of complexity including 3rd grade arithmetic, college English and actuarial-financial methods. An instructor from any level course with a fixed syllabus will be able, after reading this paper, to pose additional, challenging, non-routine problems for each syllabus topic.*

2. ELEMENTARY ARITHMETIC

We introduce the basic, five, **problem-extension** methods using an example from 3rd grade elementary arithmetic. We begin the illustration by presenting a **base** situation.

Base Situation: We suppose the class has been taught the addition table and its use in multi-digit addition.

Our goal is to pose five distinct problem types from this single base situation. The five problem types are:

Plug-in / Assignment: e.g. Compute x : $x=1+2$, $x=7+9$, $x=3+8+2$.

This is the simplest problem level where the student simply “regurgitates” learned material. The literature typically calls these types of problems “plug-ins.” They correspond to the lowest Bloom taxonomy level of *knowledge* and memorization. They also correspond to the simplest computer science statement, the *assignment* statement.

Reversal / Solve: Find the x ...: such that $3=x+2$; such that $16=x+9$; such that $13=3+x+2$.

It is important to emphasize the mechanics of the *solve* or *reversal* method. Sometimes a student has already been taught the inverse operation (in this case subtraction). In such a case the equation $3 = x+2$ can be *solved* by subtraction $x = 3 - 2$. However if the student has not yet been taught the inverse operation then the student must *solve* the problem $3 = x+2$ by reviewing the entire addition table and looking for an entry of 3 in the “2” row. When the student finds 3 in the “2” row and “1” column the student can *solve* $3=x+2$. For this reason *reversal* problems are considered more challenging than *plug-in* problems since a review of an entire table, vs. a lookup of a single value, must be performed.

Comparison / Relations: e.g. Which is bigger $1+9$ or $2+3$? Which is smaller $3+8+2$ or $7+9$?

A *comparison* problem is recognizable by the presence of relational concepts such as *bigger*, *smaller* or equivalently by the presence of relational operators ($>$, $<$, $=$). The *comparison* problem is more challenging than the *plug-in* in that it involves two

distinct sub-problems whose solutions are compared.

Sequential – multi-step problems: e.g. Let $z=1+2$; $y=z+3$; $x = 4+y$. Compute the value of x .

The sequential – multi-step problem is characterized by the use of several steps to arrive at a final answer. Some math students find the transition from single step problems to multi-step problems challenging.

Iteration / Loop problems: e.g. Let $x=1+2$, $y=x+3$, $z=x+4$. Continue till you reach 100. What is the terminal sum?

Iteration problems differ from sequential problems in that a process must be continued till some *terminating condition* occurs. The iteration problem requires the student to have an overall ability to control a process.

This last example – the iteration problem to sum the first 100 numbers – was actually given in an elementary school setting to the famous mathematical genius Karl Friedrich Gauss who, as a young boy, ingeniously solved the problem by recognizing the triangular configuration of the numbers summed. This anecdote powerfully illustrates that the five basic problem types, although semi-mechanical in nature, can be used to creatively challenge the student to discover new approaches. Also note that each of the five problem types in this section can also be dressed in a real-world relevant problem. The emphasis in this paper is that *besides* the creativity involved in finding real-world relevance or algebraic-geometric correspondence there are certain core algorithmic features of creativity captured by the five problem types.

We emphasize that all five examples in this section used the *same base situation*, the addition table. Despite this commonality of syllabus topic the challenge and skills needed to solve each problem type are distinct. Furthermore, the diversity of the five problem types facilitates differentiated instruction and assessment. As a simple example, some third-grade students may be bored with *plug-ins* and *comparison* problems but find *reversals*, *multi-step* and *iteration* problems difficult. The five problem types presented above enable an assessment identifying such students and facilitate focused differentiated instruction to each student at their level [8],[11].

3. HIGH-SCHOOL ALGEBRA

[4] presents an overall study where several teachers ($n = 8$) were asked, in the setting of a high-school algebra course and using the same story, or **base** problem, to create **extensions** of the base problem. The researchers showed three general patterns in the problem extensions. These three general patterns in “high-school algebra” problem posing neatly correspond to three of the “elementary arithmetic” problem types presented in section 2 of this paper. To review this study we first present the “high school algebra” **base problem**.

Base Problem: Jerome, Elliot, and Arturo took turns driving home from a trip. Arturo drove 80 miles more than Elliot, Elliot drove twice as many miles as Jerome, and Jerome drove 50 miles.

Next, we present the three types of approaches to **problem extension**, with illustrative examples. Some of the classification descriptions come from [4].

- 1) Solve Problems: For example *How many miles did Elliot drive?did Arturo drive?did each drive?*

These problems are classified as *solve* problems because they require modeling the problem as a system of algebraic equations and *solving* them. A *solve* problem goes beyond *plug-ins* and requires the student to *reverse* the *plug-in* process and solve.

- 2) Comparison Problems: *Who drove the most miles?the least miles? How many more miles did Arturo drive than Jerome?*

As indicated in section 2 a *comparison* problem requires solving two sub-problems and then comparing the results.

- 3) (Crude) Multi-step problems: *Suppose further that all three people are driving uniformly at 60 miles per hour. How long would it take them to get home? Or How many miles did they drive altogether?*

We call this a *multi step* problem since its solution intrinsically requires two steps. For example, first one must solve for the number of miles each person drove. Then one must use this solved-for information to compute how many miles they drove in total, or, with the additional information of driving speed, to compute how long it took them to get home.

4. GEOMETRY

Geometry is a popular area for both exploration, problem writing and problem solving. The examples in this section come from [3]. [3] also formulates problem-creation in a framework of a **base problem** and **extensions**. This section affords us the opportunity to apply the five **problem-extension** methods to a non-arithmetic setting. First we give some background.

Recall that a triangle has 3 sides. We can conveniently describe triangles using clock notation. An **isosceles** triangle has two of its three sides equal. An **equilateral** triangle has all 3 sides equal. A typical equilateral triangle could be formed by connecting the 4, 8, and 12 positions on a clock. A typical non-equilateral isosceles triangle can be formed by connecting the 5, 7 and 12 on a clock. We can conveniently refer to these as the **4-8-12** and **5-7-12** triangle. A median connects the midpoint of a triangle edge to a triangle vertex opposite that edge. Again we can use clock notation – the **25-47.5** line (connecting clock position 25 and clock position 47.5) corresponds to the median for the **7-12** side in the **5-7-12** triangle. Similarly, the **12.5-35** is a median. It is not hard to see that the **12.5-35** and **25-47.5** medians are the same length. This is true for the general isosceles triangle. With this background we can now examine the examples in [3].

Base Theorem: The medians of the two equal sides of an isosceles triangle are equal.

In [3] this **base theorem** is **extended** in a variety of ways.

Plug-in: Prove that the medians of two equal sides of an *equilateral* triangle are equal.

(Note: This – the replacement, in the **base theorem**, of *isosceles* with *equilateral* - is called **specialization** [3]. But focusing on specific cases of a general theorem is analogous to a numerical **plug-in** since the **plug-in** substitutes a specific number for a variable. For this reason we have classified geometric **specialization** as an instance of the **plug-in** method.)

Reversal: If two medians of a triangle are equal is the triangle isosceles? Prove or provide a counter example.

Multi-step proof: Prove the base theorem.

Note: One of the challenges to students learning proofs is to familiarize themselves with the multi-step nature of the derivation process. For this reason we have classified **proof** as a **multi-step** method.

Comparison: If a triangle is not isosceles how do the lengths of the medians correlate with the lengths of the corresponding two sides?

Note: This comparison problem is called **generalization** in [3] since the term *isosceles* in the base problem is replaced by the more general term *scalene*. Using the problem types, or methods, presented in section 2, we would classify this as a **comparison** problem since we are comparing the lengths of two medians in terms of their corresponding sides.

Iteration: (Note: This problem extension does not occur in [3]) What can be said about medians in a regular square, pentagon, and hexagon? (To fully develop this problem extension one has to also define “*n*-gon median”). Is there a general theorem?

5. ACTUARIAL-FINANCIAL PROBLEMS

Having presented, in the previous sections, the five, basic, **problem extension** methods, we study in depth, in this section, using the single syllabus topic of accrual of compound interest, more sophisticated applications of these five methods. The **base formula**, $A = P(1+i)^n$, gives the accumulated value, A , of a principle amount, P , invested n years, at compound interest rate, i . The reader need not be proficient in algebra; the equation can be illustrated by simple numerical examples: For example: \$1000 when invested in a 10%-Certificate of Deposit for 3 years will yield \$1331.

We develop this single syllabus topic of accrual of compound interest using our basic, five, **problem extension** methods. We also present further sophisticated forms of these five methods by combining them.

Plug / In: How much will \$1000 when invested in an account yielding 10% compounded annually yield in 3 years.

The solution requires **plugging**-into the formula. The

answer is \$1331.

Reversal/Solve: How many years are needed to accumulate \$1331 in an account yielding 10% compounded annually with an initial deposit of \$1000?

The solution of this problem requires different skills than the **plug-in**: The student must take logarithms and solve the resulting linear equation. The answer of course is $n=3$ years.

For this **base formula**, one can implement the **reversal** method in three ways, corresponding to the variables in the **base formula**: by asking a) *how many years are needed*, b) *what interest rate is needed*, c) or *what principle amount is needed*?

Furthermore, the possibility of three types of **reversal** methods leads naturally to the idea of a *time-value worksheet*, a calculator approach allowing input of any three variables and computation of the remaining fourth variable.

Comparison: Which is a better deal? The deposit of \$1000 for 5 years at 10% or the deposit of \$1000 for 10 years at 5%?

The solution requires computing two accumulated values and comparing them. The 10 year investment yields \$1629 which is slightly more than the \$1611 yielded by the 5 year investment. (Note, that the problem assumes that after the five year investment nothing will be done with the money, a very unrealistic assumption; this however can be corrected in actual textbook problems)

Multi-step problems: The following are three examples of multi-step problems:

- **Parallel multi-step:** How much has accumulated at time $t = 3$ if a person deposits \$1000 at times $t = 0$ and $t = 1$ into an account earning 10% compounded annually?

This problem must be solved by breaking the problem into two sub-problems and then adding the results. The 3 year deposit earns \$1331. The 2 year deposit (time $t = 1$ to $t = 3$) earns \$1210. So there is $\$1331 + \$1210 = \$2541$ accumulated at time $t = 3$.

- **Piecewise-Sequential-Multi-step:** \$1000 is deposited into a 10% account for 3 years. The amount is withdrawn and placed in a second account earning 5%. How much is accumulated at the end of the fifth year.

The solution to this problem requires two steps. First one must calculate that \$1331 accumulates in the first account at the end of three years. Then one must calculate that \$1331 invested at 5% for 2 years accumulates to \$1467.

- **Multi-step-solve:** \$1000 is invested in a 10%

account for n years and accumulates to \$1331. If I want \$500 to double in n years what yield should the account have?

The solution to this problem requires first solving for n (and as we saw above $n = 3$). Then one has to perform a second *solve* problem: What interest rate allows me to double my money in 3 years? The answer, which requires some routine algebraic manipulations, is 26%

Iteration: How much will accumulate in a 10% account if I deposit \$1000 at the beginning of every year for 5 years.

We can solve this by performing a complicated multi-step problem. Alternatively, as is traditionally done in actuarial courses, new methods and techniques, *annuity methods*, are introduced to deal with iterated equally spaced deposits. Using either of these methods the amount accumulated at the end of the 5th year is \$6,716.

This section presented refinements of the five, basic, **problem-extension** methods. For example, the multi-step method can be parallel, piecewise or combined with the plug method. Corresponding to standard syllabus topics in Financial Mathematics courses [9] similar refinements can be introduced to other **problem-extension** methods. As a simple example, the *method of equated time* can be classified as a hybrid *comparison-solve problem-extension* method. A typical *method of equated time* problem might be: *Find the point of time, T , such that a single deposit of \$3,000 at time T , is, assuming a 10% interest rate, actuarially equivalent to deposits of \$1,000 at $t=1$ and \$2,000 at $t=3$.*

The examples presented in this section give us insight into textbook problem writing. At one extreme, many textbooks will give an excess of plug-in problems. At the other extreme, modern textbooks may additionally give some exploratory or writing problems. The methods of this paper suggest a middle-of-the-road approach, providing problems according to the five specific **problem extension** methods [5] [6]. The methods of this section also shed light on problem-syllabus interaction: For example, the *iteration problem-extension* method, requiring the introduction of *annuity methods*, is assigned a separate syllabus unit in all standard textbooks [9].

6. COLLEGE ENGLISH

We present below, the **base text** for this section, a citation from a Biblical passage on theft. For background, we also provide Talmudic laws governing theft. We shall use this **base text** to suggest five writing and interpretation exercises that could be used in a college English class. Although we are “giving away the answer” prior to stating the questions, the format used will clarify how the five basic **problem-extension** methods can be applied in a textual domain.

Base Text (Biblical passage): *If in the tunnel, the thief was found, and he was hit and died, it is not considered murder* [1]

Talmudic Theft Law: The Talmud assumes the

following underlying reason to the law presented in the above **base text**: *The house-owner may kill the discovered thief because the thief is presumed armed and dangerous and ready to kill (therefore, the house owner has a pre-emptive right of self defense). However, when no clear presumption of self defense is present this right to kill the thief does not apply.*

The following laws may be inferred from the just-cited explanation of the Biblical law of the **base text**.

- 1) The cited Biblical passage discusses a house owner who found a thief tunneling into his house. Since the thief is presumed armed, the killing of the thief by the owner is not considered murder but rather an act of self-defense. (That is, the owner cannot be convicted of murder).
- 2) Similarly, there is no conviction of murder if people, other than the owner, find and kill the thief while he is tunneling in.
- 3) However, if the thief is the father of the house owner, then if the son, the house owner, kills his father while entering, the son can be convicted of murder (Because there is a presumption that the father would not kill his son. It is reasonable to assume that the father just wanted to misappropriate funds. Consequently there is no right of self-defense and if the son kills the father he may be convicted of murder).
- 4) Similarly, if the thief, upon being caught in the tunnel, fled, was caught by another person, fled and was caught by another person, then if someone subsequently kills the thief that person may be convicted of murder. Here, the fleeing shows that the thief is not prepared to kill if caught. Hence there is no justification of self-defense in killing him and someone who does kill him is considered a murderer.

We will use this example – the Biblical **base text** and the above mentioned laws - to illustrate the syllabus topic of the *passive vs. the active voice*. We will illustrate five problems or writing exercises using our five, basic, **problem-extension** methods. First, recall the following principle:

Passive vs. Active: A writer should typically use the active voice. However, if the writer's emphasis is on the *consequence* of the action vs. the *performer* of the action then it is preferable to use the passive.

Let us now apply this passive-active principle to the **base text** using the five, basic, **problem-extension** methods.

Plug in: The teacher gives the following sentence to the class: *If you find a thief tunneling into your house you may hit and kill him without having a murderer status.* The teacher assigns the following exercise: *Rewrite this sentence using the passive vs. the active voice.*

Solution: *If the thief was found tunneling into a house and was hit and died there is no murderer status.*

Reversal: The teacher gives the following two sentences to the class: **Passive version:** *If the thief was found tunneling into a house and was hit and*

killed there is no murderer status. **Active Version:** *If you find a thief tunneling into your house you may hit and kill him without having a murderer status.* The teacher asks the students: *Explain the difference in interpreting the passive vs. the active version.*

Solution: The passive emphasizes consequence vs. performer. It follows that if the base text uses the passive we must conclude that there is no murderer status whether the owner or someone else found the thief and whether the owner or someone else hit and killed him. These conclusions are justified by the use of the passive *was found, was hit* since the passive emphasizes consequence, what happened, vs. the performer, who did it. However, if the active voice had been used in the **base text** then we would infer that the exemption of murderer status would only apply if the owner found the thief and if it was the owner who killed the thief; it would then follow that if someone else had found the thief, or, if someone else had killed him there would be a murderer status.

Sequence / multi-step: The teacher gives the following sentence to the class and asks that it be rewritten to reflect causal connections: *If in the tunnel, the thief was found, and he was hit and killed, there is no murderer status.*

Solution: *Because the thief was found tunneling into the house there is no murderer status if he was subsequently hit and died.*

The words *because* and *subsequently* emphasize causality and sequence. The reason the thief can be killed is because he was found tunneling and therefore has a presumed status of defending himself when found. The connective words *because, subsequently* add more clarity to the sentence.

Comparison: The teacher presents the following text to the students: *Because the thief was found tunneling into the house there is no murderer status if he was subsequently hit and died.* The students are asked to compare the two cases of a father stealing from his son's house vs. a son stealing from his father's house.

Solution: The word *because* emphasizes sequence and causality. The sole reason for allowing killing a discovered thief is because of a presumption that he is prepared to kill someone who discovers him tunneling in. But it can reasonably be argued that a parent is not prepared to kill a child (the parent is only interested in money). It follows that a son who kills his father tunneling in would have a murderer status (and could be convicted of murder) while, by contrast, a father killing his son tunneling in would not have a murderer status (because there is no presumption that children will not kill their parents).

Iteration: The teacher would give the following assignment: Take the **base text** and create an **iterated** version.

Solution: *If the thief, upon being caught in the tunnel, fled, was caught by another person, fled and was*

caught by another person, then if someone subsequently kills the thief there is a murderer status. Here, the fleeing shows that the thief is not prepared to kill if caught; rather, the thief flees if caught. Hence there is no justification of self-defense in killing him and someone who does kill him has a murderer status.

The reader should carefully compare the five problems, or writing exercises, presented above. Although they all use the same **base text** and teach the same syllabus topic – *passive vs. active voice* - they differ in the level of skill, complexity and challenge to the student.

7. CONCLUSION

Although there are a wide variety of computer languages they nevertheless possess a remarkable commonality. At the beginning of the last century there was significant research on universal machines that could do any algorithm involving numbers and strings. A variety of schemes were proposed and a variety of theorems were proven showing that the various systems were equivalent. What emerges is that there is a core set of concepts needed in *any* computer. In fact, it was established that a computer could implement any algorithmic arithmetic or word processing computation provided the following were present in the underlying computer language:

1. **Variables** such as x, y, z , and **literals** such as $1, 2, 3$, "cat";
2. **Assignment statements**, e.g. the statement " $x:=1$ " assigns the value 1 to the variable x ;
3. **Sequential statements**: e.g. The sequence of statements, $x:=1, y:=x+2$, assigns a value 3 to y ;
4. **Loops**: That is, continual repetition of a procedure with termination occurring after a certain number of steps or upon presence of an event; and
5. **Operations and Operators**: This includes the four **arithmetic** operations ($+, -, \times, /$), the 3 **Boolean** operations (*and, or, not*) the 3 **relational** operators ($<, >, =$) and the basic **string** operations such as concatenation, substring etc.

All high level computer languages, *without exception*, have these five items present! We immediately recognize a 1-1 correspondence with the five basic **problem-extension** methods.

1. **Assignments**, such as $x:=1+2$, correspond to **plug-in** problems.
2. **Relational operators**, such as bigger and smaller, are the tools needed in **comparison** problems.
3. **Sequential** statements such as $x:=1, y:=x+2$ neatly correspond to **multi-step** problems.
4. **Loops** such as the problem of adding $1+2+3+4\dots$ until 100, neatly correspond to **iteration** problems.
5. The presence of **variables** vs. **literals** enables **reversal** and **solve** problems: For example, the **plug-in**, $x:=1+2$, can be **reversed** to the **solve** problem $3:=x+2$. Note the computer science subtlety: It is not just the place of the variable, x , that has changed; rather the x on the left side *functions* as a **memory** location (Bloom's **knowledge** level) while the x on the right side *functions* as an **unknown**, something to be **solved** for.

Recall that cybernetics is the study of information flow. Classical cybernetics applies to complex systems, such as computer systems or biological systems, where communication between system parts is a complex task. In this paper we have studied the *space of all problems and methods of a subject*. Cybernetics is then concerned with the information flow between the regions of this *space*. In this paper we have examined how certain broadly defined methods unify, in any discipline, the relationship between fixed syllabus topics and problems illustrating these syllabus topics. We have also just seen that these broadly defined **problem-extension** methods naturally arise from universal concepts in theoretical computer science. Consequently, the five **problem-extension** methods of this paper create a cybernetic model for syllabus-problem interaction which, as shown in previous sections, can be used to enrich textbook writing and improve syllabi.

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Using Generational Interests for Creative Computer Literacy Instruction

(Extended Abstract for face-to-face presentation)

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Teaching at public institutions, with an emphasis on accessibility, our introductory classes tend to be quite diverse. One of the attributes of this diversity is typically referred to as traditional versus non-traditional students.

Traditional students are typically those who enter college immediately after high school at the age of 17 or 18, and remain in college for four(+) years (ages 17-22).

Non-traditional students are typically lumped together as those who are “not traditional,” that is, any student who is not in the traditional age range and did not come to college immediately after high school. The National Center for Educational Statistics identifies nontraditional students using the presence of one or more of the following: delayed enrollment in post-secondary education, attended part time, financially independent, worked full time while enrolled, has dependents other than a spouse, was a single parent, or did not obtain a standard high school diploma. Based on the number of these characteristics, further characterization is minimal (one characteristic), moderate (2 or 3), or highly nontraditional (4 or more).

This two value categorization of the age demographic is used in a variety of institutional reporting contexts. However, from a pedagogical point of view, it is not sufficiently discriminatory when trying to understand the audience one is teaching. One needs to take into account both the perspective of the instructor and the distribution of students in a class.

This presentation reviews the characteristics of, values and expectations, across the generations, including:

- Traditional, born prior to 1946
- Baby Boomers, born 1946-1965
- Gen X, born 1965-1982
- Gen Y, born 1982-2001
- Gen Z, born 2001 – Present

There are a number of challenges facing instructors of computer literacy courses today:

- Students come to class thinking they know more than they do.
- Students and instructors from different generations (age ranges) do not have the same expectations, learning styles and values.
- Academic integrity issues

The presentation describes several assignments that have been developed by the authors to take into account some of the generational changes in demographics. The goal is to engage and motivate students by designing the assignments which include data and concepts that are flexible enough to satisfy the interests of a diverse age demographic in the classroom, while providing pedagogically meaningful activities. These assignments have been used both in traditional classroom settings and online learning.

Teaching Security Management with Case Studies: Experiences and Evaluation

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ABSTRACT

Teaching with case studies is an effective method that actively engages students. This paper describes two case studies we developed and our experiences teaching security management with these two case studies. The case studies were used to teach risk management and incident response planning. Each case study includes the learning objectives, one/more case scenarios and a series of case discussion questions. The student feedback on these case studies was very positive. Our future work will include refining the developed case studies, continuing to evaluate their effectiveness, developing more case studies, and exploring different ways of teaching case studies.

Keywords: security management, information security education, case study, risk management, incident response planning

1. INTRODUCTION

Security management is an important topic taught in an information security program. This paper introduces our experiences of teaching security management using case studies. Teaching with case studies helps students to learn actively and provides opportunities for them to develop their communication, teamwork, and problem solving skills. It also increases students' enjoyment in learning [1]. Case discussions can bring life to the classroom, arouse student interests, and apply their learning to the real world situations. Case study method is especially suitable for teaching security management concepts due to the richness of real life experiences in this area.

In this paper, two case studies for teaching security management are described. They are: (1) the hypothetical computer system risk management case study; (2) the incident response planning case study. These case studies were developed and taught in the "Foundations of Information Systems Security" course at Fort Hays State University. The case studies provide education on both the awareness level and the performance level on contingency planning/disaster recovery based on National Training Standard For Information Systems (NSTISSI No.4011)[2]. Each case study includes the learning objectives, one/more case scenarios and a series of case discussion questions.

We used Bloom's taxonomy to guide our design of the learning objectives and discussion questions of the case studies.

Bloom's taxonomy defines six levels of cognitive skills and capabilities. They are briefly described below [3].

Level 1: Knowledge. Recall data or information.

Level 2: Comprehension. Grasp the meaning of information materials.

Level 3: Application. Apply a concept in a new situation to solve problems.

Level 4: Analysis. Breakdown informational materials into components to understand the organizational structure.

Level 5: Synthesis. Create a new meaning or structure by applying prior knowledge and skills.

Level 6: Evaluation. Judge the value of informational materials.

It is important to set our teaching goals for students to demonstrate that they've learned skills and tasks from each cognitive category, but with an emphasis on the higher order cognitive tasks. Therefore the learning objectives and case discussion questions are designed such that they map to all the six cognitive levels of Bloom's taxonomy while stressing higher level skills.

In the following sections each of the case studies is described. The learning objectives, case description, student assignment, teaching methods, evaluation of the case study are discussed for each case study.

2. RISK MANAGEMENT CASE STUDY

Risk management is the process of identifying vulnerabilities in an organization's information systems and taking measures to ensure the confidentiality, integrity, and availability of the information system components. It includes two major steps: risk identification and risk control. In risk identification, the security profile of an organization and the risks it faces are examined and documented. In risk control, measures are taken to reduce the risk to an organization's information systems [4].

This case study illustrates the risk management process of a hypothetical government agency. The learning objectives of this case study are:

1. Identify the threats facing the assets of an organization.
2. Determine the probability of threats, and their potential impact.
3. Determine risk rating/scale.

4. Identify current control measures.
5. Identify vulnerabilities of computer systems.
6. Recommend risk mitigation strategies for controlling risks.
7. Choose risk mitigation methods.
8. Evaluate the management decision on risk mitigation strategies based on cost benefit analysis.

2.1 Case Description

The hypothetical computer system risk management case study is based on “Assessing and mitigating the risks to a hypothetical computer system” (AMRHCS) case from NIST Special Publication 800-12 [5]. In the AMRHCS case, the Hypothetical Government Agency (HGA) initiated a comprehensive risk analysis process to assess its security program. HGA’s assets and computer systems, threats to HGA’s assets, HGA’s current security measures, vulnerabilities found by the risk assessment team, the recommendation for mitigating the identified vulnerabilities, as well as the management’s final decisions are described in detail in the AMRHCS case.

2.2 Case Discussion Questions

There are five categories of threats to HGA’s assets: payroll fraud, payroll errors, interruption of operations, disclosure/brokerage of information, and network related threats. The case discussion questions are divided into five parts according to the five categories of threats. For each threat category, a series of questions are asked. For example, the questions in Table 1 correspond to payroll fraud threat. Discussion questions for other threat categories are similar to those in Table 1. Table 1 also shows the mapping of the questions to Bloom’s Taxonomy. The students were given reference [6] for answering the discussion questions.

3. INCIDENT RESPONSE CASE STUDY

Incident response planning involves identifying, classifying and responding to an incident. According to the NIST special publication 800-61[7], incident response life cycle includes four phases: (1) preparation and planning, (2) detection and analysis, (3) containment, eradication, recovery, and (4) post incident activity.

In the preparation and planning phase, an incident response team should be formed. The team is composed of members from various functional roles in the organization. In the detection and analysis phase, potential incident information is monitored and gathered. Incidents are identified and classified into different categories according to their severity. Containment phase includes activities to minimize and isolate the damage

incurred. After an incident is contained, eradication may be necessary to successfully eliminate the components of the incident. The recovery phase restores the operation of the compromised systems to normal business mode. Post incident activity usually includes a lessons-learned meeting in which the incident is reviewed, and the weakness of the incident response plan is identified. The incident response plan is then updated and the incident is documented in detail.

NIST special publication 800-61[7] categorizes four different types of incidents: denial of service, malicious code, unauthorized access and inappropriate usage. For each of the categories, NIST provides guidelines for how to prepare for, prevent, detect and analyze, contain, eradicate, and recover from the incidents.

The case study we designed for teaching incident response planning has the following learning objectives:

1. Identify an incident.
2. Classify an incident according to its severity.
3. Identify the roles and responsibilities in an incident response team.
4. Identify the steps an organization should take to contain and recover from an incident.
5. Recommend measures to prevent similar incidents from occurring in the future.
6. Recommend actions to improve the detection of similar events.

3.1 Case Description

This case study includes a realistic incident response plan “XYZ University Computer Security Incident Response Plan” and two real-life scenarios. For each scenario a series of questions were designed that correspond to the learning objectives of this case study. The students were to use NIST special publication 800-61[7] and book [1] as references.

The XYZ University Computer Security Incident Response Plan defines the roles and responsibilities for the Chief Information Officer, Computer Incident Response Team, Information Security Officer and the supporting groups. It classifies incidents into four severity levels, namely, low, medium, high, and critical levels. For each severity level of incidents, CIRP describes the roles involved and their responsibilities for handling the incident. The CIRP also describes the post incident activity and provides an incident review report template.

The two scenarios given to the students are based on NIST Special publication 800-61 [7] Appendix B “Incident Handling Scenarios”. These two scenarios illustrate malicious code attack and inappropriate usage attack.

Table 1. Discussion questions on payroll fraud threat

Risk Management Case Discussion Questions	Cognitive Levels
1. What are the different types of payroll fraud threats?	Level 2 - Comprehension
2. What is the probability of payroll fraud threats (in terms of high, medium, low)? What is the potential impact of payroll fraud threats (in terms of high, medium, low)? Explain. Refer to [6].	Level 4 – Analysis
3. According to the Risk-Level Matrix in [6], determine the risk scale of payroll fraud threats.	Level 3 – Application
4. What are the control measures currently in use to protect against payroll fraud?	Level 2 – Comprehension
5. What are the vulnerabilities related to payroll fraud found by the risk assessment team?	Level 2 – Comprehension
6. What’s the recommendation by the risk assessment team?	Level 2 – Comprehension
7. What are the final decisions made by HGA management? Justify their decisions based on cost benefit analysis.	Level 4 – Analysis Level 6 - Evaluation

Scenario 1:

On Thursday morning, John, an XYZ university employee, noticed a warning message on his computer saying that the system has been attacked by a worm Win32.VB. Even though the antivirus software was present in the system, the software failed to detect the new worm because it was not updated to the latest version. When John tried to open his e-mail, he experienced a slow internet connection. He noticed there were some unusual file names in the disk. John immediately informed his friend Bob, who was also an XYZ employee, of the problem. Bob checked his computer in his office and experienced the same problem as John. John and Bob checked several computers in the laboratories, and found that Win32.VB worm had infected many other computers in the laboratory. They contacted the system administrator of the XYZ University. The system administrator checked the computers in the laboratory and reported the incident to the incident response team. The system administrator also checked the computers in other laboratories. As a result of the worm attack the activities in the XYZ University laboratory were suspended for a day, which caused a great inconvenience.

Scenario 2:

On a Monday morning, the XYZ University’s legal department received a phone call from the Federal Bureau of Investigation (FBI) regarding some suspicious activity originating from the XYZ University’s network. Later that day, an FBI agent met with the members of management and the legal department to discuss the activity. The FBI has been investigating activity involving online purchases made with several stolen credit card numbers. More than 30 of the transactions during the past week had been traced to one of the XYZ University’s IP addresses. The FBI agent asked for the organization’s assistance, and in turn, the managers asked for the incident response team’s assistance in acquiring evidences. It is vitally important that this matter be kept confidential.

3.2 Case Discussion Questions

The case discussion questions for the incident response planning case study and their mapping to Bloom’s taxonomy are listed in Table 2.

4. EVALUATION

The two case studies were used in the “Foundations of Information Systems Security” course at Fort Hays State University in the Fall 2009 semester. Thirty one students were

enrolled in the course. The following two sections describe our experiences teaching these two case studies and the evaluations of these two case studies respectively.

4.1 Evaluation of Risk Management Case Study

After introducing to the students the basic concepts of risk management in the lecture, the students were given the risk management case study as a group project. Each group includes three students. The students were given the article “Assessing and mitigating the risks to a hypothetical computer system” [5] and NIST special publication 800-30 [6] as references for the project. Since the discussion questions of this case study is divided into five parts according to the five different types of threats, each group will answer one part of the discussion questions, and the whole class will cover all the five parts. The students are to submit a written answer to the discussion questions, and give a class presentation. The students were given two weeks to finish the project.

Before they started with the project, the students were asked to fill out a pre-survey. The pre-survey asks the students to rate their level of knowledge or skills on the eight learning objectives of this case study (see Section 2). The following scale is used to rate their level of knowledge: 1 (very low), 2 (medium low), 3 (medium), 4 (medium high), and 5 (high).

After the students completed the project, the students were asked to complete a post-survey. The post-survey has three parts. The first part asks the students to rate their level of knowledge or skills on the same learning objectives of this case study. The second part gives a series of statements, and asks the students to choose how much they agree with the statement by selecting (a) Strongly agree, (b) Agree, (c) Neither agree or disagree, (d) Disagree, and (e) Strongly disagree. The statements included in the post-survey are listed in Table 3. The third part asks the students to answer what they liked best about the project, what they liked least about the project, and what could be improved in the project.

Paired t-test was run on the students’ ranking of their knowledge and skills on the learning objectives on the pre-survey and post-survey. The t-test results (see Table 4) show that the post-survey results are significantly higher than the pre-survey results. This shows that the students believed that they improved their knowledge/skill after the project on all the eight learning objectives.

Figure 1 shows the results of how much the students agree with statements (a) to (f) shown in Table 3. On average 85% of the students agree or strongly agree with the statements.

.Table 2. Discussion questions for incident response case study

Incident Response Case Discussion Questions	Cognitive Levels
1. Would the organization consider this activity as an incident? Justify your answer	Level 3 - Application
2. What’s the severity level of the above mentioned incident?	Level 3 - Application
3. Who or what groups will be involved in the situation?	Level 3 - Application
4. Suggest measures to contain and recover from the incident.	Level 5 – Synthesis
5. Suggest measures to prevent similar incidents from occurring in the future.	Level 5 - Synthesis
6. Suggest actions to improve the detection of similar events	Level 5 - Synthesis

Table 3 The statements on post-survey

(a) This project is practical and will help you to apply what you learned to a job you may have in the future.
(b) You enjoyed working on the project.
(c) This project increased your understanding of risk management.
(d) This project stimulated your interest in learning risk management and information security.
(e) This project combined classroom and real-life experiences.
(f) This project helped with your motivation in learning risk management and information security.

Table 4. T-test results of students’ ranking of their knowledge/skills on risk management

	Obj. 1	Obj. 2	Obj. 3	Obj. 4	Obj. 5	Obj. 6	Obj. 7	Obj. 8
pre-survey mean	3	2.73	2.36	2.73	3.05	2.68	2.36	2.45
pre-survey variance	0.57	0.68	0.81	1.16	1.38	1.08	0.72	0.93
Post-survey mean	3.64	3.45	3.45	3.41	3.59	3.41	3.27	3.36
post-survey variance	0.43	0.64	0.83	0.73	1.11	0.63	0.68	1.10
degree of freedom	21	21	21	21	21	21	21	21
observations	22	22	22	22	22	22	22	22
two-tail <i>p</i> -value	0.0005	8.43E-05	0.0002	0.0042	0.0023	0.0046	0.0006	0.0030

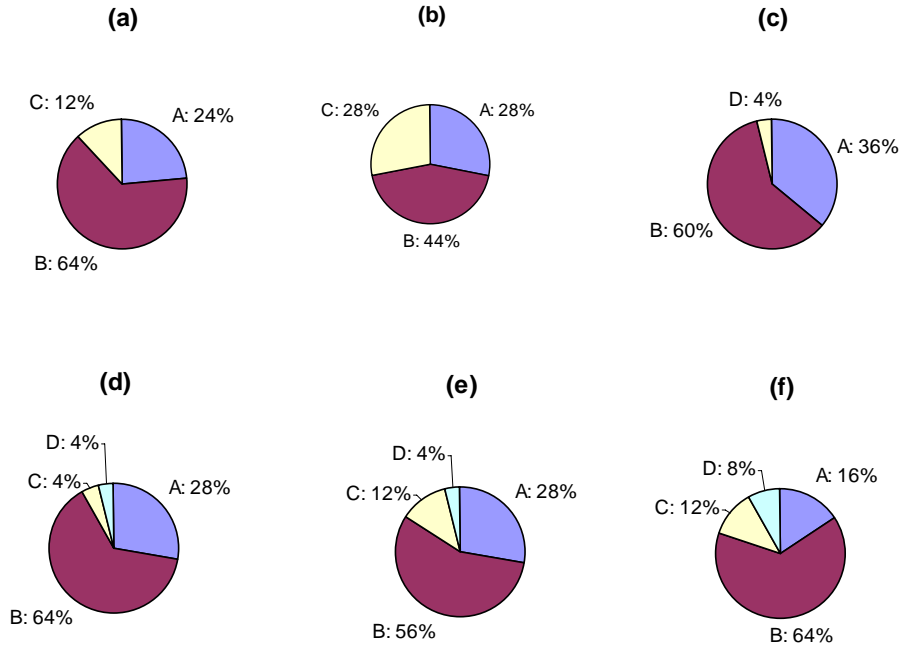


Figure 1. The results of how much the students agree with statements (a) to (f)

The students' comments on what they liked about the project include:

- The case study was a very realistic scenario that any information security professional may encounter
- The project gave a chance to apply classroom lessons to a potential real life situation.
- This project goes through the whole process of risk management rather than just some aspects and parts,. The project helped students to see the bigger picture rather than just the pieces.
- This project allows the students to work in groups and includes group presentations.
- The project illustrated that there are several other aspects of a 'process' (such as payroll), other than just putting the data into the computer and extracting it in the future.
- This project helps students to learn the importance of information security.
- This project helps students to learn much knowledge about information security.
- The discussion questions are critical for students in the future as professionals.
- The reading reference is very helpful for completing this project.
- Many of the considerations appeared to come from a real-life basis, although it was about a fictitious company. ... It demonstrates how a solution about

one particular department's problem could be applied at a later time to other departments to holistically improve layers of security across a company. It also demonstrates the overlapping issues. For example, very similar adverse results can be experienced by a company due to either fraud or a data entry error and both adverse results carry a similar amount of risk and priority to fix.

Some suggestions on improving this case study include:

- Update the case with a risk assessment that would reflect more current trends.
- Provide clarification on whether the presentation should convey what we learned from doing the project or if it should be based on our findings specific to HGA.
- Allow the students to choose which part of the discussion questions they should work on.
- Introduce to the students how to conduct case study before they take the project.
- Add more references to encourage the students to look for information other than in the case study and may be introduce ideas from CISSP to the case study.
- Make it a real life situation with a local company and make it more touch and feel for on-campus students.
- Organize an in-class discussion of this project. This provides an opportunity for inter-team

communications since each team just took one part of the project.

- Make the questions more specific.
- Have two teams working on two different areas of the Common Body of Knowledge (CBK) together.
- Provide a specific rubric for how the students will be graded.
- Include video clips in the references.
- Use anonymous survey.

Overall student feedback on the risk management case study is very positive.

4.2 Evaluation of Incident Response Case Study

After introducing to the students the basic concepts of incident response planning in the lecture, the students were given the incident response planning case study as an individual project. The students were given “XYZ University Computer Security Incident Response Plan” and the two scenarios. For each scenario, the students were asked to answer the discussion questions listed in section 3 and then give a presentation based on the discussion

questions. The students were given two weeks to finish the project.

The students were asked to fill out a pre-survey before the project and a post-survey after the project. The pre-survey asks the students to rate their level of knowledge or skills on the six learning objectives of this case study (see Section 3) using the same scale as in the risk management case study. The post-survey includes the students’ rating of their level of knowledge or skills on the same learning objectives of the incident response case study, students’ level of agreement with the statements similar to those listed in Table 3, and what they liked best and least about the project, and what could be improved in the project.

Paired t-tests were run on the students’ ranking of their knowledge and skills on the learning objectives on the pre-survey and post-survey. The t-test results (see Table 5) show that post-survey results are significantly higher than pre-survey results. The students believed that they improved their knowledge/skill after the project on all the six learning objectives of the case study.

Figure 2 shows the results of how much the students agree with statements (a) to (f) shown in Table 3. On average 78% of the students agree or strongly agree with the statements.

Table 5. T-test results of students’ ranking of their knowledge/skills on incident response planning

	Obj. 1	Obj. 2	Obj. 3	Obj. 4	Obj. 5	Obj. 6
pre-survey mean	2.94	2.69	2.56	2.69	2.63	2.63
pre-survey variance	0.73	0.76	1.46	1.03	0.92	1.45
post-survey mean	3.94	3.81	3.94	3.88	4.06	3.81
post-survey variance	0.46	0.30	0.60	0.52	1.00	0.96
degree of freedom	15	15	15	15	15	15
observations	16	16	16	16	16	16
two-tail <i>p</i> -value	0.0004	0.0003	7.84E-05	0.0002	2.59E-05	0.0004

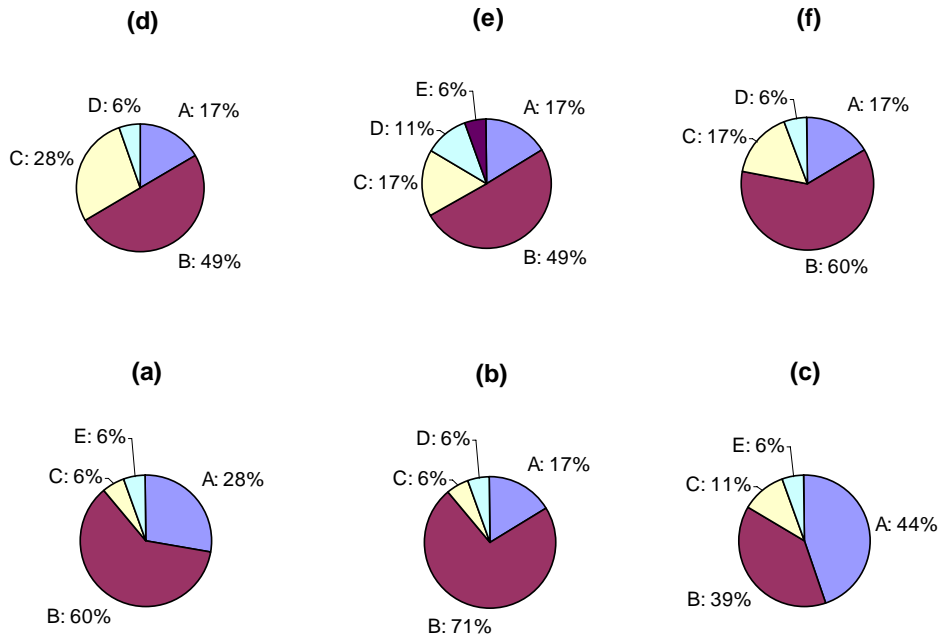


Figure 2. The results of how much the students agree with statements (a) to (f)

The students’ comments on what they liked about the project include:

- This project increased students’ understanding of incident response planning.

- It teaches many prevention measures for similar incidents.
- Students worked with some interesting scenarios and detailed information was provided to complete the case study.
- It is the real-world application of incident response concepts. It uses examples from real life to teach information from books.
- Students learn how to face problems, and how to make an incident response plan.
- This project is very important and is beneficial for work in the future.
- This case provides a new channel to understand Information Technology.
- NIST document was provided for students to refer to, which is real material that is used in the field.
- There was room given to students so that students could try to come up with what they would do about the situations rather than giving a response from something that was already determined. The students were challenged to get creative, do research.

Some suggestions on improving this case study include:

- Provide more details for each scenario
- Allow the students to work in a group

Overall student feedback on the incident response planning case study was very positive. Though some students would like the case scenarios to be more specific, others appreciate that it had room for students to get creative and do research. It is important to be balanced and provide appropriate amount of details when designing a case study.

5. CONCLUSION

This paper describes our experiences teaching security management using the approach of case studies. Two case studies were developed for teaching risk management and incident response planning. They were taught in the “Foundations of Information Systems Security” course in the Fall 2009 semester. Each case study includes the learning objectives, the case scenarios with supporting documents, and the case discussion questions. The case discussion questions were mapped to all the levels of Bloom’s taxonomy.

Each case study was evaluated by a pre-survey and post-survey on the students’ ranking of their knowledge and skills on the learning objectives. The t-test results show that the students believed that they improved their knowledge/skill after the

project on all the learning objectives of the case studies. Most students agree that the case studies helped them to relate classroom learning to real-life experiences, and increased their interest and motivation in learning information security. Some students suggested adding more details to the case descriptions, or making the discussion questions more specific. Overall, the student feedback is very positive.

In the future, we plan to improve these case studies according to student feedback and continue assessing their effectiveness in teaching. We will explore various approaches of teaching case studies and develop more case studies in the area of security management as well as in other areas of information assurance.

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Outcomes of an International Multi-Site Undergraduate Summer STEM Research Program

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ABSTRACT

Undergraduate research is becoming the norm for undergraduate STEM majors, with summer undergraduate research programs being one such way students receive this experience. These summer programs are known to have many positive outcomes for students, such as bolstered confidence, retention in STEM majors with continuation into science graduate programs and careers, and socialization into the science research culture. The majority of research on this subject, however, is drawn from programs that are small/one-site, large/multi-site from the same national funding source but with each site running independently, or is survey research drawn from individuals across many different programs. The present research provides a unique contribution to the literature regarding the outcomes of the Amgen Scholars Program multi-site, unified, international undergraduate summer research program. In addition the article also examines and provides recommendations for future research directions for such programs.

Keywords: STEM Undergraduate Research, Outcomes of Summer Undergraduate Research Programs

INTRODUCTION

Undergraduate research experiences are an increasingly normal occurrence of undergraduate students with science, technology, engineering and mathematics (STEM) majors. Summer undergraduate research programs are one such way for students to

acquire a hands-on research experience. The benefits procured by participants in summer undergraduate research programs are well-documented and include increased knowledge and understanding of science and research work, bolstered self esteem and confidence to do research and improvement in overall academic livelihood [3 – 6; 9 – 11]. The Council on Undergraduate Research, an organization that promotes and supports undergraduate student-faculty collaborative research, explicitly states on their website that undergraduate research experiences “enhance student learning through mentoring relationships with faculty, increase retention, increase enrollment in graduate education and provide effective career preparation, develop critical thinking, creativity, problem solving and intellectual independence, develop an understanding of research methodology, and promote an innovation-oriented culture” [2].

While the advantages of undergraduate research experiences and programs are well known, most of the research about the STEM summer undergraduate research programs comes from individual programs that are small in scale (e.g. Kardash, [5]), large programs that are from the same funding source yet are run differently at each institution involved (e.g. Butler et al., [1]), or include participants from many different summer research programs who are all invited to take the same evaluative assessment (e.g. Lopatto, [7,8]).

The Amgen Scholars Program is in a unique position to contribute to research on summer undergraduate research programs for several reasons.

First, this program is held at thirteen sites: ten at prestigious universities around the US (e.g. MIT, Berkley, Stanford) and three at European universities (e.g. Cambridge). The requirements for consideration for admittance into the Amgen Scholars Program are explicitly stated for both the US Program and the European Program. and are consistent within each Program. All thirteen Amgen programs have the same two common objectives those being to increase learning and networking opportunities for undergraduate students committed to pursuing science or engineering careers; and to spark the interest and broaden the perspective of undergraduate students considering scientific careers. In addition to the full-time lab opportunity, each year all current Scholars from the US sites attend the same US three-day symposium, as do current Scholars from Europe attend a three-day symposium together in Europe. To maintain consistency across locations, program directors from each of the sites remain in contact throughout the year. As part of the requirements of participating in this summer research program, all Amgen Scholars take a pre and post survey at the same point in their program.

As such, the purpose of this article is to contribute to the literature regarding a multi-site, international summer research programs by providing an explanation of the outcomes of participants in such a program. This article also articulates several directions for future research on international undergraduate summer research experiences, such as the Amgen Scholars Program.

RESEARCH METHODS

The Amgen Scholars Program, an undergraduate summer research program, was established at ten prominent research universities across the United States in 2007 and then expanded to three European universities in 2009. Students are welcomed into a community of researchers for eight to ten weeks during the summer with the purpose of exposing participants to a full-time research experience with additional programming and seminars in an effort to assist students to make educated decisions about science graduate education and science careers. Students take intellectual ownership of a project as they explore the secrets of nature, learn to ask questions, persist in the tedious

and often repetitious details of experiments and experience the joy of discovery.

Each year participants of the Amgen Scholars Program are informed by their project directors that they are required to complete both a pre-program survey as well as a post-program survey. Each Scholar receives an email with instructions to take a web-based survey within the first week that the program commences. The pre-survey includes questions regarding participants' majors, graduate degree objectives, and current level of knowledge/experiences with various research skills (i.e. laboratory skills, scientific writing, etc.). Students also complete additional comparable surveys at the end of the program. Data is available for students who participated in all three years of the US program (from 2007 through 2009) and is available for students who participated in the first year of the European program (2009).

Demographic Characteristics

For the US programs, any U.S. citizen is welcome to apply to any of the participating US programs as long as they are a current undergraduate student who has at least completed their sophomore year with a GPA of 3.2. Each site selects between 15 and 30 students each summer, with a goal of 25. A student may only participate for one summer. In 2009, the majority of the 270 participants were female (59%; 158) with the remaining 41% being male (112). The most common majors reported that year were Biology (42%) and Biochemistry (15%). The majority of participants' ethnicity is Caucasian (40%), Asian (21%) or African American (14%). The average GPA reported by participants was 3.73 on a 4.0 scale.

For Amgen Europe, students must currently be enrolled in a college or university from a European country participating in the Bologna Process and not yet have completed their first degree/bachelor's prior to their participation. Program applicants must also have a strong record of academic performance and an interest in pursuing a Ph.D. In the seminal 2009 year, like the US, the majority of the 52 participants (66%; 34) are female with 34% (18) being male. Twenty-three home countries were represented, with most participants being of British nationality (25%). Biology (34%) and Natural Science (20%) were the most represented

undergraduate majors. Grade systems in Europe differ by country and thus GPA information was not reported in the survey.

Table 1. Mean Pre- and Post- Amgen Participant Survey Responses

Item	US					Europe				
	Beginning of program (pre)		End of program (post)		t(231) ^b	Beginning of program (pre)		End of program (post)		t(57) ^b
	M	SD	M	SD		M	SD	M	SD	
Applying scientific theories	-- ^a	--	--	--	--	2.31	.777	2.55	.680	2.13*
Laboratory research	3.13	.721	3.34	.660	8.68**	2.69	.706	2.69	.654	.00
Research presentation	2.52	.863	3.07	.679		2.31	.771	3.08	.702	5.98**
Scientific writing	--	--	--	--	--	2.08	.952	3.14	.681	6.75**
Publication	--	--	--	--	--	2.41	.918	2.60	.793	1.53
Data analysis	2.84	.755	3.15	.621	5.83**	1.52	.755	1.91	.756	3.52**
Biotechnology	2.22	.814	2.93	.764	11.19**	2.73	.715	2.75	.756	.14
Drug discovery and development process	1.83	.812	2.88	.772	15.23**	2.26	.807	2.12	.818	1.13
Graduate school options	2.59	.826	3.13	.722	3.334**	1.88	.867	2.05	.953	1.30
Funding opportunities graduate education	2.14	.829	2.62	.857	7.16**	2.57	.861	3.10	.852	4.24**
Science-based career options	2.77	.830	3.32	.707	8.79**	2.08	.702	2.66	1.060	3.76**
Poster presentation	2.50	1.02	3.13	.806	8.64**	--	--	--	--	--

Note. Each item is in response to the inquiry to “indicate your current level of knowledge/experience in the following areas.” Items were rated on a 4-point scale from 1(*None*) to 4 (*A lot*). *p < .01, two-tailed **p < .001, two-tailed

^a Not all items on Europe survey appeared on US survey

^b Degrees of freedom for each item varied slightly due to participants who did not answer particular questions

Data Analysis

Overview

Preliminary analyses examined whether any differences in the participants’ responses of survey items could be attributed to differences in the US program when compared to the European program. Pre-test mean scores from European participants are consistently lower than those from their US counterparts. A t-test between Europe and US participants’ responses on the pre- and post- test indicated that there was a significant difference between these two populations and thus the remaining analyses were run with these two populations separately.

RESULTS AND DISCUSSION

Impact of US Program

US participants reported a significant increase in proficiency, experience or knowledge on

all questions pertaining to the following areas: Biotechnology, data analysis, drug discovery and development process, funding opportunities for graduate education, graduate school options, laboratory skills, laboratory skills, poster presentation skills, science-based career options, and scientific writing/publication skills.

Impact of European Program

European students reported a significantly increased proficiency level in applying scientific theories, research presentation, poster presentation skills, scientific writing, data analysis, funding opportunities for graduate education, and science-based career options.

Across programs

The major distance uncovered in this analysis was that while participants of the US programs reported statistically significant increase in

proficiency, knowledge, and experience for all questions, participants in the Amgen Europe program experienced significant increases in only seven out of twelve areas examined. One explanation for these differences is merely a statistical relic as the US had over four times as many participants. Another possible explanation for the differences between Europe and the US participant outcomes is that the European Program is in its first year and relatively new at each of the three universities whereas the US Program is in its third year and is located at universities where summer research is more common. It is also possible that there is something significantly different between the European participants and the US participants. European participants consistently rate the pre-survey and post-survey items regarding knowledge and experience lower than do the US participants. However this difference may not be the result of a lack of knowledge, but simply be a cultural difference between the two programs where there is less inflation in grades and ratings in Europe.

FUTURE RESEARCH

The current research demonstrates the impact a summer research program has on the knowledge and experiences of undergraduate science students across the US and Europe. The important next steps with the research will allow for a more in-depth look at a number of factors. Based on these results it is first essential to determine if the European and US students are in fact different or if their method in responding to surveys and providing data is to supply more conservative responses rather than inflated ratings. Secondly research should examine the factors that contribute to success in a summer research program and determine if these are similar for the US and Europe. Finally, it will be important to research the long-term impact the Amgen Scholars Program has on participants' knowledge, future education, and careers. The Amgen Scholars Program is in a unique situation as it provides a similar treatment across thirteen universities to a like group of students across the US and then Europe. This in turn allows for common data instruments and longitudinal data collection across two continents, which will ultimately allow for additional research and increased knowledge of

summer science research programs and their impact on students in an international realm.

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Extended Abstract (Research-in-progress)
Information Technology (IT) Professionals' Critical Skills Set, Its
Outcome, and Implications on IT Education

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ABSTRACT

This paper is an extended abstract of the research-in-progress. Drawn from previous IS literature, this study aims to explore the most widely required knowledge and skills set for current IT professionals. In addition, the study aims to link possible end-state that IT professionals will reach when properly equipped with skills set required on their works in the form of IT professionals' quality of work life (QWL). By identifying skills set required for today's IT professionals, the study is expected to help current IT professionals better prepared for their future careers (which will increase the performance of the IT unit as a whole for an organization), help organizations to retain quality IT workforce (whose need-satisfactions, QWL, heightened) for a long haul, and contribute to IT curriculum at higher education.

Keywords: IT Professionals, IT Knowledge, IT Skills, QWL, IT Education

1. INTRODUCTION

There has been a growing importance of information systems (IS) in business organizations. Moreover, organizations are facing increasing challenges in managing global operations as they become more interlinked through technology and networks. Accordingly, IS activities have become more pervasive. These activities range from developing, managing and maintaining an organization's information technology (IT) resources and applications to contributing to other business functions to meet their strategic goals [1]. Thus, the IT unit is expected to play an important role in achieving organization's strategic goals and objectives: the IT unit should ensure an organization's all IS resources properly aligned with its overall business strategy and core competencies (e.g., supporting an organization's business operations and processes, incorporating an organization's business priorities and IT needs, etc).

In so doing, ensuring a good relationship between organizational users (users) and IT unit has been recognized as one of the IT unit's critical success factors. It has become one of the main responsibilities of IT professionals on how to utilize their technical and business competencies to create and maintain this relationship in ways to support users to achieve their goals more effectively. This organizational expectation towards the IT unit has certainly changed IT professionals' job definitions and related roles [2], which in turn leads to the changes in critical knowledge and skills set required. However, as baby-boomers retire and a lack of interest in IT careers, it is still very challenging to find qualified IT professionals with the 'right' skills set to meet organizations' such IT needs [3]. In fact, many IT leaders including Chief Information Officers (CIO) indicate that there is still a lack of well-rounded IT professionals with array of business knowledge, who speak both business and IT languages and can make a good sense of IT in the business context [3]. Previous IS literature has portrayed this emergent trend of IT professionals' multidimensional knowledge and skills requirement encompassing technology, business and management and interpersonal relationship [e.g., 4,5,6,7,8,9]. Overall, IT professionals are needed to have their core competencies in operations and IT management, supported by a well-rounded business foundation.

The purpose of this study is to shed light on the changing skills set demand for IT professionals and accentuate its importance and implications on attracting and retaining capable IT

professionals. It is also to develop a systematic framework of how critical skills set required on today's IT professionals affect needs satisfaction, quality-of-work-life (QWL). There are two implications: one on IT curriculum and one on skill sets needed for incoming IT workforce and incumbent IT professionals with ambition to develop their careers. So that IT professionals get their careers in IT field not just for the sake of getting a job and/or having something to do after their higher-education, but for seeking careers that fit with their skills set, provide meaningful and valuable outcomes, and eventually flourish their careers for the better future.

2. IS PERSONNEL'S CRITICAL KNOWLEDGE AND SKILLS

The IT unit typically executes activities that develop, operate, and manage IT, provides functional needs, and contributes to clients meeting their strategic goals (e.g., IT development and management) [1]. To be successful, IT professionals should have accurate specification of clients' IT needs and business priorities. In other words, IT professionals should be multi-faceted and multi-talented possessing skills in diverse areas in addition to technical skills such as communication (verbal and written), teamwork (works well with others), interpersonal (relates well to others), problem-solving (with reasoning and analytical critical thinking), creativity, selling, leadership/management (especially in project management) to name the few. This is in line with what is required for the next generation of IT professionals: to possess skills set including technical knowhow and softer, non-tech skills to get the job done [3]. These skills set generally includes the following [3,10]:

1. Problem-solving: IT is to reconcile business problems,
2. Communication (both oral and written): since, regardless of technical skills, IT professionals must be able to effectively present how IT can contribute and enhance different/idiosyncratic business operation/process,
3. Collaboration (including team and/or project management): IT professionals must be able to work with business partners, other IT professionals, and vendors,
4. Business analysis: IT professionals must understand their business and industry to successfully leverage technology to help their clients to compete,
5. Functional area/domain knowledge: in addition to technical skills, IT professionals must possess specialized skills in various business operations to effectively contribute to their organizations.

Drawn on the previous research, since these activities include gaining and structuring factual and heuristic knowledge by directly interacting with users and domain experts, they can be illustrated in the forms of knowledge acquisition (KA) and requirement acquisition (RA) because they [11]. RA and KA activities are considered as almost identical that entails acquiring, refining, and structuring declarative and procedural knowledge by communicating and interacting with users and domain experts [12]. Thus, these activities are described as KA in general in this study. Overall, aforementioned skills set can be sorted in five major categories (communication/problem solving, personal traits, control, organization, and negotiation) and require IT professionals to possess 26 essential behavioral skills and traits [12]:

1. Communication/problem solving: interviewing, listening, sensitivity, open-mindedness, probing, conceptualizing, rational thinker, and hindsight,
2. Personal traits: empathy, sense of humor, tolerance, and amiableness
3. Control: assertiveness, salesmanship, politics, and organizational knowledge,
4. Organization: leadership, speaking, writing, management, and domain knowledge,
5. Negotiation: diplomacy, patience, and cooperation.

Essentially, IT professionals need to develop these (behavioral) skills set and attributes. IT professionals should be capable of cooperating and collaborating with their clients in ways to properly incorporate their business priorities and IT needs.

3. QUALITY OF WORK-LIFE (QWL)

QWL is defined as employee satisfaction with a variety of needs through resources, activities, and outcomes stemming from participation in the workplace [13]. It is theorized to be the discrepancy between outcome and standard and the weight of each outcome [14]. Outcomes of work life such as economic rewards, promotion opportunities, challenges, and co-worker relations are the material and psychological results of evaluations of the products of organizational work. Standards encompass many different possible bases for the appraisal of work outcomes, such as expectations, values, motives, wants, and social comparisons. The differences between outcomes and standards are weighed differently by the personal value of each outcome. When desired work outcomes such as performance and satisfaction are achieved, individuals are likely to experience three psychological states of experienced meaningfulness, experienced responsibility, knowledge of results [15]. These psychological states resulting from the fulfillment of needs are regarded as QWL in this study.

Studies have shown that excessive workloads, forced overtime, and ambiguous or conflicting role demands cause emotional distress among employees and lower QWL [16]. Studies also have shown that QWL is enhanced by such factors as substantive autonomy, clear role descriptions, team work, involvement in the solutions of work problems, and learning opportunities [17]. QWL is found to be positively related to various organizational affective variables such as job satisfaction [18] and organizational commitment [19].

4. BEHAVIORAL SKILLS/TRAITS OF IT PERSONNEL AND QWL

IT professionals' skills are expected to be positively related to their evaluation of needs satisfaction at work. As their competencies are developed or improved in line with what is expected and/or required, IT professionals' self-efficacy and self-regulation of motivation to work will be increased (According to Bandura's self-efficacy [20] and social cognitive theory [21]. This will lead IT professionals to feel more confident, be more active, and seek innovative, persuasive ways to work with others. Accordingly, the enhanced skills and confidence facilitate the achievement of desired outcomes in terms of need satisfaction such as IT professionals' social, esteem and actualization needs (e.g., IS personnel feel good about themselves by getting recognition for their work and enhancing their professional skills, competencies, and potential)[16].

5. CONCLUDING REMARKS

This research-in-progress study is in the process of collecting data via web-based survey using questionnaire consisting of items taken from previous studies. All items being used are valid with proper levels of psychometric properties as well as successful track records. For data analysis, partial least square (PLS) method will be employed, mainly because this study assumes a linear combination among latent variables including a dependent variable 'IT personnel's QWL'.

This study aims to shed lights on changing skills set required on IT professionals and its impact on IT professionals' QWL as more business organizations realize the importance of the IT unit and professional to fully leverage IT investments. As illustrated, today's business environments demand more encompassing set of knowledge and skills. IT professionals' competencies in technology, business, and interpersonal relationship are becoming a must to execute their in- and out-ward IT activities.

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ITEAMS: an Out-Of-School Time Program to Promote Gain in Fundamental Science Content and Enhance Interest in STEM Careers for Middle School Students

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The number of American students showing interest in pursuing a career in STEM (Science, Technology, Engineering and/or Math) is low, in comparison with the number of students attending two and four year colleges. In addition to the challenge of producing a sufficiently large qualified work force for a world that is daily becoming more dependent on technology, the problem of inspiring all students--particularly students of underrepresented communities as well as female students--to pursue and persist in STEM remains unsolved. The probability that a student will persist in STEM is greatest if they choose a STEM career and/or show significant interest in STEM by the eighth grade. ITEAMS (Innovative Technology Enabled Astronomy for Middle Schools) is an out-of-school-time (OST) program that captures middle school students' interest in STEM content and in STEM careers by involving students in technology-based astronomy research. ITEAMS targets students in underserved communities, who are, according to the literature and current research, less likely to enter into STEM careers. The participating students use online robotic telescopes, called MicroObservatory, to conduct original research. They also work with other applications, such as image processing and production of original wiki sites. Additionally, they communicate their findings to other students and teachers. This project has produced significant interest among students, not only in STEM careers, but also in fundamental science content knowledge, both of which are essential to pursuing a career in STEM. More, upon the completion of the pilot study, this project will be made available via the internet to any interested class, and thereby extend the possibilities of increasing interest in STEM within underserved communities.

Recent reports paint a stark picture for America's STEM education and resulting workforce, providing ample evidence that there is not only a decreasing number of students majoring in STEM during their university careers, but a vast under-enrollment and under-representation of women and minority students (NSF 2006). Further, previous studies have shown that persistence in STEM is twice as likely for students who express an interest in STEM during middle school (Tai, et al, 2006). The overall statistics for underrepresented groups are grim: of all STEM doctorates earned in 2008, 75% were earned by White students and, of all STEM

doctorates, women only earned 36% (Survey of Earned Doctorates 2009). America's STEM workforce, though dependent on a technologically advanced workforce geared toward accelerating research and techniques for future technologies, is waning in both quality and quantity. Ample evidence has shown that, without dramatic increases in the quality and quantity of this workforce, the damage to the country's economy will be deep and long lasting (NCEE 2007). The question of how to interest students at younger ages and maintain their interest throughout school and into their careers is a long-standing problem and the exigency of finding a solution has become even more apparent in recent years. Many different kinds of reform curricula and programs have been proposed to ameliorate this crisis, but definitive answers have not yet emerged.

ITEAMS (Innovative Technology-Enabled Astronomy for Middle Schools) seeks to interest students in STEM during their middle school years. It also measures the efficacy of the program in relation to both content knowledge and career intention. ITEAMS, funded on 1 October 2008 by the National Science Foundation, is a three-year project created and managed by science educators from the Science Education Department (SED) at the Harvard-Smithsonian Center for Astrophysics (CfA). The project targets underserved and minority students in grades 5-8 who are enrolled in out-of-school-time (OST) enrichment programs. There are five eastern Massachusetts schools involved, one each in Lynn and Fall River, and three in Cambridge. The goal is to provide sustained, innovative experiences emphasizing the centrality of Information and Communication Technology (ICT) for the growing STEM (science, technology, engineering, and mathematics) workforce. Extensive student activities – all with intercurricular extensions and career correlations - are built around the CFA's MicroObservatory robotic telescopes. Working from school, home, or libraries, the students directly control one of the telescopes (located in MA, AZ, and soon in HI) to get images, primarily of galactic and extra-galactic objects. The next morning the images are delivered to the students by email for processing (colorizing, enhancing, altering the dynamic range, creating simulations and visualizations, and more).

There are both academic and non-academic partners, including: Harvard University's (HU's) Earth and Planetary Sciences Department and the Initiative for Innovative Computing; the Amateur Telescope Makers of Boston (one of the oldest and largest amateur astronomy clubs in the nation); and the Retirees' School Volunteers

Association (supported by Raytheon Corporation, and whose retired engineer members contribute 5000 hours of volunteer service to area schools.) Students come to the CFA each summer for institutes, which include programs with the HU partners and at other campus locations. The non-academic partners volunteer at the schools, working with the students during the OST sessions. Participating students take field trips to high technology and robotic firms. There is also programming for the students' families, both at CFA and in their communities. Project leaders have designed a content assessment, given to both students and teachers, based on previously designed distractor-driven multiple choice (DDMC) concept inventories produced by the SED. A significant portion of the students will be involved for two or three years, providing an excellent base for longitudinal study. There is much evidence from the literature for the validity and utility of DDMC items of the type we use (Rothman 2006). The intervention strategy is to first use the inventories diagnostically, and then longitudinally with the deliveries of comparable assessments twice a year for both students and teachers. Teachers predict the strongest distractors for the DDMC items, and these predictions are compared with the actual frequencies of incorrect answers chosen by students, as proxy measures of teacher pedagogical content knowledge. In addition, an affective assessment is administered to the students twice a year to determine both STEM interest, and implicitly, confidence in one's abilities, and STEM career intention. These data are then analyzed to determine significant change over the course of a year and the students' involvement in ITEAMS.

METHOD

In the pilot phase of this project, 84 students and 9 teachers were recruited from 5 schools. Every student involved in the project represented an underserved population, including females, minorities and low SES. All students were enrolled in grades 5 through 8, and were between the ages of 10 and 14. During professional development workshops, the teachers were taught how to request and process images obtained through MicroObservatory. Teachers were also given pilot curricula modules and materials. Teachers piloted the curricular modules themselves, helped in further development, and then piloted the revamped modules with their students. In addition, they introduced their students to MicroObservatory and helped them establish their own student accounts and request images. Teachers then guided students through image processing, including stacking filtered images and redefining image parameters. Throughout the semester, teachers were asked to proceed at their own pace through ITEAMS and other curricula, as well as telescope use, and to report back as to the efficacy of various modules and curricula.

The students had their own accounts on MicroObservatory, and used these accounts to request images, learn about celestial objects, and receive images

they had requested. They processed their images using two different kinds of software and learned how to stack, refine and use filters to discern various kinds of data in their images. The students developed wikis representing their OST group at their school, and used their wikis to post the images they processed. Students often used ideas from posted work to inspire their own research and used additional forums, such as science night or science fairs, to disseminate their findings and display their work. Simultaneously, the students participated in activities, explorations and projects and interacted with volunteers from amateur astronomy and retired engineer groups. These interactions were meant to inspire students to learn more about the possibilities of a STEM career, but have also served to develop relationships with scientists largely outside of their normal educational experience.

The experimental content test was administered to all students via an online system now being implemented within the SED to deliver all of our DDMC tests. Teachers brought students to their school computer laboratories and guided them through the pretest, helping them sign onto the testing site their first time as well as submit their answers properly. Students then took the experimental posttest while attending their two-day summer institute at Harvard University. Preliminary results were calculated using a paired-samples t-test and a repeated-measure ANOVA. This version of the content test included items aligned to six different standards: three from the National Science Education Standards and three from the AAAS Benchmarks. All standards were aligned with the content and intention of the ITEAMS project; specifically, all items directly tested concepts covered either in ITEAMS curricula or direct use of the MicroObservatory robotic telescopes. Teachers were given a similar assessment: the teachers' assessment consisted of all the questions on the student test as well as eleven more questions in order to lessen the probable ceiling effect that frequently occurs when teachers take tests designed for students.

Students were additionally asked to take an affective survey, which tested attitudinal hypotheses, and asked about frequency of technology use and career intentions. This survey delved into issues of self-efficacy, confidence, hobbies and approach to problem solving. Students were also asked about their computer and software experience. These questions were added to the survey in order to gain insight into which of those programs the students would need introduction and training. Students were asked demographic questions so that we will be able to track them anonymously: students are asked the same demographic questions on every assessment, content and affective. In order to maintain anonymity while still tracking students longitudinally, we use their birth date, gender, school and race to identify them. At the end of the assessment, students were asked if they considered a career in STEM and, if so, what career they considered. They were able to type in answers to this question, which were then coded into five

categories: Science/Math, Engineering Computer Science, Medicine/Health, Other Applied Science and Other. Again, students completed this survey via the online testing site, from school-based computer laboratories. These data were analyzed using a one-way ANOVA and Chi Square test, in which Likert-scaled data were tested for main effects and interactions between gender, race and attitude/frequency of technology use. In an effort to measure gain and/or change in attitude, both the content and affective assessments will be administered regularly twice per school year.

RESULTS

The students truly enjoyed working with MicroObservatory, and produced work of which they were very proud. They excelled at requesting, processing and stacking filtered images of deep space objects as well as requesting and processing images of the moon and many objects in between (Figure 1). They not only posted their processed images on their wikis, but displayed them during Science Day at their schools. Their facility with the many different technologies involved in the project was impressive and helped to

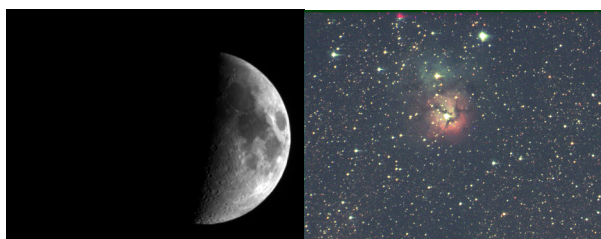


Figure 1. Student processed images: Students requested images from MicroObservatory and processed these data. On the left is a refined image of the moon; on the right, a stacked image of the Trifid Nebula taken through three different filters.

advance the students to a point at which they could pursue their own research interests. With a little bit of guidance, students also used the internet to begin preliminary data research on various deep space objects as well as engaging in real astronomical research. In short, the students' use of MicroObservatory served its purpose and continues to do so: it enhanced their interest in both STEM content and careers.

For the content test, preliminary diagnostic data showed some consistency between teachers and students in both knowledge gaps and expertise before beginning any dedicated course on Space Science. Teachers performed significantly better than students on test items, although some test items proved far more difficult than others for teachers. We also found that teachers hold some of the misconceptions reported in the literature--an obstacle to their learning and to that of their students. We grouped the questions in relation to their alignment with either the National Science Education Standards

(NSES) or the AAAS Benchmarks (B)¹, and then analyzed them by standard (Figure 2). Teachers excelled on the standard concerning the purpose and use of telescopes, but need more work on the standard concerning the solar system. As this is an OST course, we do not want to overemphasize content gain or alignment with standards. Nonetheless, it is important to the overall aims of the project that both students and teachers be armed with the basic knowledge needed to enjoy using the MicroObservatory telescopes. Based on these diagnostic data, we began to approach professional development differently, placing more emphasis on the areas in which the teachers needed more work and less on others. The student pretest showed similar results, although the students scored lower in each standard and particularly so for the standard concerning energy. For the majority of the students involved in the program, this content test was the first on space science that they had taken since primary school. They may have had some experience with related topics (such as energy) in the interim, but they scored well and without guessing relative to the long gap in time since their last exposure to the topic.

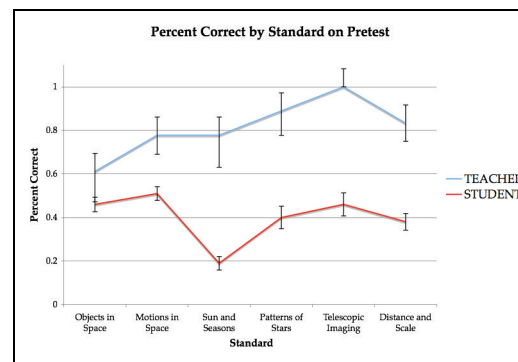


Figure 2. Pretest Results by Standard: Teachers score significantly higher than students for each standard. As a diagnostic tool, the pretest shows areas where teachers and students excel and/or need further instruction.

During their summer workshop, students were asked to take the correlated posttest to ascertain any content gain after one semester of instruction. We found a significant drop in scores, which may be related to either instruction or poor timing. In terms of instruction, studies have shown that a student's subject matter knowledge (SMK) may initially drop after that student is faced with their misconception about a topic. The struggle to restructure one's thinking and replace robust misconceptions with scientific ways of thinking is onerous and takes time to accomplish. After this period, studies have shown that a student's gain in SMK moves

¹ Please see Appendix 1 for a list of the standards used on the content test.

beyond the trajectory of a student in a more traditional learning environment (Sadler, 1998). We hope this is the case with our cohort as well. In terms of poor timing, we had the students take the assessment almost immediately after school had ended while they were visiting Harvard University for their summer workshop. Excited to be at Harvard, they were, at least in part, already on summer vacation and less focused on testing than other pursuits.

During the second semester of the first year of this project, we asked teachers to administer the pilot affective assessment to the students². We used the data collected as diagnostic data and analyzed them accordingly. At this time, gender did not have any significant impact on how the students felt about science in general (Figure 3). The students answered positively on all of the Likert-scaled questions, except when asked if they'd like to receive science books or equipment as a gift.

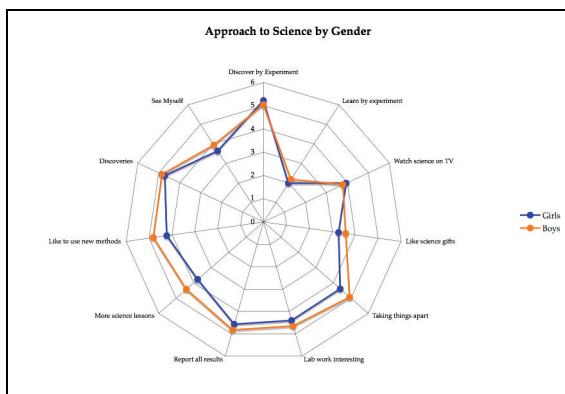


Figure 3. Approach to Science by Gender: Student responses to Likert-scaled questions concerning their approach to science, their feelings about science, and whether they see themselves as scientists. Average student response is more positive toward the outermost circle.

When asked if they could see themselves as scientists, girls and boys answered virtually the same. This reinforced the notion that gender differences appear later in their academic careers, and served to underscore the opportunity that educators have at this time to interest students in STEM related careers. One question was stated in a negative manner, and the students answered this question with the same degree of negativity with which they answered the others positively. We have every confidence that the students took these surveys seriously and thought about each question before answering it. The teachers reported student comments on this assessment, noting that the students found it to be fun and almost like playing a trivia game, even though they knew it to be an assessment. It was encouraging to see the students so excited about incorporating technology

² Please see Appendix 2 for a text version of the Affective Assessment

into their everyday lives, using high-tech substitutions for what they normally do, but even more so to see the girls and students of color taking a particular interest in these technologies.

The questions concerning the use of computers showed significant differences in gender (Figure 4). This series of questions was of particular concern to us for several reasons. The answers to these questions dictated how quickly we could advance the students' use of the project technology; they also served to guide us in the development of our curriculum. In the use of online communication, word processing programs and graphics software, the girls' use was significantly more frequent than the boys'. Not only do these data prove that there is equal interest in STEM at this point in their lives, but girls actually surpassed boys in frequency of use (and this may imply interest in these technologies). Again, the age-old adage that boys excel at math and science while girls do well in the humanities is debunked by our finding that girls not only have equal interest in STEM, but that they avail themselves of the many conveniences of technology more often.

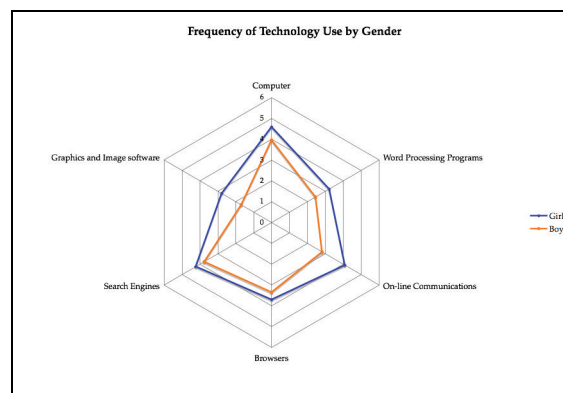


Figure 4. Frequency of Technology Use by Gender: There is a significant increase in regular use of particular technologies for girls in this sample.

Finally, we analyzed the statistics for the probability of students of a particular gender or race showing a preferential interest in a STEM career. Using Chi-Square analysis, we found a higher probability of Black or Hispanic females choosing a career in medicine or health than students of other races/ethnicities or boys to choose similarly (2-sided Asymp. Sig. = 0.04 for both groups). All of the other categories of career were non-significant for both gender and race and there were no main effects. Despite the statistics that show the dominance of white males both earning degrees in STEM and pursuing STEM careers, our data clearly show that girls of color have a significantly higher interest in applied STEM (that is, medicine and health) than their white counterparts.

CONCLUSIONS

In its pilot phase, ITEAMS has proven effective in several ways, including amplifying student interest in STEM content and providing quantitative data on the use of technology for this sample. We find that there is no significant difference between the genders in terms of interest in STEM and in STEM careers. The distinction between genders presuming that boys will surpass girls in their science and math skills is not present at this age within our population. Instead, it is the girls in our sample who embrace technology more extensively. Although there are data that show that the majority of students receiving higher degrees in STEM subjects are white and male, we find that applied STEM appeals far more to girls of color than to white girls or males of any race or ethnicity. These findings are hopeful: the face of the STEM work force in America can potentially undergo momentous change if we can help our students' interest in STEM persist throughout their academic careers. The ITEAMS project is still in its pilot phase, but by the end of the project, we hope to demonstrate that a blend of advanced online technology and age-appropriate classroom materials increases the interest of students in STEM careers.

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APPENDIX 1: STANDARDS USED ON THE CONTENT TEST

Objects in Space—The earth is the third planet from the sun in a system that includes the moon, the sun, eight other planets and their moons, and smaller objects, such as asteroids and comets. The sun, an average star, is the central and largest body in the solar system.

Motions in Space—Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.

Sun and Seasons—The sun is the major sources of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. Seasons result from variations in the amount of

the sun's energy hitting the surface, due to the tilt of the earth's rotation on its axis and the length of the day.

Patterns of Stars—The patterns of stars in the sky stay the same, although they appear to move across the sky nightly, and different stars can be seen in different seasons.

Telescopic Imaging—Telescopes magnify the appearance of some distant objects in the sky, including the moon and the planets. The number of stars that can be seen through telescopes is dramatically greater than can be seen by the unaided eye.

Distance and Scale—The sun is many thousands of times closer to the earth than any other star. Light from the sun takes a few minutes to reach the earth, but light from the next nearest star takes a few years to arrive. The trip to that star would take the fastest rocket thousands of years. Some distant galaxies are so far away that their light takes several billion years to reach the earth. People on earth, therefore, see them as they were that long ago in the past.

APPENDIX 2: AFFECTIVE ASSESSMENT ITEAMS Fall Assessment '09

Answer the following according to this scale:
Strongly Agree Agree Slightly Agree Slightly Disagree Disagree Strongly Disagree

1. I would rather discover why something happens by doing an experiment than by being told how it works.
2. Doing experiments does not help me learn as much as finding out information from teachers.
3. I like watching science programs on TV.
4. I would like to be given a science book or a piece of scientific equipment as a present.
5. I like taking things apart to see how they work.
6. Working in a laboratory would be an interesting way to earn a living.
7. In science experiments, I report unexpected results as well as expected ones.
8. School should have more science lessons each week.
9. In science experiments, I like to use methods which I have not tried before.
10. I would like to work with people who make discoveries in science.
11. I could see myself being a scientist or engineer.

Please describe how much experience you have had with the following:

I use it everyday a lot quite a bit
only a little not very much none

12. A computer
13. Word processing programs
14. On-line communications (like IM or email)
15. Web browsing and information searches
16. Yahoo, google or other search engines
17. Creating graphics, photos, graphs or tables on a computer
18. Are you male or female?
19. How old are you?

20. Which of the following best describes your race/ethnicity?

White Black HispanicAsian Native American Other

21. Please enter your birthdate: (MM/DD/YY)

22. How interested are you in science, technology or engineering as a career?

Completely Quite a bit A little bit Somewhat Not very much Not at all

23. How often have you given serious thought to your future career?

Every day Frequently Often Occasionally Infrequently Never

24. If you already know what you might like to be when you're older, please write it in here:

Developing Information Technology (IT) Fluency in College Students: An Investigation of Learning Environments and Learner Characteristics

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Abstract: Using a causal-comparative research method, data from 120 undergraduate students studying computer concepts were analyzed to determine the relationship between learning environment, IT fluency, and course satisfaction. Results suggest that in learning environments based on active learning strategies, IT fluency was achieved and course satisfaction was significantly higher regardless of preferred learning style. This research can be used as conceptual model of how current college students prefer to learn IT to determine how undergraduate programs might change existing curricula to better prepare their students for the rapidly changing 21st century workplace.

Keywords: Achievement, active learning, college students, constructivism, information technology fluency, learning environments

1. INTRODUCTION

The confluence of powerful technologies of computers and network connectivity has brought explosive growth to the field of IT; emerging with a focus on applied computing that includes an ability to adapt hardware and software to solve problems and process information in conjunction with accomplishing an organization's goals. Organizational dependence on technology will demand all individuals be IT fluent upon workplace entry as the rapid deployment of technology continues to drive up the worldwide need for a skilled workforce [1-4]. Yet, in undergraduate classrooms, the teaching tends to focus on software proficiency, even though a more expansive definition of what it means to be IT fluent is needed. In addition, teaching using traditional instructional methods such as lecture is still the norm [5] despite the push for more hands-on, constructivist approaches that may engage learners regardless of their major or preferred learning style [6-9].

3. PROBLEM STATEMENT

The problem presented in this study is whether the type of learning environment where IT concepts are taught to undergraduates has a relationship to the development of IT fluency and course satisfaction. The literature suggests that if learning environments

based on constructivist learning strategies are used, IT fluency would be achieved while controlling for known predictors of academic achievement. These predictors are mathematical background, mathematical ability, cumulative grade point average, and learning styles [10-19]. As a conceptual model of how current college students prefer to learn IT, the environment in which learning occurred as well as instructional methods used was investigated and compared to determine how undergraduate programs might change existing curricula to prepare their students for the rapidly changing 21st century workplace.

2. PUROSE OF THE STUDY

The purpose of this research was to examine the relationship, if any, between traditional and constructivist learning environments to the development of IT fluency and course satisfaction in a course in which students were learning to become IT fluent under a revised definition. The revised definition of what it means to be IT fluent still encompasses software proficiency, but expands to include demonstrated knowledge of computer operations, networks, online resources, digital media, and programming. IT fluency includes content from the disciplines of computer science, computer engineering, electrical engineering, library science, business data management, and communications [20]. IT fluency, in its broader sense, is concerned with the skills, concepts, and intellectual capabilities related to data in terms of its representation, structure, organization, processing, transmission, distribution, and the technologies involved in the interactive execution of those activities-computers, networks, and software.

The study is among the few quantitative studies designed to analyze the factors influencing IT fluency in the general college undergraduate population. Although there are quantitative research studies in the field of IT-related education, they have mainly focused on use of specific visualization tools to teach algorithms and data networking and on the smaller population of computer science majors [21]. One qualitative study [22] focused on the general student population, teaching the IT concepts of input-output processing, interrupt, and BIOS, which are

similar concepts taught in the course investigated in this research study. However, that study focused more on learner perceptions of a specific instructional tool rather than on academic achievement in a given environment, which the current study intended to do.

4. THEORETICAL FRAMEWORK

Constructivism is a theory of how people learn that considers the engagement of learners in meaningful experiences. Constructivism is a recent development in cognitive psychology, influenced by the works of Bruner, Piaget and Vygotsky [23], which shifts learning from a passive transfer of information and collection of facts to active problem-solving and discovery. The type of environment that supports this learning theory is one where the instructor provides learning activities with which students formulate and test their ideas, draw conclusions and inferences, pool and convey knowledge collaboratively, and focuses on the central role that learners play in constructing knowledge [24].

The two learning environments studied were traditional and constructivist. Traditional learning environments tend to focus on the development of basic skills using didactic lecture, teacher presentations, and lecture/discussion methods [25]. This type of environment uses the transmission instruction model, based on a theory of learning that suggests students will learn facts, concepts, and understand material by absorbing the content of their teacher's explanations or by reading explanations from a textbook. Most often, lessons taught using the transmission instructional model are intended to direct the predetermined sequence of instruction, referred to as teacher-centered instruction [26].

Constructivist learning environments are interactive, collaborative, and explorative where instructors use approaches designed to stimulate thinking, motivate student involvement, and provide an opportunity to reflect on experiences [27-28]. Reflection is the willing intellectual activity of an individual to consider and explore their experiences in order to lead to a new understanding and appreciation of the fundamental nature, purpose, and essence of those experiences [29]. These learning environments are student-centered where the role and intention of the instructor is to design activities that facilitate student learning [30].

General Attributes of Learning Environments

The general attributes associated with learning environments are context, construction, and collaboration. *Contextual* teaching strategies include instructional methods that serve as mental bridges for learning. The purpose is to model the intention of the instruction for students, thereby allowing them to

observe and reflect through the sharing of thoughts and ideas that provide for the consideration of alternate perspectives [31]. One contextual instructional method is simulation; descriptions of events or conditions and often allow the user to change variables to see the impact of that change. They include exercises, games, media, and computer animations that place learners in an artificially constructed, yet sufficiently realistic context for learning to occur [27, 30, 32]. Lecture is also a contextual instructional method and continues to be the most widely used teaching method in undergraduate classrooms [5]. Lecturing is an efficient means of instruction insofar as ability to deliver large quantities of information to large quantities of students. They are a useful method to help students read more effectively by providing an orientation to a concept's or the author's salient points.

Construction teaching strategies include instructional methods that serve to build knowledge through worked examples such as writing, discussing, and reflecting to include self-evaluation of progress toward conceptual understanding [30]. *Collaboration* teaching strategies include instructional methods that serve to develop negotiation skills by establishing peer groups [26]. When two or more peers work together on a learning activity, it eventually requires the arrival at a shared solution through social negotiation. This negotiation process can take place either on or offline, synchronously or asynchronously, without the instructor present.

The related literature provided factors known to contribute to academic achievement in IT-related courses. The predictors of academic achievement in IT-related courses emerged as math background (calculus and/or discrete math courses), math ability (SAT math score), cumulative grade point average, and learning styles. Two gaps existed in the constructivist learning literature related to IT education: the limited amount of quantitative research and the lack of examination of the impact that constructivist environments had on non-technical majors studying IT concepts.

5. METHOD

Participants

Undergraduates at a mid-size university in the New York metropolitan area responded to the study survey in spring 2007. The 294 students, who previously completed a fundamental computer course received an invitation to participate via email. By the end of twelve weeks, 124 responses had been received, a 42 percent response rate. The appropriateness of the sample size was confirmed via an a priori power analysis for ANOVA using the software program

G*POWER, where a sample size of 120 was recommended [33].

Modes of Inquiry

Data describing students' experiences and scores were collected using four instruments: (i) Kolb Learning Styles Inventory; (ii) Evaluation of Teaching Effectiveness; (iii) Departmental Final Exam; and (iv) Self-Reported Learner Characteristics Questions. The first, Kolb's Learning Styles Inventory, measured individual preferences toward learning on a twelve-item survey asking respondents to rank-order four sentence endings in a way that best described their learning style [28]. The Evaluation of Teaching Effectiveness Scale measured course satisfaction experienced by students and contained 28 items, each a seven-point response continuum representing agreement, ranging from strongly disagree to strongly agree [34]. The third, Departmental Final Exam, measured academic achievement of fundamental IT concepts [35]. Lastly, students responded to the Self-Reported Learner Characteristics Questions, reporting their mathematical background in terms of whether they completed a calculus and/or discrete math course, their mathematical score earned on the SAT exam, and their cumulative grade point average.

Data Analysis

Using causal-comparative research methodology, data from two non-randomized groups of 120 qualified undergraduate students (53 in the traditional environment and 67 in the constructivist environment) was used to explore the relationship between learning environment (one traditional and one taking a cognitive science approach), IT fluency, and course satisfaction as moderated by math background, grade point average, and/or learning styles. Additional data regarding instructor strategies, student perceived performance, workload, and methods of instruction were evaluated.

The statistical data techniques performed were analysis of covariance (ANCOVA), Independent *t*-Tests, and analysis of variance (ANOVA). Statistical analyses were performed using SPSS for Windows (v15), with a minimum alpha of .05.

6. RESULTS

ANCOVA analysis confirmed the main premises of the study: (1) when learning environments based on active learning strategies are used, IT fluency is achieved regardless of an individual's preferred learning style; and (2) when learning environments based on active learning strategies are used, course satisfaction is higher regardless of an individual's preferred learning style. Students in the constructivist

environment had higher exam scores, although not statistically significant, than students in the traditional group. Further, students who studied in the constructivist environment were statistically more satisfied with the course than students who studied in the traditional environment.

Results of Independent Sample *t*-test comparing responses on the Evaluation of Teaching Effectiveness scale revealed statistical significance in the constructivist environment in the following dimensions: active learning, class organization, media use, student perceived performance, and workload. Findings revealed significance in promotion of class discussion ($p < .000$) based on challenging questions posed ($p < .000$) along with clearly defined course objectives ($p = .013$) and effective and interesting use of media ($p = .002$). Student perception of their performance ($p = .031$) in the constructivist environment was significantly higher than the traditional, further reporting that the assignments given in the constructivist were very challenging ($p = .034$). An evaluation of instructional strategies used in the two learning environments (Table 1) revealed that active learning methods of student presentations, simulations and game play, peer feedback, development of online portfolios, use of media resources, reflective writing exercises, class discussions, and group work were used with greater frequency in the constructivist environment (Table 2). These findings expose learning differences in the two environments and indicate how these differences, tied to instructional methods and materials used in college classrooms, can affect academic achievement.

7. SIGNIFICANCE OF STUDY

Both higher final exam scores and significantly higher levels of satisfaction in the constructivist environment are explained by the specific active learning techniques used in the constructivist environment, in which methods oriented toward enhancing student-centeredness and student-teacher interactions were favored. This is confirmed in the IT literature, where higher final exam scores and greater satisfaction in constructivist environments are associated with the perceived quality of the student-teacher interactions [36-40].

One interesting connection was found between students in the constructivist environment who believed that the course covered too much material ($p = .008$) and the assignments very challenging ($p = .034$) felt they learned a lot ($p = .031$) and were more satisfied with the course ($p = .009$) at a significantly higher level than students in the traditional environment. These findings indicate interest in learning IT concepts among students in the constructivist group although the students found the

course difficult. This may point to the perception that the content learned was relevant and worth the effort that students put forth. In addition, greater satisfaction in the constructivist environment albeit difficult may be the result of reflecting on their learning. There was a decisive gap between the time participants completed the course and the time when asked to participate in this study, as much as two years in some instances. The rationale for this time lapse is purposeful to reflective learning. Since the reflective instructional methods of discussion, persuasive writing assignments, and peer reviews were modeled for students in the constructivist environment, it may be that students taught in this environment were more skilled at thinking about their own learning and showed an increased complexity in their metacognitive skills when responding to the survey questions. Once given the opportunity to reflect, they realized how hard they worked in the course and the amount of work was meaningful to their current stage in life.

In addition, it is important to note that the type of assessment used to measure IT fluency (departmental final exam) was a format (single-best-answer, multiple-choice questions) in which converging and assimilating learners have a performance advantage (Kolb, 1984). Even when using such a format, students who learned IT concepts in the constructivist environment had higher IT fluency scores than those in the traditional environment, where the assimilating learning style was higher ($M=.21$; $SD=.409$) than in the constructivist environment ($M=.18$; $SD=.386$). Stealth learning is learning that happens so naturally that learners are not directly aware of its occurrence [41] and may help to explain this occurrence. Hands-on learning attracts all types of learners through deep immersion and engagement in activities and tasks. Simply put, students in the constructivist environment learned the same course content as students in the traditional environment as evidenced by same final exam administered to all students. They just took a different path that both attracted and interested them, one that immersed them in their learning.

The findings add to the ongoing discussion about the dynamic and powerful paradigm shift in the way students' prefer to be taught. The results of recent large research studies, scholarly writings, and consumer behavior reports indicate that students like using technology tools for school tasks; consider themselves savvy and innovative users of technology; and prefer learning actively - defined as *learning by doing* through the use of interactive lessons, friendly competition, and trial and error. Students entering college today are a generation of consumers of

technology devices and software, who expect that they will be able to continue to use the tools of their youth in the college setting and beyond. Students in the constructivist environment used similar tools. Student-teacher interactions existed in the constructivist environment, which matched student preferences for course materials [media use; activities; discussions] and how they prefer to process them [interactively]. This explains the similarities in exam scores as students had numerous opportunities to ask questions, express ideas, and engage in challenging and open discussions in the constructivist environment.

Overall, study findings add to an understanding of higher education learning environments, student characteristics, and how IT fluency is achieved. The results of the study has implications for designing learning environments and using associated instructional methods that foster learning IT concepts in undergraduate programs. These results provide additional support to the constructivist learning theory and its execution in higher education classrooms where IT concepts are taught to non-technology majors.

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Table 1. Course Syllabi

General Topic Area	Specific Topic Area
Computer Organization and Hardware	Processing Components, Primary Storage, Peripherals, Architectures, Data Representation
Systems Software	Operating Systems, Utilities, User Interfaces
Application Software	Word Processing, Desktop Publishing, Spreadsheets, Multimedia
Communications and Networks	World Wide Web, Personal Communications, Network Access, Network Architecture, Data Communications
History and Social Impact	History, Social Issues, Safety and Security, Careers

Table 2. Analysis of Strategies Used

	Constructivist		Traditional	
	1	2	3	4
Contextual Strategies				
<i>Virtual Games & Simulations</i>	X	X		
<i>Lecture > 20 min</i>			X	X
Construction Strategies				
<i>Peer Feedback</i>	X	X		
<i>Online Portfolio Development</i>	X	X		
<i>Research Paper</i>			X	X
<i>Class Discussions</i>	X	X		
<i>Reflective Journals</i>	X	X		
<i>Case Study</i>			X	X
Collaboration Strategies				
<i>Group Work</i>	X	X		
Assessment Strategies				
<i>Student Presentations</i>	X	X		
<i>Quizzes</i>			X 5	X 8
<i>Final Exam</i>	X	X	X	X

Making a Difference? Assessment of Information Literacy at Linköping University Library.

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ABSTRACT

Information literacy, the ability to identify, assess, retrieve, evaluate, adapt, organize and communicate information within an iterative context of review and reflection, has been recognized as a critical competency both at universities and in professional work. In higher education information literacy instruction is now being integrated into the academic curriculum and is also now being assessed like other subjects. This paper summarize and discuss how information literacy skills are assessed by librarians and faculty together in two different educational programs at Linköping University and the outcomes of such efforts.

The similarities between the two programs, although different approaches, is the importance of tying information literacy assessment methods to leaning outcomes and to prepare students for future professional life.

Keywords: information literacy, assessment, librarian – faculty collaboration, learning outcomes

INTRODUCTION

The core purpose of any assessment model in most educational settings is to find out how an individual or a group is progressing in a particular area and also to determine if there is a way that the quality aspects of learning can be improved. It is of vital significance which assessment model to use since it has such an important impact on both instruction and learning [1; 2]. In the last decades we have seen a shift from teaching to learning, from faculty to students and from instructional development to learning development. These trends have produced changes in our conception and methods of assessment procedures.

Today's students will face a world that will demand new knowledge and new abilities. They will for instance need critical reflective thinking skills meaning an ability to gather, analyze and evaluate information, to make informed judgments and to make inferences. Helping students to develop these skills will require changes in the assessment procedures and we need to re-conceptualize both learning outcomes and processes. We also need to re-conceptualize changes in the skills and knowledge needed for success and also how to equip the students for the real and complex world outside of the university. Furthermore we have to acknowledge that the relationship between assessment and instruction is most likely going to change our learning goals. Consequently, we must change our strategies to tie assessment design and content to new outcomes and

purposes for assessment and to make learning and instruction more in congruence with assessment [3].

ASSESSING INFORMATION LITERACY

In order to become accepted as a valid outcome of higher education we think information literacy must be assessed. Webber and Johnston in 2003 stressed the importance of assessment as it grants credibility and indicates importance, and consequently improves the status of information literacy as a subject. They also stated that a combination of expert, self and peer assessment that support reflection and critical awareness was desirable. Furthermore they stressed the necessity of using a variety of methods in order to ensure its relevance of information literacy being learnt and linked to real-world applications [4].

Quite often, at least in the past, librarians have attempted to assess student information seeking skills by using standardized tests based on multiple choice, fill-in-the-blank, matching questions and similar tests. Such tests generally measure tangible knowledge and only a few of the important cognitive skills and knowledge students should learn. Therefore these tests don't assess the effectiveness of students search skills especially in views of the variability of real life situations.

Authentic assessment, on the other hand, is any type of assessment that requires students to demonstrate complex cognitive skills and competencies that realistically represent problems and situations likely to be encountered in daily life. These real-world challenges require the use of relevant skills and knowledge to practical problems meaning to produce ideas, to integrate knowledge, and to complete tasks that have real-world applications. The emphasis on such meta-cognitive skills promoted by an information literacy approach points to a synergism between the ability to manage information and the complex thinking processes involved in doing research. [5]. Students need coaching, not just with identifying and locating information, but also with internalizing and making sense of the information gathered. We must foster their focus on the process and help them learn from the content. It is also important to provide time and encouragement for reflection and meta-cognition to occur [6].

Authentic assessment forms a contrast to any traditional testing and evaluation method, which focus on reproducing information such as memorized dates, terms, or formulas and that provide limited information about performance.

Just testing an isolated skill or a retained fact does not effectively measure a student's capabilities and could, in the worst scenario, lead to passive learning. To accurately evaluate what a person has learned, an assessment method must examine his or her collective abilities [7]. Some educators believe that alternative assessments motivate students to show their best performance, a performance that may have been masked in the past by standardized fixed-response tests and by un-motivating content. However, not all authors are in favour of authentic assessment and some of them argue that these kinds of alternative assessments can create concern, confusion and frustration among students [e.g. 8; 9].

Authentic assessment used in the context of students working on real-world problems, projects, or products that genuinely engage and motivate them to do well is most likely to be a learning experience. If students are not fully engaged in the assessment, it is not likely that any resulting inference will be valid. Furthermore, authentic assessment values the thinking behind work, the learning process, as much as the finished product as stated by e.g. Pearson and Valencia, 1987; Wiggins, 1989; Wolf, 1989 [10; 11; 12]. It focuses on student's analytical skills and their ability to integrate what they learn and they are also given a chance to proof their written and oral expression skills.

In authentic assessment, students use remembered information in order to produce an original product and are then assessed according to specific criteria or rubrics that are known to them in advance. The performance criteria should therefore be clear, concise, and openly communicated to students. Rubrics for instance give students a clearer picture of the strengths and weaknesses of their work. Setting criteria and making them explicit and transparent to learners beforehand, is important because this guides learning.

LINKÖPING UNIVERSITY LIBRARY (LiUB)

Linköping University is a two-campus university situated both in Linköping and Norrköping in the county Östergötland. The university offers postgraduate studies and research in more than 100 scientific areas within 17 multidisciplinary departments and around 26 000 students. The library is divided into four different sections; Humanities and Social Sciences Library, Science and Technology Library, Health Sciences Library and Campus Norrköping Library.

The instructional programs of LiUB have a long and evolving history. Librarians have taught formal instruction sessions since the 70's. The programs have evolved over the years from library orientation, to bibliographic instruction and since the mid 90's they have developed into information literacy provision. The library has successfully adopted information literacy as an organising principle that informs all of our work and commitment in order to play an active role in the preparation of students for a lifetime of purposeful learning. LiUB has a strategic plan wherein it is stated that 'the library should contribute to integration of

information literacy in all undergraduate programs [13]. We also have adopted general learning outcomes for information literacy education according to the Bologna process. These outcomes are the backbone when we plan our teaching and they are adjusted to the disciplines and contexts wherein we librarians work.

ASSESSMENT OF INFORMATION LITERACY SKILLS AT THE DEPARTMENT OF WATER AND ENVIRONMENTAL STUDIES

The Department of water and environmental studies is a centre for multi- and interdisciplinary postgraduate training and research. Research is focused on water and environmental problems relevant to society. Basic research issues spring from every-day life and ideas are born in contacts with society.

Master's program in Science for Sustainable Development

The master's program in Science for Sustainable Development is interdisciplinary in character and consists of theoretical and empirical studies in the natural, social and technological sciences and to some extent the humanities and health sciences that relate to current societal and environmental problems. Students can specialize within one of three areas: Climate, energy and recycling; Water and food security and Geo-informatics.

The program is problem-driven with the goal of creating and applying knowledge to support informed and responsible decision-making. The program provides students with research skills and practical know how in contributing to a society that is more ecologically, socially and economically sustainable. At the moment students from 23 different countries are enrolled.

When the first international students started their study at our master's program we noticed that they had poor search skills such as that they often used under-evaluated and even dubious web sites for their research. We also noticed that a number of them didn't know how to discern the quality of the information sources they found. Furthermore we noticed that they found it difficult to come to terms with the learn-how-to-learn approach (to develop learning strategies suitable for different situations), and that this was compounded by their lack of familiarity with research theory and practice. 'Bad writing', including grammar and spelling mistakes, lack of clarity, poor organization of the text and not being able to formulate a good research question was also something that we noticed. Last but not least we found that there sometimes was a cultural clash regarding academic styles which led to several cases of severe plagiarism

In 2007 a university professor, a program director and a senior librarian at the department began a collaboration which focused on how to increase scholarly reading, information literacy and academic writing skills. As a first step we integrated information literacy more strongly into the course, and we all agreed that it was essential to

communicate the importance of information literacy to the students in the syllabus. So under the new learning objectives for the course, the students were informed that there would be an emphasis on information literacy. Students were also told that their completed papers would be given a score for information literacy competency. It was further explained in the syllabus that the librarian would provide instruction in information literacy.

We also discussed how to assess the student's information literacy skills. By skimming through the literature we decided not to use standardized rubrics although it was well spoken of in the literature. Instead we set up some criteria according to the library's learning outcomes; criteria such as the student's ability to define an information need, to identify key concepts and terms, to identify different types of information sources and to develop (and refine) a search strategy. We also took into consideration the student's ability to manage information, their ability to critically evaluate the information retrieved and their ability to communicate information to an audience. A very strong emphasis was put on the student's ability to analyze and synthesize in the meaning of creating something new by combining different ideas. For this, they need to understand what scholarly investigation and writing are all about. They need to formulate the issues in a structured manner, identify the problem, formulate the hypothesis, collect data and facts regarding these issues, and to analyze them and come up with multiple solutions to an issue and to choose the best suited one.

We also discussed how we could help the students to find a place in this new context by familiarizing themselves with new values and customs, while making sure they meet the requirements their studies ask of them. We talked about an interdisciplinary enculturation in order to make an outsider into an insider in the academic community. One central point here was the writing of an academic text and writing into a professional discourse since we had noticed that they struggled with the complexity of the academic discourse. So we decided to concentrate on writing strategies such as how to develop a good research question; making an outline, paragraph structure; conventions regarding referencing into a consistent stylistic approach just to mention a few.

We began with an instruction of a few basic search skills where students at the end of that session were required to clearly define an information need and to show their ability to locate books and articles in a scholarly manner, still on a basic level though.

The second time we moved on to more advanced search skills like how to analyze search results and how to evaluate their significance and validity and how to think critically about the information found. Realizing that these students now had this basic core, (and in a way, advanced knowledge) of resources and searching skills, we continued the sessions on how to correctly document the usage and synthesis of information. The aim here was to make the students learn how to effectively integrate outside information resources ethically and correctly into their work.

The third time we moved on to anti-plagiarism instruction. Establishing the consequences of plagiarism early is probably the best way to go. There are many reasons why students plagiarize; some of these are deliberate and others are inadvertent but it is always considered a serious misdemeanour and penalties are therefore very harsh. And students need to know this.

Understanding and participating in the academic process is an important part of university study, and because the cycle of knowledge creation is the same even outside of the university, understanding this process is also a key to opening the doors to professional work beyond the university, hence the fourth and last session about academic writing. The aim here was to teach students to do independent research and writing and to instil an academic attitude that will serve well in their graduate studies.

Both at the end of the semester, with the final paper, and at the end of a specific module the students are required to produce a quality paper to demonstrate their learning on an approved topic or issue of their interest. A paper similar to what they can be asked to produce in real life. They should also present their work to other people, both orally and in a written form, because it is important that they defend and share their work to ensure that their apparent mastery is genuine. This characteristic serves another goal as well. It signals to students that their work is important to other people, which increase the perception of relevance and meaningfulness.

In the Climate, Energy and Recycling Module, just to give an example, the students were presented with some information problems related to IPCC and society. Each student had to prepare and present a list of valuable information resources useful to analyse the problem assigned. They had to annotate their list and justify their different choices of information resources used. Furthermore they had to explain and discuss their research strategy and to comment on the reliability of the information retrieved and also its suitability for the analysis of their information problem. This assignment was assessed by the professor and the librarian collaboratively.

In other cases the librarian assesses the information seeking process in the student's papers or essays according to specific criteria mentioned before and then report the grades to the university professor who finally decides if the students pass or fail taking the librarians judgments into consideration. The librarian also attends the seminars when the students present and defend their papers.

According to Curzon in 2004 skills and knowledge of librarians and teachers respectively are complementary and together they form a good breeding ground for successful partnership in information literacy programs. We think this is the case with our partnership [14].

ASSESSMENT OF INFORMATION LITERACY SKILLS AT THE HEALTH SCIENCES LIBRARY

For many years the Health Sciences Library, has been working successfully together with teachers as well as the student union to promote information literacy in order to obtain optimal learning outcomes thus ensuring that the students are information literate in their future professional life.

Problem-based learning, PBL, and interprofessional learning, IPL, were introduced in all undergraduate programs in 1986 and the faculty is constantly developing and improving the educational profile. According to Barrows (1996) there are six core characteristics of PBL. 1. learning needs to be student-centered, 2. learning has to occur in small student groups under the guidance of a tutor, 3. the tutor is to be seen as a facilitator or guide, 4. authentic problems are primarily encountered in the learning sequence, before any preparation or study has occurred, 5. the problems encountered are used as a tool to achieve the required knowledge and the problem-solving skills necessary to eventually solve the problem, 6. new information needs to be acquired through self-directed learning [15]. So PBL focuses on the students own ability to seek relevant information and “the main actor is the self-supporting, information-seeking student not the lecturing teacher” [16].

Examinations of the medical students’ ability to solve various information problems have taken place for more than 20 years. The initiative to the collaboration between teachers and librarians came from the curriculum group that, among other things, introduced a stronger emphasis on a scientific and evidence-based approach in the curriculum. Although the examination procedures have changed over time, the collaboration with and the role of the library in this process has never been questioned [16].

During the first ten years the examination was held in the fourth semester and was based on real patient cases. The students met patients at health care centers. After thoroughly interviewing a patient the student formulated a clinical case concerning the patient’s problem. Then the student had to “run” to the library to seek information (at that time few resources were online) and the examination took place the following day (!). This moment with the real life connection at the health care centers has now ended because it was considered to be too time- and staff consuming.

Today the examination, which is compulsory for all medical students, takes place during the second semester. A few weeks prior to the examination the students attend an information literacy class for half a day embedded in the ordinary curriculum. A few weeks after this session, the students are provided with a list of 120 cases to choose from. These cases originate from the real-world cases mentioned above. The term coordinator, who also is the examiner, compiles the cases and makes them relevant according to the context and knowledge that the students have at this time. The students work individually for about one week with their case before the examination takes place. The administrator of the program compiles the schedule, which students to assess when and what cases

they have picked, and send this to the librarians and teachers in advance. About 80 students, 10-15 professors/senior lecturers and 6 librarians carry out the examination which takes place in the library twice a year. Each session lasts 25-30 minutes.

In order to pass the student has to prove his/her capability to make the case “his/her own” by translating or interpreting it in order to make a sound search strategy and choosing relevant sources. Last but not least the student also has to show a reflective and critical attitude towards the search process itself and to the information found. During the exam both the librarian and the teacher will comment and ask for explanations, especially if they suspect that there is a lack of understanding and/or poor information seeking abilities.

Furthermore the student has to have a well-reasoned strategy, an ability to find basic information, know how to make a relevant subject search, have an understanding of the difference between text words and subject words, know how to sift information in a relevant way, know how to use several resources and several search paths, know how to critically evaluate the search results and to deliver an answer as to how the case could be solved.

Immediate feedback and response is given directly after the examination but not the score. The result is officially listed after two days. Weak students will be offered complementary training and a new examination after a couple of weeks. About 5-10% of the students fail and the main reasons are a lack of a serious approach to the search process itself and a lack of a creative and reflective way of thinking. The student normally doesn’t have any problems finding information but the difficulties lie in finding qualitative information with scientific value. We believe that the main purpose of the examination is to transfer this kind of knowledge and approach. This problem-based approach was designed to engage students in a verbal demonstration and explanation of how they would solve a real-world problem.

LEARNING OUTCOMES

The outcome of our efforts became evident when we evaluated and compared the reference list in 23 student’s papers or theses [17]. The main purpose of this study was to shed light on student’s information-seeking behaviours. We found that students who had been taught information literacy competencies, at the Health Sciences Library and in the master’s program, used scholarly resources to a much higher degree than students without training. In a study conducted during the fall of 2007 we interviewed 700 undergraduate students and found differences in the use of information sources depending on how long the students had been studying. We also found that stringent course requirements, including assessment procedures, from faculty and staff, like the two cases above, affected the student’s information behaviour [18; 19].

The teachers in the master's program reported a higher critical thinking ability in papers written by information literate students that had been assessed. The teachers also noticed an increased use of academic sources as well as a better grasp of academic writing, the research process itself and of the information seeking process. The number of plagiarism cases dealt with by the disciplinary board at the university decreased for the master's program after the implementation of the extended information literacy skills training.

CONCLUSIONS

We strongly believe that new forms of assessment are powerful tools for understanding student performance, particularly in areas that require critical thinking and complex problem solving in real world settings.

We believe that authentic assessment is a promising method for the evaluation of information literacy learning outcomes, as it measures not only what students learn through library instruction, but also how the learning is subsequently incorporated into their academic work.

Furthermore we believe that information literacy is about creating a change in attitude, less the learning of skills and more the development of a mind set. We believe that student's abilities to manage their own work hinges to a great extent on their capacity of associative and complex thinking.

We also strongly believe that the time has come for us teaching librarians to expand the content of our instructional offerings and to infuse information literacy activities throughout the curriculum. An expansion in our repertoire will help us be valued as educators with expertise in the many areas of the complexity involved in teaching the skills surrounding critical thinking about information documentation in conjunction with information retrieval. Through assessment of information literacy activities, libraries have the opportunity to measure their contribution to the educational missions of their institutions.

The love of research and knowledge comes when the information literate student has the confidence and know-how to explore readings and when the student has the ability to identify legitimate primary information which enables him/her to develop and articulate his/her own ideas and positions. It comes when they more prominently can demonstrate their information literacy competency. Something we all, librarians and faculty, have to continue to work towards and something we believe that we have successfully achieved in the two cases described above.

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Abstract

A Framework For Developing An Assessment Tool Of Enterprise Resource Planning Systems (ERP) Used In Intro ERP Business Courses.

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ABSTRACT

This study focuses on the development of an assessment framework tool for improving ERP student's comprehension of ERP applications that match industry requirements. This paper illustrates how to improve student knowledge and assist the teacher in better understanding their students' mastery of ERP by using an Industry-Based assessment framework tool. The research completed in this study, including the review of literature supports the idea that there is a need for a more complete assessment of ERP skill sets and that these skill sets should best represent industry needs. We propose that an assessment framework tool can incorporate in the ERP education agile practices to improve teaching effectiveness and facilitate learning of critical concepts. The essence of this model will attempt to concentrate on literature review and data collection.

1. INTRODUCTION

A number of companies that create and market ERP systems have initiated arrangements with universities to incorporate ERP concepts and techniques into business classrooms in efforts to better prepare the next generation. There is a strong demand in the market place for students prepared with ERP knowledge and skills. We propose that an assessment framework tool can have a significant positive impact on the outcome desired. The focus of this paper is to describe how an assessment framework tool can be used to improve student understanding and assist the teacher in better understanding their students' mastery of ERP.

This paper proposes that there is a need in academia to evaluate the methods used for effective teaching of ERP concepts using ERP software in the classroom that should reflect best practices of industry. *An increasing number of business schools are using software employed in business practice in an attempt to teach business process.* (Wagner.,

2000) (Corbitt & Mensching, 2000); (Nelson & Millet, 2001)

A framework for an assessment of ERP in the classroom is not currently available. The researchers will attempt to build a consensus from previous literature research reviews, interviews, instruments, questionnaires and focus groups to derive an overall understanding of the key aspects and factors of ERP Assessment. The process will be done utilizing the agile methodology. The focus will be on expected benefits of ERP assessment based on skill set of students from industry requirements.

Having ERP in the classroom provides an opportunity for academic entities to develop a competitive advantage over competing schools nationally and internationally in preparing students. The review of ERP enterprise systems assessment in the current literature is limited and many papers recommend this area for further study as seen in the call for future research from Fedorowicz, Gelinias, and Usoff paper titled; "Twelve Tips for Successful Integrating Enterprise Systems Across Curriculum" They state: Little research has been published that measures the effects on students understanding of course material and their broader knowledge of business issues. This paper proposes that an assessment will allow for greater, more effective and efficient results in evaluating the teaching and learning of ERP in business classes.

2. ERP In Academia

Using the ERP software in the classroom can help students learn skills and provides a better understanding of the way functional areas in business are dependent on each other for accurate and timely information. *There are numerous*

reports about the integration of ERP software into undergraduate business curricula and about the potential value of such initiatives in promoting cross-functional understanding of business processes. [1] (Becerra-Fernandez., 2000) Today corporations solve business problems using technology to connect business processes and functional areas.[2] (Kobayashi, 2003). Bringing ERP (Enterprise Resource Planning) software into our classrooms has allowed us to provide our students with the most comprehensive software that is used in our local industries.

ERP Systems have become so widespread that they are difficult to ignore, if academics want their teaching and research to be relevant [17]. (Scott, 1999).

3. Assessment Critical

Because of academic and industry arrangements students are able to develop ERP skills that are highly valued by industry recruiters. This ERP experiential learning experience strengthens the students understanding of business and computing concepts, principles and decision making. There are different types of ERP manufactured software systems available for students to learn in various university disciplines representing functional areas within a company. Using ERP in the business classroom enhances the credibility of the business school in the eyes of industry. If the ERP system package is used worldwide it contributes to attracting foreign student's interest and provides significant potential for recruitment for traditional and online forums.

The partnership between professors and industry leaders in creating, redesigning and assessing the input, process, output and outcomes creates a benchmark for success. This is why assessment is critical to helping academia stay in range of industry accomplishments not at the "glacial pace" of yesteryears. There however does not appear to be a universal assessment or standard framework for confirming the successful objective of matching outcomes with industry needs. Accordingly, each academic entity will have to evaluate their local industry needs and assessments should reflect these needs because they will be different based on the territorial differences of industries represented. Industry needs will vary so should the academic offerings.

We propose that an agile approach to content delivery offers the best possibility for academic success for students, and any assessment framework must be structured from this perspective.

4. Agile Content Delivery

Agile methods will allow for the adaptation of both internal and external entities, deliver high value and functionality on a regular basis and build on continuous inputs with

feedback and check points. Agile methods of course content delivery will be an important component in successful learning outcomes. Consequently, although the goal of this assessment is to structure a framework for industry-based outcomes, we believe that agile pedagogical methods are important for achieving these outcomes. Agile methods have been used in different types of projects and lean manufacturing in ERP is considered in industry. The study reviews the agile approaches to assessment in education verses the traditional assessment approaches. We attempt to use agile principles in this assessment framework including lean, flexibility, and agility. The framework proposes the assessment model to be lean in the elimination of wasted time and resources in gathering data and information required. With the ever changing business environment this assessment will allow for constant changes in industry needs by being agile and lean. The framework assessment tool will include students and instructor's communication, feedback and a comprehensive adaptive toolset that will be most efficient and productive in meeting the goals of the requirements.

Scrum is an agile process that can be used to manage development using iterative and incremental feedback mechanisms. Using inspection and adaptation to attain goals with transparency engages everyone in identifying obstacles [26]. The student activities would be completed in iterations with constant feedback. These daily or weekly meetings with students during class time are to communicate the status of their progression which is part of the inspection process. Students will present on what they have accomplished since the last class, what they will accomplish before the next class and what obstacles are in their way of meeting these goals. Students convey comprehension of activities in assignments, exercises, tests and reports per the course syllabus.

As with the agile model, feedback is an important component of active learning methodologies. This "learn-by doing" aspect of active learning, activities that incorporate student participation in instructor-guided hands on activities, allows for feedback to the instructor to determine understanding of this material.

The Scrum agile principle of urgency (in submitting assignments), sharing (student pairing) and communication (instructor-customer feedback) provides a good choice for managing classroom activities. This would be mirrored in the creation of the assessment tool by acquiring data information from industry through the measure previously described that would include urgency, sharing and communication.

Planning, coordinating and communicating within the class for both student and instructor provide control through inspection and adaptation. The short bursts of hands on work by students are created and build upon as in a backlog of required submissions. The inspection is based on the class test, exams and exercise that review previously acquired knowledge in a unit type test scenario specific to the functional submission.

The core principles of XP that would apply [27] in this situation includes the planning game scenario where students would produce the maximum value of work featured in the assignments. Students would through their completed assignments help instructors develop estimates of how long each assignment would take for full comprehension. These small releases of work by the student in completion of the progression time line based on their simple design will incorporate continuous testing until full understanding is obtained. Pairing of students is critical for speed of this hands-on learning in the production of acceptable assignments on time. The XP values of simplicity, communication and feedback are critical to the success of this tool. Having the instructor (customer on site) allows for continuous access to requirements in accordance with the fulfillment of the course objectives. Similarly in surveying industry (the other on site customer) for the assessment tool data we will have access to industry standards. The valuable nature of industry input in small iterative increments continually allows for the most comprehensive agile assessment available of this database acquired skill sets for our students. Utilizing refactoring in the classroom to modify or restructure exercise, assignment and material based on student understanding achieves agility. Having information radiators throughout the course, introduced as a solid theoretical framework in Agile Software Development by Alistair Cockburn [29], will display critical information requirements to fulfill the objectives of the class. The display of this critical information is in the form of the course schedule requirements and syllabus, for everyone to see as often as needed. In the syllabus and course schedule the backlog is described in the form of small sprints of required activities that build upon each other and completion of those ahead cannot occur without fulfillment of the backlog. The goal setting of students completing these sprints (exercises, assignments) is the most critical success factor. The exercises, assignments, sprints or tasks that can be considered as stories are created to initiate critical thinking and decision making opportunities for better understanding. Preparing for the next story, sprint, exercise reduces waste. The stories are completed in entire themes representing functional areas activities in a module. Smaller stories are estimated within the functional areas to encompass the entire theme.

The benefits of combining XP and Scrum in this agile framework development include [28] the control mechanisms of Scrum and the scalability of goal directed iterations. This model will illustrate how agile practices can influence the nature of the outcome.

The proposed assessment will include the evaluation of agile content delivery methods which would embrace industry change and be flexible to changing material used in student comprehension of concepts and theory. The assessment is created based on a plan driven by activities the students complete in the class lab that builds upon each other. Both the class activities and the creation, formation of this framework assessment tool are proposed using the agile principles.

5. Agile Student Learning and Framework Tool Assessment

The Agile Manifesto areas specific to this framework will include identifying individuals and interactions over processes and tools. In efforts to be most effective and efficient in facilitating learning, the focus is on how the student comprehends the progressive steps and what pedagogical methods are successful. Students will be engage in learning the ERP concepts via the syllabus specific to the course but this syllabus will be in accordance with the interactions and completion of the module requirements. While growth for students will be in the interaction with the instructor the agile assessment configuration will be based on responding to customer feedback (the industry) rather than following a plan. The agile specific components of this framework would illustrate how the instructor and students welcome and adapt to changes during the semester. Agile pedagogical methods use problem solving and successful response to change as an opportunity to facilitate learning and better develop marketable skills in the students.

The course structure requires from students, working deliverables (module assignments) over short periods of time, repeatedly during the semester allowing for frequent feedback. Instructors guide problem solving by the students experimentation in decision making. There is an iterative requirement of exercises due periodically that provides confirmation to the instructor that the student comprehends the activity they just performed. These submissions are the primary measure of the student's progress in completing modules assignments required. The systematic description of the knowledge progression timeline of student required activities for the entire process is described as a road map or knowledge progression timeline.

Students are required to pair with each other or form small groups to work on their module assignments resulting in better understanding for both involved. In this cooperative learning environment students actively seek guidance from the instructor and paired partners resulting in the skill sets needed for life-long learning. In designing specific module exercises and assignments problem solving, opportunities exist to prove technical competency that enhances learning.

Understanding the problem and coming up with a solution using the database is essential. After each functional module assignment completion of regular intervals, the students and instructor reflect and offer feedback on how to be more effective. All stakeholders (industry) shall adjust accordingly to the goal of capturing what best practices in industry should be the measured against the students skill sets acquired in the ERP class.

Much of the research has shown a strong association between heightened student learning and formal and informal faculty student interaction and contact. [31]

When students are actively engaged in the college experience, learning and retention are more likely [32].

6. Agile Teaching Objectives

Agile teaching incorporates constant communication and feedback between students and the instructor with the flexibility to respond to the dynamics of changing student needs. This allows for a goal driven relationship as opposed to a plan-driven contractual relationship as seen in more traditional delivery methods.

By its very nature, the use of ERP software in a business is such an inherently hands-on environment, that agile content delivery methods are almost a necessity. We expect the results of any assessment to reflect that the use of agile methods in such cases will be superior achieving learning outcomes.

In the study, "Evaluating Agile Principles in Active and Cooperative Learning" [30] the authors review of the literature on "*agile and active/cooperative learning literature showed parallels between the utilization of agile methods in teaching (pedagogical methods) and active/cooperative learning techniques commonly found in the education literature. They propose that each of these components complements each other, and that using agile methods of delivering the material combined with active learning activities, leads to improved learning outcomes and higher levels of student engagement and satisfaction*" [30]. As described in their paper we will also explore the use of agile principles in the development of pedagogical activities to facilitate learning by mapping the ideals and principles of the Agile Manifesto to pedagogical methodologies. We too will use our framework to suggest practices that can make ERP teaching more agile and, therefore, more student-centric and effective.

7. Objectives of Framework

The objective of this study is to 1) Structure a framework to assess the success of industry-based student learning outcomes in ERP training and 2) Determine the degree to which agile teaching methods contribute to this success.

The study will provide evidence of the need and purpose of agile methods in ERP training. Using a value added consideration, the formative would assist instructors in determining how to improve and the summative would provide information for decisions on instructor/student performance. The study would reveal measurements and guidelines for meeting the needs of our students in obtaining best practice skills similar to industry. The assessment will be consistent with course objectives, learning outcomes and appropriate student educational goals. The framework will include course program educational objectives, student outcomes, performance criteria, and evaluation.

A framework objective would be to identify a clear skill set that takes advantage of the technical and knowledge management skills acquired from ERP courses relative to business process and analytical comprehension. Preparing this in the form of clearly defined stories from the customer (industry) should make it more successful.

The students will acquire a mix of managerial and technical talent necessary to compete in the workforce. The purpose would be to prepare the student to contribute to an organization through continuous delivery of course components that reflect competence of the material. These competences would be derived from the industry feedback previously described.

For this assessment framework we would include the input, processes, outputs and outcomes of ERP in the classroom. The assessment of inputs and processes in this study will establish the capability or capacity of a specific program or course. The assessment of output will serve as an indirect measure of effectiveness in using ERP. The assessment of outcomes will provide for direct measurement of the effectiveness of what has been done with that capability related to individual student learning and growth. The benefits include full time employment opportunities for recent graduates and would include an ERP program that will elevate enrollment of internships, on site seminars, workshops, training and will build industry ties. [16].

The framework will include the F.A.M.O.U.S assessment model in using knowledge management (KM) and data driven decision making (DDDM) based on a needs analysis. Included will be qualitative data received including learning objectives, validated student instrument [18], validated industry instrument, results and decision considerations which will lead to the cycle of continuous improvements.

The hypothesis could potentially include based on the outcome of this study, the negative effects of not having and ERP assessment. This research poses the question whether an ERP assessment framework would create a more effective and efficient process of matching industry demand with student acquired knowledge and skill sets. Having clearly defined goals for this assessment will provide a better chance of the success of this study. Goals that are specific to industry requirements and student preparation.

We began this research with a number of exploratory interviews in an attempt to better understand the issues prevalent in ERP assessment in business classes as well as avenues of assessment used in academia. The study will include Focus Groups Discussions (FGD) and In-Depth Interviews (IDI) of industry professional and academics.

The collaborative nature of this project with students and industry (both customers) and the parallels between agile software development and active learning, values students and teachers interaction in accordance with the need in industry for these ERP prepared students. To assess if we are currently offering this type of end product is the kernel

of this investigation. The results will be based on this empirical and experimental research study proposed.

8. Industry Input for Agile Assessment

Most research on ERP in the classroom is the results of remarkable strides SAP has made in academia and what has been received with the inception of using the Visual Info product in the ERP Intro classroom at Farmingdale State College (FSC).

There is a great demand in our industry for students that come prepared ERP skills as indicated by local industry responses. Their preparation and capability to immediately use ERP has proven favorable to the local workforces as exhibited recently at the ERP Alliance Networking Event at FSC.

The input for the empirical and experimental study will be based on the agile principle similar to what is being used, considered and practiced in the ERP course referenced herein. There has been industry input as referenced below. Based on responses stories will be created with iterations. Interviews have been completed and more are scheduled, additional surveys will be completed, focus groups will be conducted with feedback and direct measurable correlation to assess student's skill set requirements compared to industry needs.

We first started with surveying the current industry market about their ERP use. In collaboration with the APICS NYC-LI ERP User Group, <http://www.apicsnyc-li.org/resources/forum.html> [33] of which the writer is a committee member and committee founder, a survey was submitted to local industry, titled APICS ERP Planning Survey which requested answers to 12 questions about local industries ERP experiences [30]. This survey included questioning the local industry about their ERP use including,

- their size,
- industry type of company,
- job function,
- number of locations,
- where locations are,
- at what stage they are with their ERP implementation,
- which ERP system they use,
- how long has their ERP been up and running,
- their cross-functional collaboration identifications,
- identifying critical functions that are actively involved in the development or continuous improvement of the ERP system in their organization,
- what the three biggest problems they have experienced with their ERP system, factors of their ERP software, and

- how they did or will measure the ROI (Return on Investment) for their ERP system?

The results indicated a vast difference in experiences. These questions and answers provided give way for the foundation of the new industry survey titled, "ERP Skills needed by College students for job opportunities in Industry". This additional survey will be created and conducted about ERP student skill sets need for opportunities in the workforce. The writer is the executive vice president of the APICS NYC-LI Chapter, (Association of Operation Management formerly known as the Association of Inventory and Production Control, in existence for 50 years) <http://www.apicsnyc-li.org> [34] and has access to industry entities to help facilitate this information. This avenue of assistance is critical in performing these tasks to best represent industry information.

Collaboration between industry, academia and APICS is strikingly important to this author.

Industries involvement is critical to developing curriculum and hands on activities in the classroom that best reflects what student will be doing when employed in the workforce. That is what has occurred in this ERP course at FSC. In collaborating with industry on design of curriculum and classroom activities she believes she is getting closer to identifying the true needs of industry for ERP prepared students.

Industry has recently validated the works of this ERP class by awarding the BUS313 course at FSC with the prestigious Progressive Manufacturing 100 award for 2010, <http://www.managingautomation.com/awards>. FSC is the only academic in the winner's category. "The Progressive Manufacturing idea has captured the spirit of an industry that is in the throes of dramatic change," says David R. Brousell, Editor-in-Chief of *Managing Automation* and a Progressive Manufacturing judge. "Innovation, invention, and new ways of thinking about the business of manufacturing are picking up steam everywhere. The expansion of the Progressive Manufacturing Awards Program pays tribute to this important trend." [35]

9. Conclusion

The goal of the assessment framework is to validate what is done in the classroom, determine what needs to be taught, and how it is delivered, determine learning outcomes and determine how the resulting student skill set closely represents and reflects the needs and expectations of industry.

This framework will enable instructors to know that in the preparation of their courses, lectures, exercises and assignments they are compliant with a standard which best meets industry practices. All students who take an Intro to ERP class in Business Management should have the same or similar qualifications as they apply to and start working

in industry. That regardless of the manufacturer of the software or the university the outcomes should be the same.

The literature, experiments in the class, surveys, interviews and focus groups will attempt to support the hypothesis and questions posed in this study. The framework is being built based on the literature, class activities and industry responses to what is perceived to be needed. This research seeks to build a framework for being more efficient and effective in the assessment of ERP learning and teaching in an Intro ERP course.

The data along with the literature used to support this hypothesis brought forth the need for this assessment framework tool. The model proposed utilizes agile teaching methods as a basis for an effective and efficient process for gathering and analyzing data that will lead to better prepared students and instructor lead courses.

The practical application of this assessment could potentially benefit universities, students, professors, software manufacturers and industry.

We desire to establish that this framework for assessment will improve the ERP learning and teaching in Business ERP introduction courses through the development of this tool using agile methods represented herein.

The culmination of the aforementioned efforts will bring about a standard for ERP assessment that is absolutely essential for the work of this author. This work is seen as a crucial part of identifying, confirming and justifying what should be taught and learned in an ERP Intro course that best represents industry needs.

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Engineering Computer Games: A Parallel Learning Opportunity for Undergraduate Engineering and Primary (K-5) Students

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1. INTRODUCTION

There are few professions that are shrouded in more mystery than engineering. When questioned about the role engineers play in society, most people will answer with generic comments such as "They build things," or "They design stuff." The specific challenges faced by engineers are much more daunting than just building or designing. Each day, engineers must quickly find optimal solutions to problems while using the least possible amounts of time and other resources. Engineers will play an increasing role in mankind's ability to thrive in the 21st century as our global resources continue to be stretched.

Our global economy needs the skills of engineers more than ever before, but the general population continues to be confused about what engineers actually do. Most secondary school students and most engineering freshman would find it difficult to describe an engineer's job. Throughout the country, many schools are giving more attention to pre-engineering education. However, most of their focus is on secondary students, and many of these individuals have already decided on educational goals and career paths. Few resources have been dedicated to the elementary (5-10 year old) student population, where we have a tremendous opportunity to excite them about the prospects of a career in engineering.

2. HYPOTHESIS

Our College of Engineering is working to revitalize the development of pre-engineering resources that are appropriate for elementary school students. We plan to develop a new array of short computer games intended to teach young students introductory engineering ideas and concepts. The games are intended to be fun but will always include an application focus to help the young students better understand the role and work of engineers in the 21st century.

3. UNDERGRADUATE ENGINEERING GAME DEVELOPERS

To best utilize limited resources, we offered our undergraduate engineering students the opportunity to help develop the games. Their own engineering abilities will be sharpened by reinforcing the skills that they have learned in their engineering and programming classes.

The undergraduate engineering game developers were all students in an electrical and computer engineering (ECE) class: ECE200 - Introduction to Computational Techniques. This class is traditionally taken by third semester students at Valparaiso University. The class is taught in a combined lecture and laboratory format, with approximately twenty-five students per section. Each laboratory classroom has sixteen computers, so students generally have their choice of working individually or with a partner.

The ECE200 class follows a two-semester course sequence of GE100 and ECE110 (Introduction to Engineering and Introduction to Electrical and Computer Engineering, respectively), which are typically taken during an engineering student's freshman year. In these classes, the engineers are taught basic principles of electrical and computer engineering in order to introduce them to the world of engineering. These ideas are further developed in a linear circuit class and a digital logic class, also taken in the third semester in parallel with ECE200.

The intention of ECE200 is to introduce our students to various computer tools that can be used to solve electrical and computer engineering problems. Lessons are taught in PSpice (an electronic circuit simulator) and LabVIEW (a graphical programming language). One of the five objectives of the class is for students to be able to develop new graphical programs using LabVIEW. Therefore, the decision to have the students develop the engineering game in LabVIEW as a final project for ECE200 was a natural fit. Developing the games gives the ECE200 students a chance to further develop and refine their LabVIEW programming skills and reinforces the engineering lessons they have learned in other classes.

4. PROGRAM LANGUAGE FOR THE DEVELOPMENT OF THE COMPUTER GAMES

The programming language engineering undergraduates learn in ECE200 is LabVIEW. It was introduced by National Instruments in the 1980s and is widely used in the engineering and science disciplines.

Every LabVIEW program has two facets. The first is the front panel, which displays all of the user's controls (i.e. buttons, dials, numbers, switches, character strings, etc.) and indicators (i.e. gauges, graphs, charts, lights, etc.).

The other facet is the block diagram, which is the graphical code that determines what the program does. Data in a LabVIEW program travels down "wires" from user controls, through computer functions, and then to user indicators.

Several characteristics of LabVIEW make it an ideal programming language for this project. First, LabVIEW is very flexible. It allows the computer programmers to develop custom user controls and indicators in any size, shape, or format. Second, the language is very simple to learn - a key feature for a first programming language. A complex program can be developed in a very short time using either library functions or programmer developed functions. In addition, the dataflow principles used in LabVIEW make it ideal for students to learn while they are studying analog and digital electronic circuits. In the first five weeks of ECE200, students have been introduced to and have already demonstrated proficiency in using:

1. Standard and custom controls and indicators
2. Library functions provided by LabVIEW
3. Macros or functions (sub-programs)
4. While and for loops
5. Shift registers
6. Case and decision structures
7. Sequences
8. Arrays and clusters
9. Charts and graphs
10. Character strings
11. File input and output

With these skills, a surprising array of computer games can be created.

5. COMPUTER GAME REQUIREMENTS

For their final LabVIEW project (the K-5 engineering game), the ECE200 undergraduate game developers were given the following requirements. First, the game must incorporate a minimum number of LabVIEW features including:

1. Binary, numeric, and string controls and indicators
2. Functions from LabVIEW's library
3. At least one while or for loop
4. At least one shift register
5. Arrays and clusters

These requirements would serve to demonstrate the ECE undergraduate's mastery of the essential elements in any LabVIEW program.

Second, the game must feature an application based lesson related to the engineering course work in the GE100 / ECE110 course sequence. Students were asked

to prioritize three preferred engineering lessons for their game. This was done so that the professor could ensure that a variety of different engineering lessons would be supported by the new games. The engineering lessons included:

1. Ohm's law
2. Linear direct current circuit analysis
2. Digital logic design and analysis
3. Analog circuit design and analysis
4. Power transmission
5. Transistor biasing and applications

This second requirement reinforces earlier coursework and builds a stronger foundation for the undergraduates as they progress through their engineering curriculum.

Third, the programs must meet certain specifications. The games must be instructional and informational. The games must teach players about the selected engineering topic. In order to score well and "win" the game, players must demonstrate proficiency in the lesson. The games must take ten to fifteen minutes to play and be targeted to 4th and 5th graders. Finally, the game must be "fun."

6. RESULTS

Twenty-one students developed a total of ten different engineering computer games. The topics of the games implemented by the students are shown in Table 1. Screen shots of eight of the video games are presented in Figures 1 through 8.

Subject of Game	Number of Games
Ohm's law	2
Linear direct current circuit analysis	2
Digital logic design and analysis	3
Power transmission	2
Transistor biasing and applications	1

Table 1: Engineering game topics.

Several times during the development, students took turns playing "beta" versions of each other's games to provide constructive feedback. Feedback forms were provided by the professor for the student peer reviewers. The review forms were then given back to the student game developers for future revisions. Upon completion, the games were graded by the professor for their LabVIEW programming proficiency, and playability. During the spring 2010 semester, the games will be featured in our community school system's Advanced Learner (Gifted and Talented) program. Additionally, the games will be showcased at our College of Engineering's annual Engineering Exposition

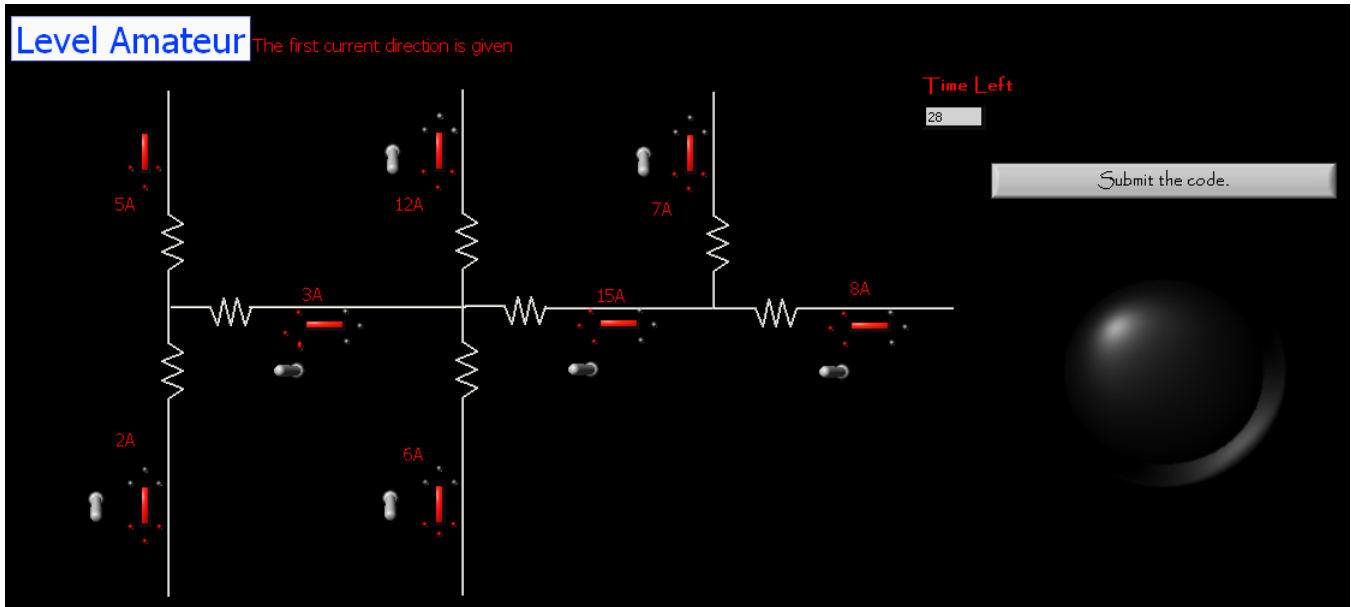


Figure 1. LabVIEW based computer game teaching Kirchhoff's current law.

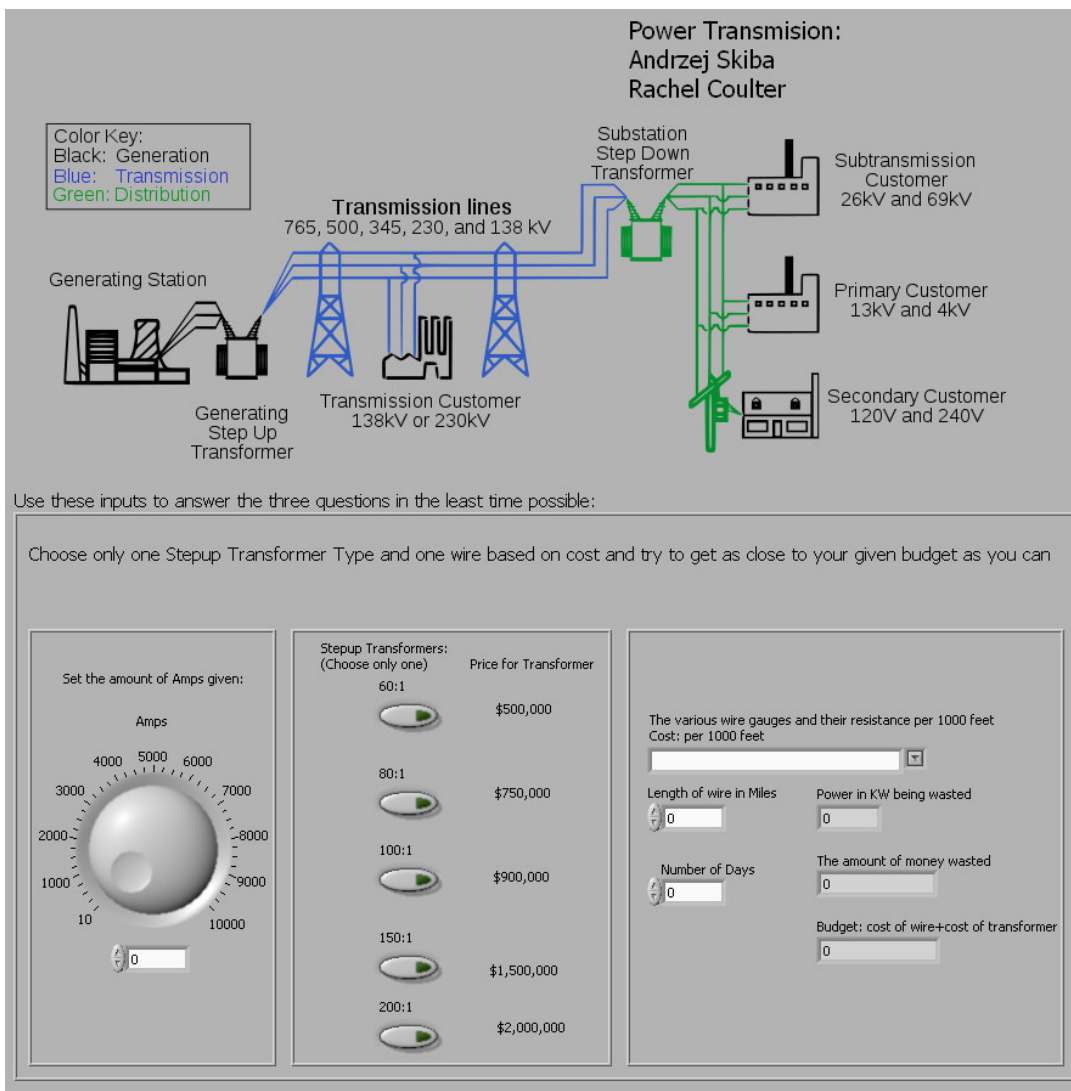


Figure 2. LabVIEW based computer game teaching electrical power transmission.

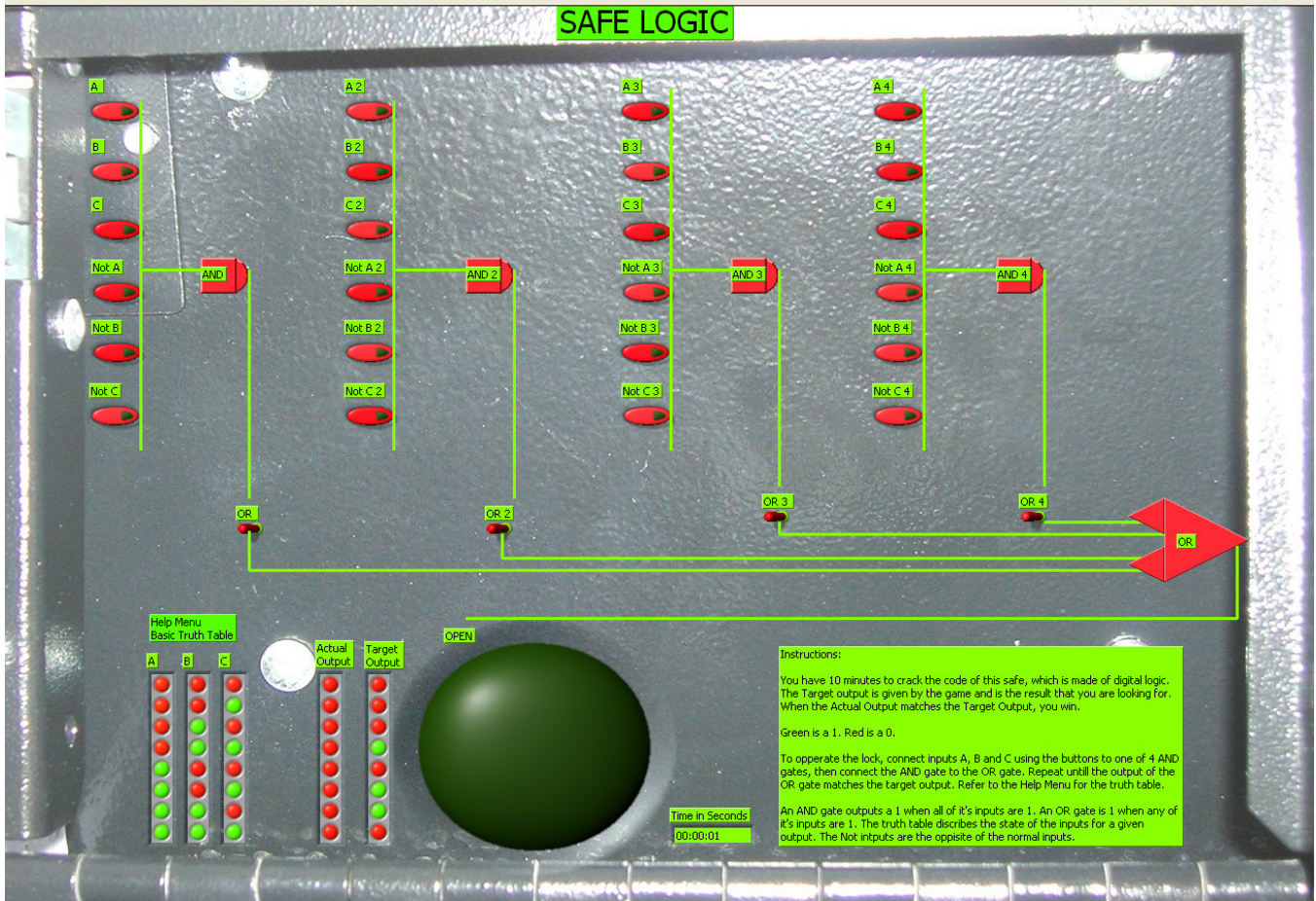


Figure 3. LabVIEW based computer game teaching digital combinational logic.

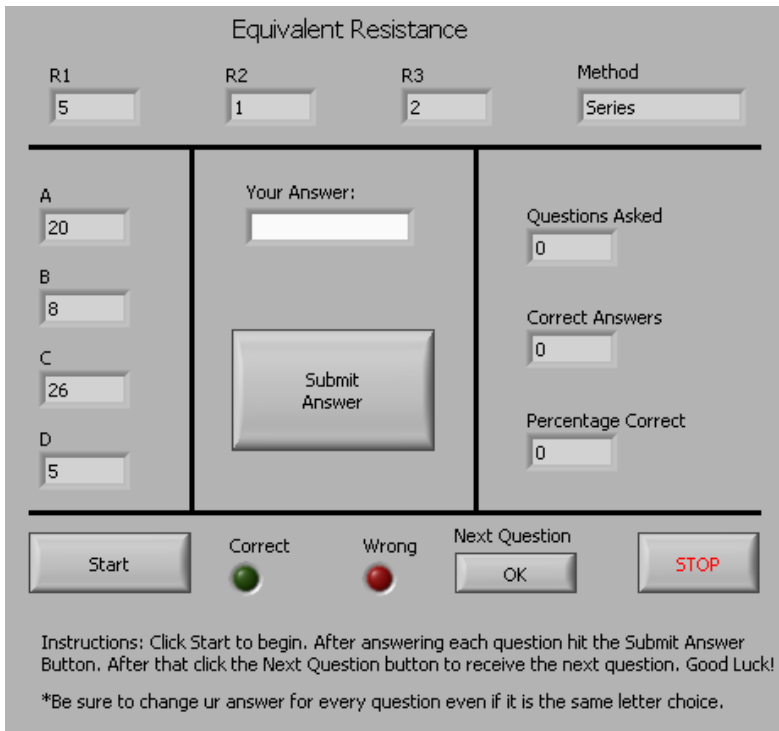


Figure 4. LabVIEW based computer game teaching Linear direct current circuit analysis

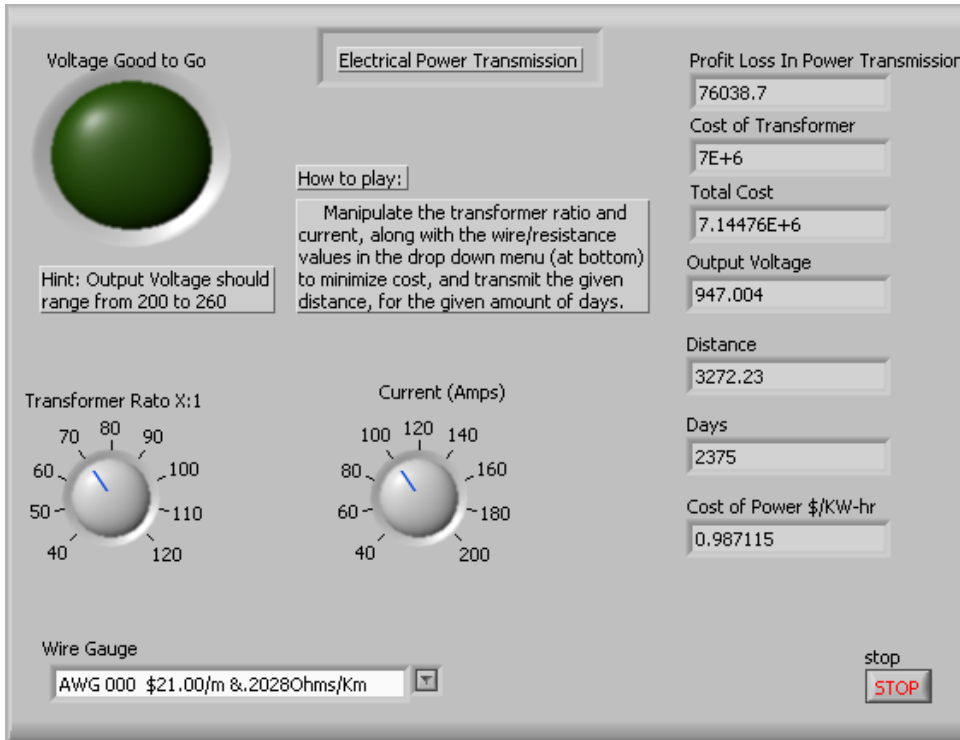


Figure 5. LabVIEW based computer game teaching electrical power transmission.

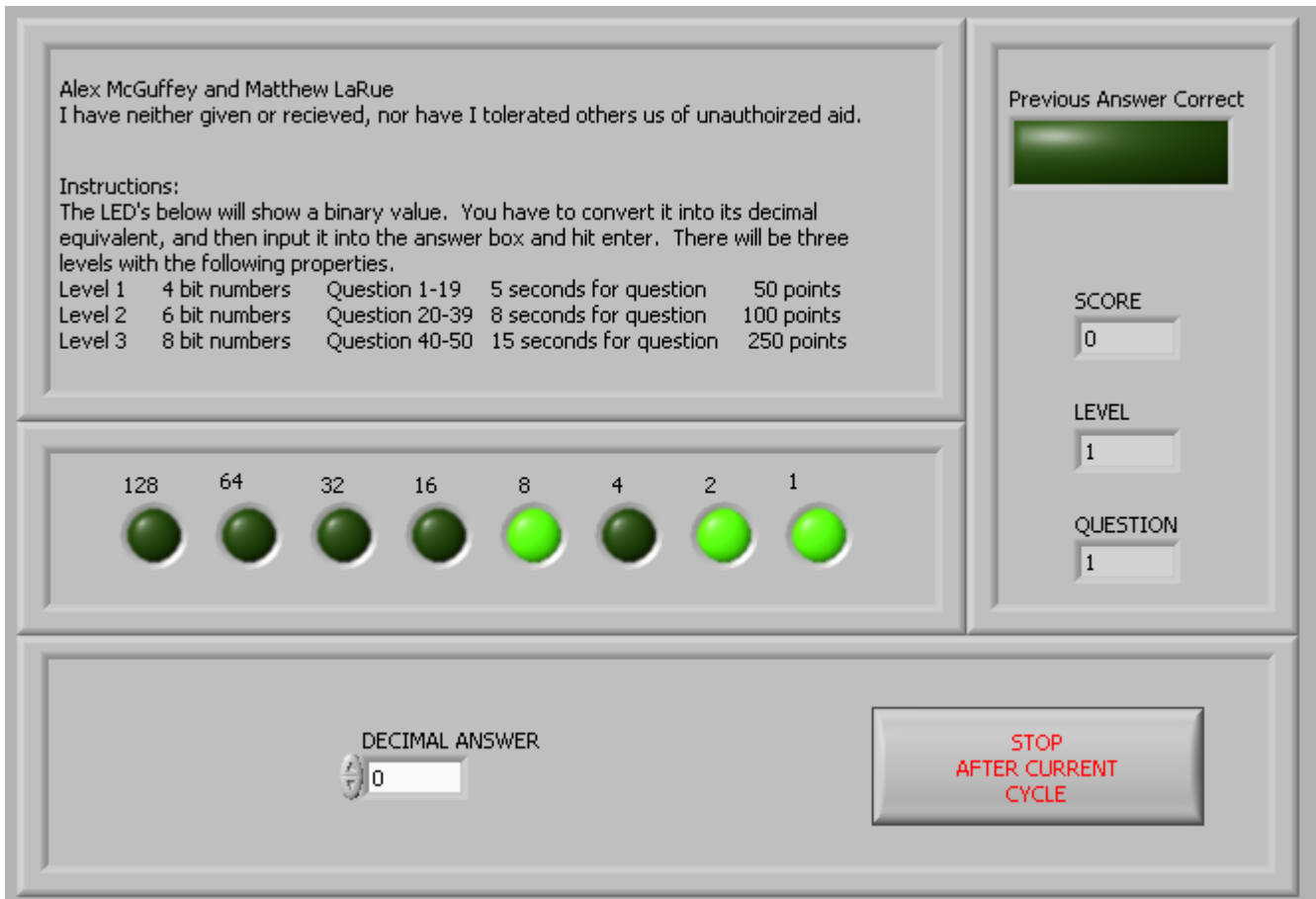


Figure 6: LabVIEW based computer game teaching binary numbers.

Summoning Shenron

Use Ohm's Law to summon Shenron!
 Use the given values in the first two columns to calculate the third column.
 Each correct answer will get you one step closer to granting your wish!
 You must achieve a power level of 1,000,000 in order to summon Shenron.
 You have 20 seconds to answer each set of 3 problems.
 ([Round to the nearest tenth if necessary])
 Make sure to press ENTER after entering an answer.

Voltage = Current Value x Resistor Value
 $V = I \cdot R$

Current Value **Resistor Value** **Voltage Answer**

7 6 0

Voltage Value **Current Value** **Resistor Answer**

42 4 0

Voltage Value **Resistor Value** **Current Answer**

27 2 0

Power

0





Time Left

18

Give Up

Correct

0

Answered

0

Brittany Scherer and Vincent Killion

Figure 7: LabVIEW based computer game teaching Ohm's law.

Countdown to Armageddon

Uh oh, you're a nuclear/electrical engineer that fell asleep at work and accidentally initiated a nuclear holocaust. Hurry up and deactivate it or you'll be known as the guy who ended the world. Adjust the potentiometers to cancel the countdown but be warned, stopping it is much more difficult than starting it. Be mindful of the clock! You only have minutes to make your calculations.

Input Voltage **Potentiometer 2** **Potentiometer 4** **Potentiometer 6**

5 10 10 10

4 8 8 8

3 6 6 6

2 4 4 4

1 2 2 2

0 0 0 0

Potentiometer 1 **Potentiometer 3** **Potentiometer 5**

10 20 10

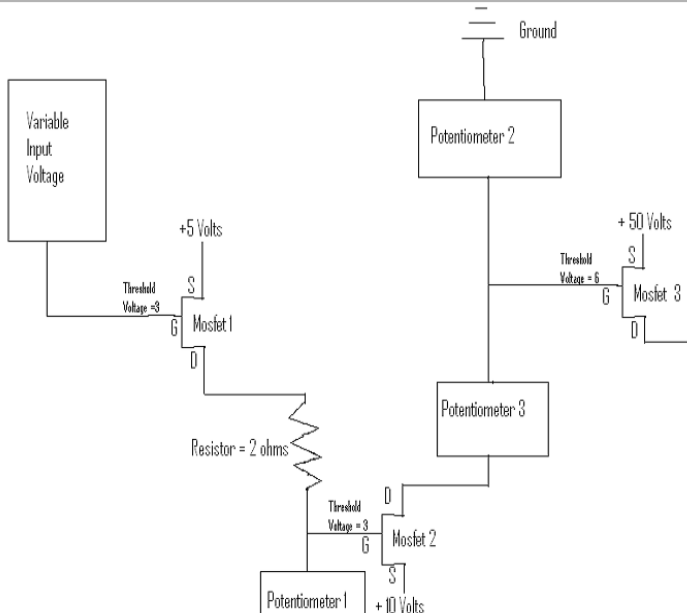
8 15 8

6 10 6

4 5 4

2 2 2

0 0 0



Congratulations, you stopped the countdown, you'd probably get an award if it wasn't your fault to begin with.

Yay, you literally killed everyone!!

A Mosfet is basically a gate, it needs a minimum threshold voltage to open. It has 3 terminals: gate, drain, and source. If the gate receives a voltage larger than or equal to its threshold voltage it allows the source voltage to pass to the drain, if smaller 0 volts pass through the drain. Use your knowledge of ohm's law, $V=IR$, to supply each Mosfet with at least its minimum threshold voltage and stop the countdown.

Hints: only look here if you're stuck or lazy.

For Mosfet 1 merely adjust the Variable Input Voltage to above 3 volts.

Figure 8: LabVIEW based computer game teaching transistor biasing and applications.

MapMyClimate – between Science, Education & People

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ABSTRACT

These days the awareness of climate change is growing. This awareness is nursed by the gradual change in weather conditions experienced worldwide and not least as the result of the COP15 summit in Copenhagen. However, still there seems to be a wide knowledge gap between what science predicts and what common people know and understand.

The MapMyClimate vision is to reduce that gap by making you - as the user - understand how your daily behavior affects the climate, which effects you will experience and further illustrate how you - as part of the community - can act to prevent or reduce some of the climate changes.

The concept is based on detailed visualizations and interactive tools. The starting point is a virtual world where you can move from place to place, combining different climate or environmental scenarios, investigate effects based on your daily choice of living, participate in blogs and share experiences and ideas.

MapMyClimate was originally developed as a communication platform between science and the common citizen, but recently, and with success, primary school kids have tested MapMyClimate as part of their mutual climate understanding. This paper focuses on the MapMyClimate case-story and describes the vision and the solution behind MapMyClimate and further discusses the experience gained from applying it in primary school teaching.

Keywords: Climate change, interactive education, climate effects, carbon emissions, edutainment

1. INTRODUCTION

The focus on climate change and resulting effects is increasing – and this seems to be worldwide. To many people the climate change has become part of their daily life, but how does the majority of the population relate to climate changes? Where are they ready to actively make a difference? And do they know what to do?

MapMyClimate is an Internet platform where you can investigate how your life and that of others affect the climate change and where the impact is illustrated in your neighborhood.

Stories of sweating polar bears and intangible quantities such as ‘the amount of CO₂’ are often used to demonstrate the impact of climate change. These are events far from your daily life – both physically but also to some extent mentally. At the same time a great part of the western world is aware of the climate and environmental changes, but lacks access to information and knowledge of the link between personal behavior and the changes we hear about daily.

The Chinese philosopher Confucius said: *“I hear and I forget. I see and I remember. I do and I understand”*.

‘To see’ and especially *‘to do’* are central elements in this climate platform. Hence, we hope to take exactly that step forward in the climate dissemination, which actually makes people understand how their own and others way of living links to climate changes.

2. WHO ARE THE USERS

MapMyClimate is aimed at everyone interested in the consequences of climatic changes – how the changes affect our everyday life and our city, and how we can contribute

to reduce the release of CO₂. The primary target groups for the platform are the 'almost green' groups, especially families with children. Already many families with live-in children are aware of issues related to the environment and climate changes, but they lack clear and easy accessible information on the link between climate change and their own behavior.

MapMyClimate was intentionally developed to meet these users, seeking information about:

1. Links between life style and climate change?
2. Which predicted effects will occur where the user lives, and make him/her obtain qualified knowledge to make sustainable energy-/environmental dissensions?
3. How will the political dissensions at meetings like COP15 change the future?

changes. Nice that you get hold of students, where they are." Quote: 5th. grade teacher at Fuglsanggårds School.

3. THE CONCEPT

The concept is based on graphics with a photo background and interactive 2D/3D maps – taking a starting point in greater Copenhagen, see Figure 1. These maps show local neighborhoods in great detail allowing citizens to experience their own immediate environment, and by entering simple data into an interactive profile, the user can see the effect of his or her behavior. Hence, MapMyClimate gives the user the possibility to compare climate behavior internationally and visualize the effects locally, if everybody acted similarly to him or herself.

The platform includes some of the latest climate impact calculations produced by research institutes in Denmark including DHI, Danish Technical University (DTU) and



Figure 1: Example from the 3D city model as it is implemented in MapMyClimate. Data provided by BlomInfo A/S.

However, children and young people of today are active 2.0 'webizens' using the Internet both in school projects and as a daily communication channel with their friends. It is therefore imperative to raise awareness of the climate problem in this group through a medium that is familiar, interactive, informative and fun to use. MapMyClimate intends to fulfill these criteria, which is the reason why MapMyClimate also has been introduced successfully to 5th grade primary school kids, e.g. : *"They (Ed: The kids) got better understanding and more concrete pictures on climate*

National Environmental Research Institute (NERI). These institutions are all world leaders in the field of predicting the impact of climate change and are therefore essential partners. Their calculations show possible consequences of the climate change, in e.g. the greater Copenhagen area over the next 50-100 years. These calculations are derived by computers based on mathematical models describing various natural phenomena.

Furthermore, the platform has been developed to give access to time lines, graphs, icons, video-clips including expert comments and animations of different scenarios as well as stories relating to people around the world. However, this work is still on-going.

With MapMyClimate we aim at creating a user-friendly and entertaining – but scientific founded – tool which allows the user to understand own behavior and political decisions.

The platform is developed focusing on environmental and health issues related to climate changes. It will allow stock holders to visualize and communicate specific projects/ politics, as well as our continuous work to expand worldwide.

- Work targeted towards communication developments of a virtual space through citizens involvement.
- Create a platform where people can get information on climate change impacts on their neighborhood and themselves through the principles of familiarity and proximity.
- Create a platform for visualization of the effects of different behavioral changes in areas such as traffic, air and water.
- Create an accessible platform that can be used for communication and dialogue with the public on issues related to environment and health.

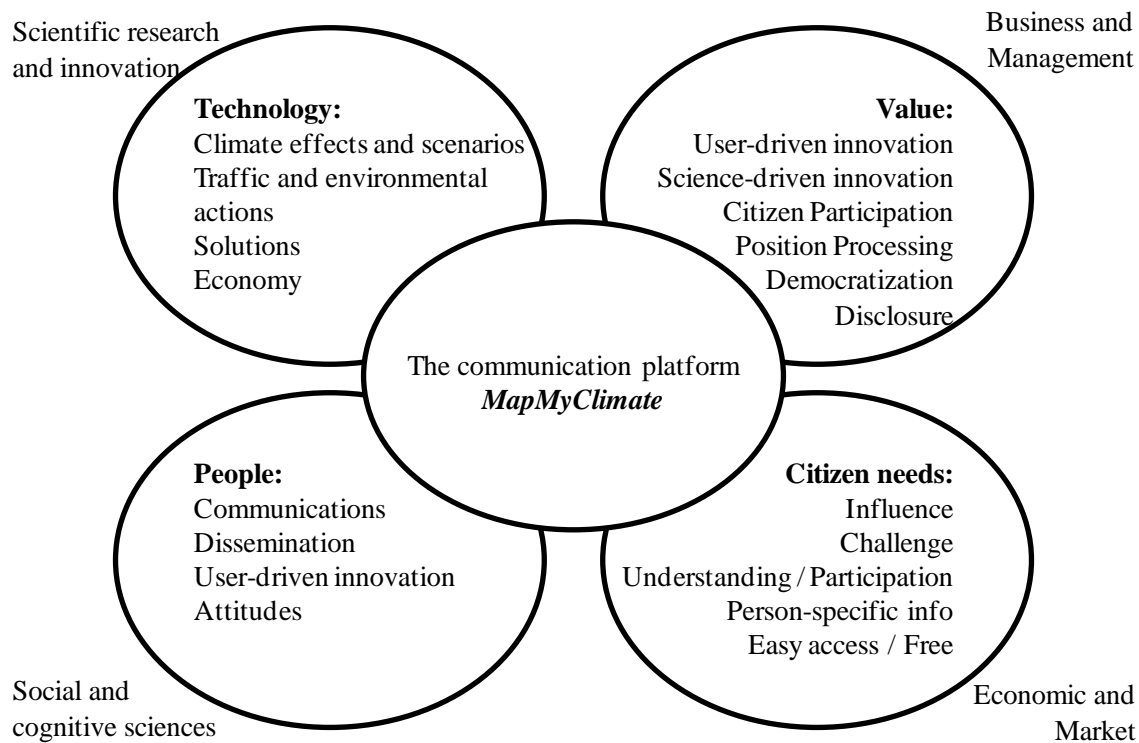


Figure 2: Schematic description of how the communication platform MapMyClimate is conceived as part of natural science, social and cognitive sciences, business and economics and market.

The MapMyClimate development was funded by the Danish Agency for Science, Technology and Innovation and co-funded by the participating partners: DHI, NERI, DTU, BlomInfo, Minard Design, Morten Kvist, Monday Morning, Microsoft and City of Copenhagen.

4. COMMUNICATION, VISUALIZATION & DISSEMINATION

Based on the 2D/3D description the purpose is to:

5. TECHNOLOGY AS ONE CORNERSTONE

The knowledge institutions (DHI, NERI & DTU) in the project are classic technological institutions with the technology in focus. Society is changing constantly, and the technological solutions have become so complex that one needs to involve many aspects other than technology.

Instead of placing technology in the center, it is now only one among several cornerstones of MapMyClimate, see Figure 2.

6. INNOVATIVE ASPECTS

MapMyClimate is the foundation for a continued innovative development in which users' needs for knowledge and influence is contributing factors to focus on the effects and solutions. It is new to scientific and technological institutions, enterprises, focusing on attitudes and dissemination, as well as global players with a focus on values and market.

1. A climate barometer
2. A series of interactive pages about lifestyles and CO₂ emissions
3. A climate impact column

The Climate Barometer

The climate barometer, illustrated on the left of Figure 3 under "scenarios", is crucial. Here the user can always see how the climate will change from a number of assumptions on the greenhouse gas emissions. The location of the

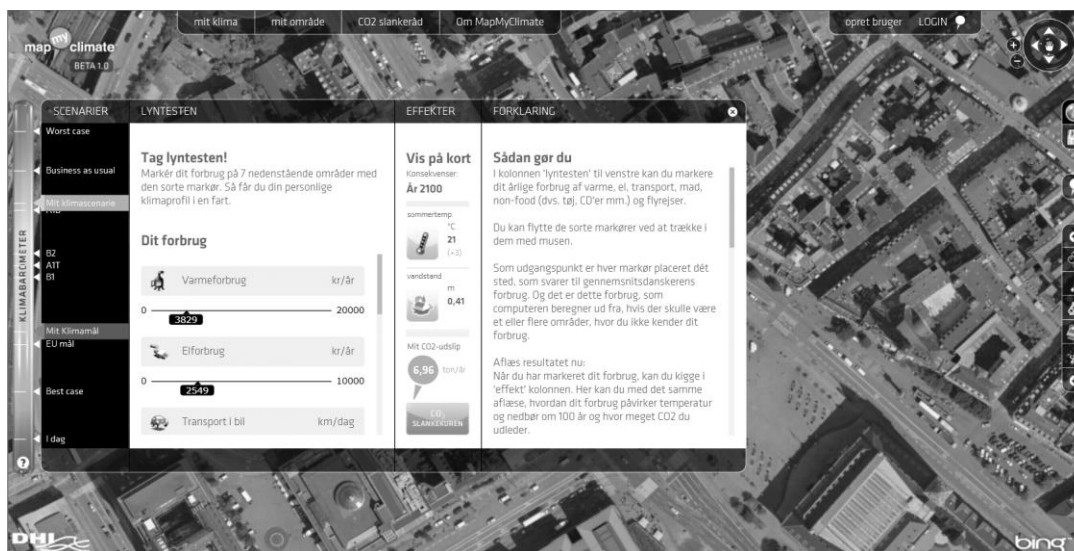


Figure 3: The main elements in MapMyClimate

In addition, the innovation falls in several other categories. This applies to both dissemination and dialogue. Dissemination of science to layman and dissemination of user interests is an integrated part of the project process.

This also applies to communication channels. From a scientific perspective, it is entirely new roads for a substantially larger audience - roads that are applied without the scientific message being deteriorated.

It has been a complex task to complete, but it has succeeded mainly because of the interdisciplinary collaboration, which by the participating partners were to focus on the platform and the recognition of and respect for each other across the disciplines.

7. THE IT SOLUTION

The MapMyClimate solution is built around an Internet platform. The platform is generic and can be expanded to handle a wide range of climatic and environmental data. Currently, MapMyClimate builds on a number of key elements, see Figure 3:

barometer is calculated as the expected future global warming based on calculations from the International Panel of Climate Change (IPCC).

As shown in Figure 4 there is a very high degree of linearity between the cumulative emissions of greenhouse gasses and the climate effects, when based on the IPCC's work. MapMyClimate is based on these assumptions.

It should, however, be emphasized that obviously there is a considerable uncertainty about the IPCC's assumptions. The final link between consumption and climate effects are still discussed.

The IPCC predictions though may still be the 'official' and most worked through predictions presently available, which is why we have chosen to use them in MapMyClimate.

Interactive approach to life and CO₂ reductions

The idea is to get the user to experiment with his/her own life in order to achieve an understanding of which factors affect the climate. Figure 3 shows the 'quick test', which is

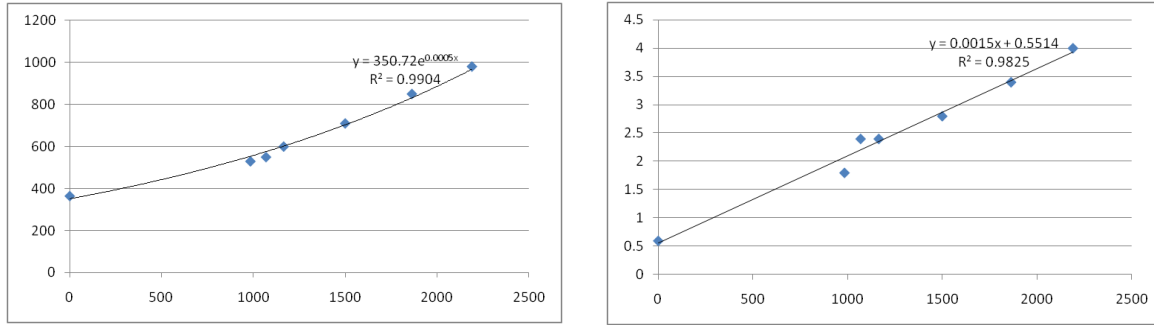


Figure 4: Illustration of the correlation between the estimated cumulative greenhouse gas emissions over the next 100 years in GTC (Giga tons of carbon) and CO₂ in ppm (parts per million) in the atmosphere (top figure) and the global rise in temperature in Celsius (bottom figure) [1].

included in order to gain a quick overview. However, it is also possible to take a more detailed test and get a more correct picture of the individual consumption compared to e.g. sea level rise.

Once the user changes the settings, the result can be read as a changed climate scenario on the barometer, i.e. “My Scenario” changes position, see Figure 3. In addition, the figures in “My CO₂ emissions” changes likewise as well as the effect figures, see the effect column. Thus, the user can get an idea of which actions are effective, and which may be deployed.

A climate impact column

As depicted in Figure 3 there is also an effect column. Here the opportunity is to compare the way one lives with the potential local climate effects. The current effects included are precipitation, summer temperature and sea level rise. Like “My climate scenario” changes, the effect also changes simultaneously when the user changes the settings in “quick test” or the “detailed test”.

In addition, the climate data are included on the map. Thus, the user has the possibility to see the climate effects locally, see Figure 6

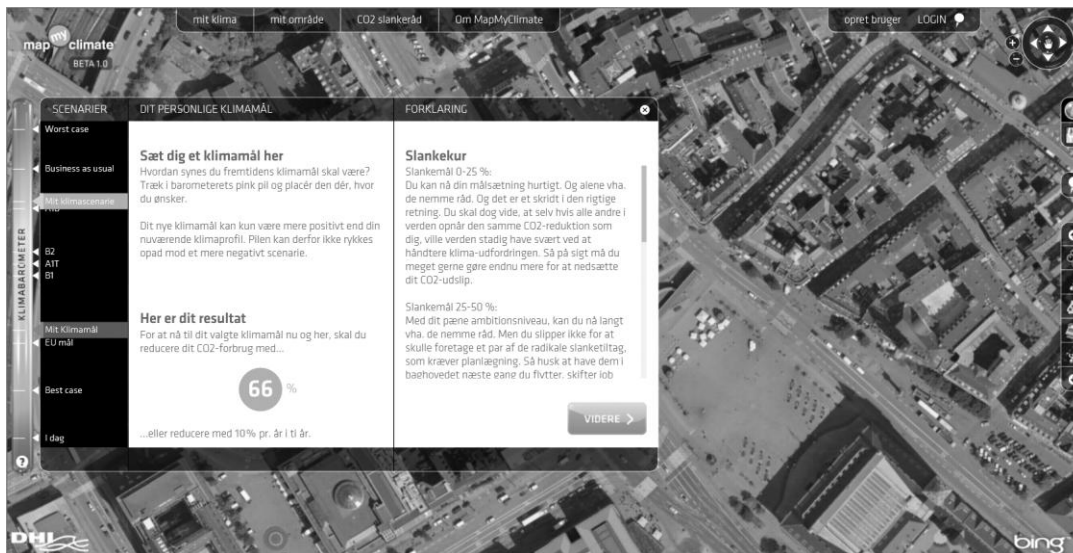


Figure 5: Illustration of the main elements of the CO₂ diet.

Similarly, it is possible to implement a CO₂ diet, Figure 5.

Here the idea is that the user picks a climate target. In Figure 5 the target is set to be close to the EU 2 °C scenario. The user can then see what it takes to achieve the different political objectives, and MapMyClimate posts a number of CO₂ reduction advises.

8. MAPMYCLIMATE APPLIED FOR SCHOOL KIDS

Originally, MapMyClimate was not envisaged as a tool for teaching children. However, at DHI we offer school classes to come and visit our hydraulic laboratories and attend a lecture addressing the consequences of climate changes and how to adapt. This has proven very successful not least as it

serves to demonstrate how mathematics are applied. In this context MapMyClimate has proved very useful as it opens up for discussions on consumption and habits in class, but also at home between children and parents. This new awareness has proved an eye opener to many and supports the concept of such a portal for dissemination purposes.

After the somewhat rather disappointing result at the COP15 meeting in Copenhagen, the Vice President of the UN climate panel IPCC, Nobel Prize winner Mohan Munasinghe concluded: "... *The great attention COP15 shows that it is possible to get them (ED: the richest people on the planet) to reduce their emissions through a combination of many small steps, and make them aware of their role*".



Figure 6: Example of displayed data. This figure illustrates rainfall, as estimated from the EU's 2 °C scenario. Original data: Danish Meteorological Instituted [2].

9. FUTURE DEVELOPMENTS

A number of focus groups were involved early in the project. These proved highly efficient and aided in defining the project. Presenting MapMyClimate to school children proved to be very efficient and will be utilised to develop a more dedicated teaching branch of the portal taking the various levels into account.

Furthermore, the plan is to develop an English version of the portal, which will give it a much wider use. The concept as such can be extended to any city or country.

10. CONCLUSION

Change in the global climate is one of the greatest challenges of our times. Efforts to reduce the effects of climate change and to find new environmentally acceptable energy solutions impinge on all parts of society – from enterprises and authorities to the individual citizen – and even the future citizens. However, climate change also opens up opportunities for introducing new constructive ways of including citizens in bringing climate-related challenges into the forefront of everyday life.

MapMyClimate is a unique platform that gives people the opportunity to better understand their impact on the environment and climate – and what their consumer habits, as well as their personal CO₂ discharge means to the environment in their immediate neighborhood and beyond. Where other climate platforms leave the users to measure their own CO₂ consumption, MapMyClimate shows the effects of each person's climate behavior and stimulate us to find out how we can implement green habits into our everyday life.

Finally, MapMyClimate has proven to be an efficient tool for teaching school children how personal behavior and habits impact the climate and not least how science can be transformed into everyday life.

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Illustrations in multi-media programs: A way to understand science?

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ABSTRACT

This paper reports on a pilot study within a Swedish Research Council Project called *Illustrations making meaning? Young pupils encountering explanatory pictures and models in science and mathematics education in primary school and pre-school*. The aim of the pilot study was to give an example of how children may meet science illustrations through encounters with an electronic multi-media program that is quite widely used at pre-school. The pilot study developed on the basis of an inventory of educational illustrations that was carried out at ten preschool departments. This inventory showed that a CD-ROM program called *Ants in the pants (Myror i brallan©)* is frequently used and the pilot study set out to explore its use at one specific preschool site. A variation theory analysis of the software was made. The conclusions were that there is a gap between natural science content and the play content and a clear absence of integrated educational content due mainly to the simplified design of the program. This design mimics assumptions about pre-school teaching and the idea that preschool teachers try to make content more childish by using other words than the official or by letting the content become an educational background whilst fantasy and play are pushed into the foreground. This tends to make key elements of content invisible. The natural science models are also found to be simplified and decontextualized and could be significantly improved by offering opportunities to

discern important aspects related to the object of learning.

Keywords: Edutainment, object of learning, pre-school, science illustrations, variation theory.

1. INTRODUCTION

When using visual information in education, the transparency of pictures and models is often regarded unproblematic, at least as a resource for the children's learning. This also seemed to be the case in relation to the education taking place and observed in the present pilot study. However, transparency is not an innate quality of illustrations and cannot be taken for granted. As amongst others Åberg-Bengtsson (2009) has demonstrated, visual information is always coded and interpretations of this information are always related to culture and context. This has been found in previous research when children are facing explanatory pictures and models in science in a pre-school context. For instance in research by Sträng and Åberg-Bengtsson (2009) in relation to an exhibition entitled 'The route of water exhibition', and Thulin (2006) 'Life in the stump', two aspects that appear to be significant were found. These were first, that the illustrations are presented as parts and the children's understanding of whole and relationships are taken for granted (Sträng & Åberg-Bengtsson, 2009) and second that adults' tend to over-use play and anthropomorphic expressions as a way to try to raise children's interest and understanding

for the presented illustration (Thulin, 2006).

Both of these studies focused on the way pre-school teachers introduce and present a scientific model in, so to speak, real life. However, as the intention of the present presentation is to say something about how children may meet science illustrations in an electronic multi-media program, it may be appropriate in addition to the above to also to say something about computer games and their link to teaching in early childhood education. This link is very much tied up with the use of commercial software produced within what is known as the edutainment genre.

The edutainment genre is dominant when using computers in pre-schools [see e.g., 3, 4]. The themes of such software is often based on literature, movies known by the children or likewise and the content is organized in terms of words and pictures that are intend to foster learning and understanding. The words can either be printed (on-screen text) or spoken (narration). The pictures can be static (e.g. illustrations, graphs, charts, photos, or maps) or dynamic (e.g. animation, video, or interactive illustrations) (Mayer & Moreno, 2003).

The genre of edutainment is multi-medial and tied to the idea that the instructor uses more than one presentation medium (Mayer & Sims, 1994). In this way the content will consist of a mix of tasks related to numbers, shapes, science, letters, words or so on presented in a computer play context with game opportunities to compete and win points, to reach a goal or to beat a friend.

The edutainment genre is thus a mix of education, competition and entertainment and the user is supposed to learn something about the content while playing or competing. This is often considered positive by many educators. Such a starting point can be understood as an expression of the rationalization of children's play and the tendency to describe it in terms of development and learning (Ljung-Djärf & Tullgren, 2009).

The combination of play and learning can also be seen in the Swedish preschool curriculum (Ministry of Education and Science, 1998), which states as an important starting position that play *is* learning. This places high demands on how the object to be learned is presented and handled. In the present case this concerns natural science models and there presentation through the use of multi-media software in a preschool context.

Previous research on children using computer software points out a tendency that playing itself is often superior to a focus on the content (Linderoth, 2004). This is not surprising as most software produced with pre-school children as assumed users are organized without integration between content and play or with a very low degree of such integration.

The present pilot study will attempt to add new knowledge to the use of software in learning. However, the study does not allow us to say anything about how the children make meaning of the content. It only allows us to speak about how a phenomenon that children are supposed to learn something about is illustrated and presented.

2. METHOD AND THEORETICAL ASSUMPTIONS

An inventory of computer software used in preschool settings gave at hand that the edutainment program *Ants in the pants*© was used at seven out of ten pre-school departments. An analysis of the software with a particular focus on the organization, scientific content and the illustrations was then made so the program could be accurately identified in its key component parts. Two parts were then chosen for a closer analysis.

The close analysis of the program in use was made from a variation theory perspective (Marton & Booth, 1997) and aimed to find out what *aspects* of the intended *object of learning* (in this case a scientific model) are offered to the children. The starting point in the analysis was taken

in the fact that when we *discern*, the discernment is based on *variation*. For instance, if we recognize size, this is made based on experienced different sizes of the same group of phenomena or of one phenomenon in relation to other phenomena. If all phenomena had exactly the same size, size would not be possible discern. Size can only be discerned in terms of differences. So if everything was the same size other things like color, shape or material would be focused on instead, if they differed between the phenomena concerned.

If we discern the same phenomena in different sizes, we can do it either by actually seeing these phenomena or by recalling the memory of phenomena we have experienced previously at the same time as we see a focused phenomenon. This means we see the phenomena *simultaneously*, either for real or as memory based images.

These aspects of variation have bearing on how we learn. They mean that when a person learns a new concept or ability, the learning outcome is related to what aspects are offered in the learning situation and what kind of variation and simultaneity are used. In the present study, the variation theoretical framework has been used to analyze what is offered to the users in a software program with science content. The analyses describe what features of the object of learning are offered and not offered and what this means for the user's learning possibilities.

3. RESULTS

The software content of 'Ants in the pants' is organized around an animated world within a forest with trees, flowers, animals, mountains, a lake and a field. The player is walking along a path and meets (1) play situations, (2) activities, and (3) natural science information on the way. In (1), i.e. a play situation, everything is possible. An ant, for example, can talk and is wearing a funny hat. The play situations have no or very limited connection to reality, neither in respect of how nature is reproduced nor in relation to how its' details and context are

presented. In (2), i.e. activities, the user is supposed to collect different things and then place them correctly or participate in a quiz. Different examples of 'Activity' include sorting the garbage or making jam out of berries found in the forest. The activities sometimes have natural science content, but they are more often just an animated mix of fiction and reality. The natural science information parts, i.e. (3), are not animated. They consist of photos, short movies, written or spoken texts about animals, trees, flowers and so on. These are organized as an interactive book where the user can choose what to listen to or read.

The chosen parts of the software that were chosen for closer analysis came from element (2), activities, in terms of a mix of fiction and reality. The theme was about, recovery processes and included both natural and fabricated materials. This enabled me to take a closer look upon how this natural science phenomenon is constituted and presented in an edutainment context used in pre-school.

Activity a; Guess the poop

The player is invited to collect animal droppings in the forest and to place them in a flower bed. The droppings appear when the user clicks on an animal, such as for example a warthog, a ladybird or a cow. All droppings look the same, besides a small picture on the top depicting the pooping animal. When putting the dropping into the flower bed a non realistic flower starts to grow, one from each sort of dropping.

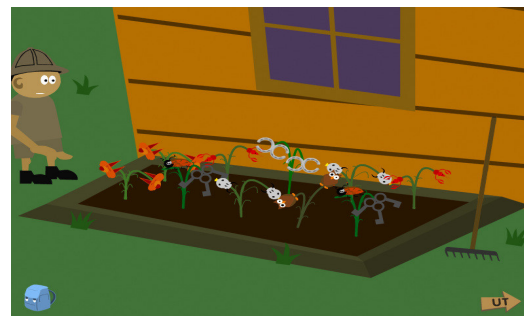


Figure 1 The flower bed in the "guess the poop" activity

Activity b; Sort the garbage

Waste is also to be found in the forest in the same way as flowers or berries. The aim, in this section, is to collect it and to put it in the right dustbin. There are five bins. One for glass, one for metal, one for plastic, one for paper and one for batteries. A voice-over commentary tells the player if s/he has placed the waste correctly or not.



Figure 2 The dustbins in the “sort the garbage” activity

The analysis

First I will say something about the environment and its inhabitants as depicted in/by the program. The intended object of learning described on the packaging is; “you will learn about things like animals, fishes, birds, insects, flowers and trees”.

A lot of creatures, plants and so on are living and growing together in the forest. Animals such as cows, arctic fox and bald eagles are to be found in the program. But it is not possible to discern either which animals are domestic animals (like a cow) or wild animals (such as a moose) nor which are living in the same or different environments (such as underground or in a tree) in real life. In the same way, there appear there appears to be no differences between vegetation as in reality is growing in one biotope or another (e.g. meadow, marsh or lake) or birds who is not living in the same environment (e.g. duck and bald eagle). The life in the forest is simplified. Key similarities and differences relating to

how different species relate to each other are not present.

In (3), i.e. the natural science information part, different animals and vegetation are described and illustrated. An important aspect when discerning different species could be for example which species do they belong to? Or what are their special features? When the species is described different aspects are focussed but they are not contrasted against each other. For example the bear is described as going into hibernation for the winter, but no other animal is described as doing so (or not) and the wolverine is described to having a tail but nothing is said about the tail of other species. Other examples are that one bird is said to have feathers and not fur but none of the other species are said to have fur instead of feathers and so on. In the information provided the natural science content is fragmented and focused on details instead of a whole and context.

In activity a, the “guess the poop” activity, the natural science aim seems to be to discern different sorts of droppings and to encourage an understanding that when droppings are placed into a flower bed this will help flowers grow. Important aspects when discerning different droppings might be size, color, shape and texture. But as all droppings look the same the user is not offered neither an opportunity to discern such differences nor what such differences can say about the animals in question.

When putting the dropping into the flower bed a non-realistic flower grows up. This suggests that all droppings are always equally useful in this sense and that all the plants look the same, except for a small picture on the top of each. Important aspects needed in order to understand the nature of germinating seeds is nutrient-rich soil, water and sunlight. None of these aspects are included. Both in terms of the possibility to distinguish different types of droppings, as described above, as well as important aspects of crop production, the representations offered by the software are

simplistic. They are partly true and partly pretend and it is difficult to determine what is real and what is not.

As well animals and droppings, waste is also to be found in the forest. However, in the same way as described above in relation to what is growing in the forest (e.g. flowers and berries), the possibility to discern between the elements that have been put there by humans (e.g. waste) is zero. In activity b, 'sort the garbage', the natural science aim is to discern different types of waste and put them in the right place.

Important aspects when discerning different sorts of waste concern the common denominator in each material. In the program the offered variation is limited in this respect as a bottle cannot be made of anything other than glass, a newspaper is paper and a tin is metal. The representation of a bottle is by that invariant and the needed simultaneity to understand the important knowledge that it is a bottle that makes us know how to handle it – i.e. knowledge of the material it is made of – is missing. If the design instead was invariant due to representation (i.e. bottle) but varied and was made of different material (metal, glass and plastic) the user would have been offered other learning possibilities. The user design gives a simplified understanding about how to handle waste as bottles as all made of the same material.

4. CONCLUSION

The aim of the study was to give an example of how children may meet science illustrations in an electronic multi-media program used at pre-school. The conclusions are that (a) the gap between natural science content and the play content is obvious both in the analyzed software as a whole and in the chosen parts. (b) The illustrations usually lack reality (e.g. poop) but are in some cases true to real life as well (e.g. sorting garbage). But even then content is superficial and presents knowledge lacking continuity and context. The analysis also shows that (c) the variation of aspects that can be critical for

the users' learning is limited as learning is not related to either discerning for instance droppings or their relationship to growing seeds. The same can be said in relation sorting the garbage. In this sense the design of the software is simplified in a way similar to natural teaching where the preschool teachers try to make the content more childish by using other words than the official (i.e. poop instead of droppings) or let the content be background to learning and fantasy and play a foreground [see e.g., 8]. This limits the learning object's aspects in a way which makes them invisible (e.g. the differences between different forms of droppings due to animal size and nutrition).

The analysis of the chosen parts has focused on how natural science phenomena are constituted and presented in an edutainment context used at pre-school. The analyzed natural science models are found to be both simplified and de-contextualized and could be significantly improved by offering opportunities to discern important aspects related to the object to be learned. By using variation related to the real world and contrasting the phenomena, the user could have been offered the possibility to learn something more crucial about the intended object of learning. This applies even if the child playing on the computer is using situation as playing primarily rather than learning specifically.

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Didactic Networks: A proposal for e-learning content generation

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ABSTRACT

The Didactic Networks proposed in this paper are based on previous publications in the field of the RSR (Rhetorical-Semantic Relations). The RSR is a set of primitive relations used for building a specific kind of semantic networks for artificial intelligence applications on the web: the RSN (Rhetorical-Semantic Networks).

We bring into focus the RSR application in the field of e-learning, by defining Didactic Networks as a new set of semantic patterns oriented to the development of e-learning applications.

The different lines we offer in our research fall mainly into three levels:

- *The most basic one is in the field of computational linguistics and related to Logical Operations on RSR (RSR Inverses and plurals, RSR combinations, etc), once they have been created. The application of Walter Bosma's results regarding rhetorical distance application and treatment as semantic weighted networks is one of the important issues here.*
- *In parallel, we have been working on the creation of a knowledge representation and storage model and data architecture capable of supporting the definition of knowledge networks based on RSR.*
- *The third strategic line is in the meso-level, the formulation of a molecular structure of knowledge based on the most frequently used patterns. The main contribution at this level is the set of Fundamental Cognitive Networks (FCN) as an application of Novak's mental maps proposal.*

This paper is part of this third intermediate level, and the Fundamental Didactic Networks (FDN) are the result of the application of rhetorical theory procedures to the instructional theory.

We have formulated a general set of RSR capable of building discourse, making it possible to express any concept, procedure or principle in terms of knowledge nodes and RSRs. The Instructional knowledge can then be elaborated in the same way.

This network structure expressing the instructional knowledge in terms of RSR makes the objective of developing web-learning lessons semi-automatically possible, as well as any other type of utilities oriented towards the exploitation of semantic structure, such as the automatic question answering systems.

Keywords: *Rhetoric Structure Theory, Rhetorical Semantic Relations, Semantic Network, Knowledge node, Rhetorical-Semantic Network.*

1. BASICS: RSR AND INSTRUCTIONAL THEORIES

Instructional Theories and the Rhetorical-Semantic Relations are the two main topics of our proposal.

RSR (Rhetorical Semantic Relations)

As one of the results in our line of computational linguistic research, and based on the Rhetorical Structure Theory (RST), in previous papers we proposed the rhetorical-semantic relations to be used as basic components for rhetorical-semantic networks.

In short, the RST defends the principle that the reading of a text does not always produce an expression of coherence. [1], [13]. The theory explains the coherence of the discourse in terms of the existence of a kind of relations between blocks of text: the rhetorical relations.

Based on RST, we proposed the RSR as a finite set of relations capable of generating any kind of knowledge [15]. The RSR have been defined as a set of relations valid for representing any kind of knowledge.

The result is summarized in the following table, where we have included the canonical expression, showing the representative fragment of text for all the rhetorical-semantic relations including both the relation to be used and the type of content of the child node in capital letters.

Nr.	Denomination	Canonical expression
1	Transformation	changes the 'OBJECT' ...
2	Feature	shows the 'FEATURE'...
3	Function	performs the 'FUNCTION'...
4	Location	places in the 'LOCATION'...
5	Objective	pursues the 'OBJECTIVE'...
6	Classify	belongs to the 'CLASS'...
7	Coincidence	shows the 'COINCIDENCE'...
8	Difference	shows the 'DIFFERENCE'...
9	Part	shows the 'PART'...
10	Effect	produces the 'EFFECT'...
11	Result	yields the 'RESULT'...
12	Activity	develops the 'ACTIVITY'...
13	Method	is reached by the 'METHOD'...
14	Comparison	is compared to the reference 'OBJECT'...
15	Taxonomy	is organized in 'CLASSES' ...
16	Cause	because of the 'CAUSE'...
17	Evaluation	has the 'VALUE'...
18	Condition	has the 'CONDITION'...
19	Elaboration	is elaborated in the 'OBJECT'...
20	Antithesis	is opposed to the 'OBJECT'...
21	Summary	is summed up in the 'OBJECT'...
22	Restatement	can be expressed as 'OBJECT'...
23	Background	is understood because of the 'OBJECT'...
24	Instrumental relation	is related to the 'OBJECT' ...
25	Interpretation	must be interpreted in the 'CONTEXT'
26	Concession	although the 'PREDICATE' can be true ...
27	Justify	is justified by the 'THESIS' ...
28	Motivation	is interesting because of the 'REASON'...
29	List	Includes the 'OBJECT/CLASS'...
30	Following	follows the 'ELEMENT'...

Table 1. RSR Canonical expression

Once we have expressed a discourse in terms of RSR, a direct translation in terms of prolog predicates is possible. Questions are interpreted as queries and the use of an inference mechanism concerning the declared facts will be enough for answering [9].

If the result of this query is true, this implies that the facts are true. If it is false, it is not possible to confirm that the proposition is true or false with the available knowledge.

An important contribution of the RSR approach to the semantic web exploitation is to provide an instrument for the automatic building of knowledge bases. The main applications are in the field of automatic e-consulting, e-learning generation or automatic document production. The main innovation aspect of the proposed approach is the semantic enhancement of the resulting representation.

Instructional theory

On the instructional methods side, Reigeluth's Basic Methods of Instruction (BMI) stand out from the rest of the theories because they synthesize a great number of theories such as Merrill's Component Display Theory, the Reigeluth and Stein Elaboration Theory, etc. [16], [17], [18]

Reigeluth establishes three major levels of knowledge in cognitive learning: **memorizing** (rote learning), **understanding** (meaningful learning) and **applying** (learning to generalize), and three types of content can be learned: concepts, procedures and principles.

- A concept is a group or class of particulars which have something in common. It is the answer to the question "What?"
- A procedure is an ordered sequence of steps for accomplishing some goal. It is the answer to the question "How?" In the simplest cases, it is a sequence of ordered steps to achieve a defined goal.
- A principle is a relationship between two or more changes. It can be a causal, co-relational, or natural-order relationship. It is the answer to the question "Why?" Reigeluth identifies three kinds of principle: Causal, Correlated and Natural principles. The Natural principle, also called the process principle, can be linear or cyclic.

Every kind of knowledge in every one of the three levels of knowledge requires a specific learning method. [12], [15]

Didactic method for concepts, procedures and principles memorization

The didactic method for memorization is common for three types of content. It is an invariant task, because we can see all of them as a list of items (facts for concepts, steps for procedures and events for principles).

The following three major tactics are used to facilitate memorizing:

- Cognitive scientists consider that storing information in human memory is not a difficult task, but the difficulty is in the recovery process. The strategy is to create strong links between items.
- Another difficulty we can find for memorizing difficult content is the list length. The recommendation is to create chunks of 5 to 7 elements.
- Finally, the use of mnemonic rules is recommended.

The method in a very concise way consists of the following steps:

1. Presentation
2. Enrichment tactics (for difficult content): Chunking, Repetition, Mnemonics
3. Prompting and practice
4. Motivational tactics: depending on the student's needs

Didactic method for concept application (classification)

1. Presentation:
 - Prototype formation (common characteristics),
 - Generalization (variable characteristics) and
 - Discrimination (critical characteristics)
2. Exemplification
3. Presentation of the process of Concept classification
4. Practice, Test and Feedback

Didactic method for procedure application

A procedural task is basically a sequence of physical or mental actions. It can be a linear or branching procedure. In the second case, we have as many linear procedures as combinations of the possible branches. Everything we can do in our life, such as reading, writing, driving, dressing, etc., follows a procedure. The correct method for procedure application is:

1. Presentation of the procedure, identifying not only all the steps but also the goal and the name of the procedure
2. Presentation of dimensions of divergence, such as different sequences of steps for different circumstances
3. Examples of applications (as divergent as possible)
4. Test
5. Simulation (in some cases)

Didactic method for principle application

Applying Natural or Process Principles implies generalization and prediction of new cases, by means of describing what is happening and the order of events for a given situation. The method for teaching is basically the same as in procedure application teaching.

The test phase can consist of questions such as ordering the following events, predicting what will happen in the next step, or deducing what has happened in the last step.

For causal principles (much more complex than natural principles), there are two phases (acquisition and application) and three possible behaviors:

- Prediction or implication: A particular cause is given, and the learner must predict what its effect will be.
- Explanation: A particular effect is given, and the learner must explain what its cause was.
- Solution: A particular desired effect is given, and the learner must select the necessary causes to bring it about.

The correct method for learning principle applications is:

1. Presentation
 - causes and effects for causal principles,
 - sequence of events for natural principles
2. Examples of applications (as divergent as possible)
3. Demonstration (By using divergent examples)
4. Test
5. Practices

Didactic method for Understanding Concepts and Principles

Understanding is related to meaningful learning. It is probably the least studied and least understood type of learning within the cognitive domain. The objective is to create a mental model which integrates it with what the

learner already knows. This only applies for concepts and principles.

The method is to establish relations with prior knowledge by means of certain kinds of relationships such as "is a", "has a", "cause", "act", "is when", "location", and "object" relationships, among others. The kinds of content to which we can connect are Super-ordinate, Coordinate, Subordinate, Experiential, for Analogy, Causal, or Procedural knowledge. [12],[15]

2. PROPOSAL: DIDACTIC NETWORKS

This paper is a partial result of one of the main research lines in the fields of scientific knowledge modeling, database storing and exploitation on the web, with applications in e-learning and e-consulting (automatic question answering for engineering).

We define our "Didactic Networks" (DNs) as a specific kind of semantic network based on the formulation of generic reusable patterns composed of RSRs, expressing the prescriptions of the instructional theory. Due to space limitations, we will show here just some important examples of the complete methodology

The main advantages we can obtain from this approach are related to semi-automatic web-learning generation by means of webpage patterns on one hand and the quality of the resultant e-learning as a consequence of using a solid instructional theory on the other. The automatic generation of written documents, tests and tutorials for procedures will be important benefits of this approach.

Didactic method for concepts, procedure and principle memorization

1. Phase: Presentation of the object to memorize

The methodology simply requires a list of elements, valid for concepts, causal principles and natural principles. We define three different DN that will be generalized to be also a FCN: Parts Network, Principle Network and Procedure Network. For a concept presentation we use the Parts Network.

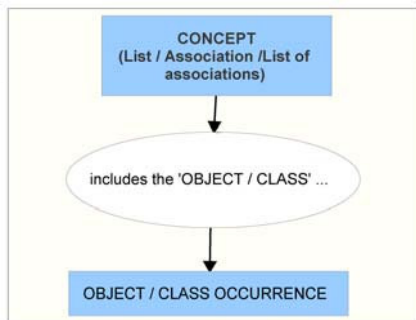


Figure 1: Concept presentation Didactic Network

In the most basic situations, we work with lists of features (for concepts) or lists of steps (for sequential procedures) or lists of changes (for natural and causal principles).

In these cases, usually we deal with long lists. Then, the use of power tactics such as Chunking, Repetition or Mnemonics is recommended.

For a meaningful presentation, we suggest to use an alternative didactic network, for procedures and for causal principles.

For general procedures presentation, the first step is the Objective declaration followed (optionally) by the description of the sequence of steps required to achieve it. If necessary, it is possible to specify the condition and the action corresponding to each step.

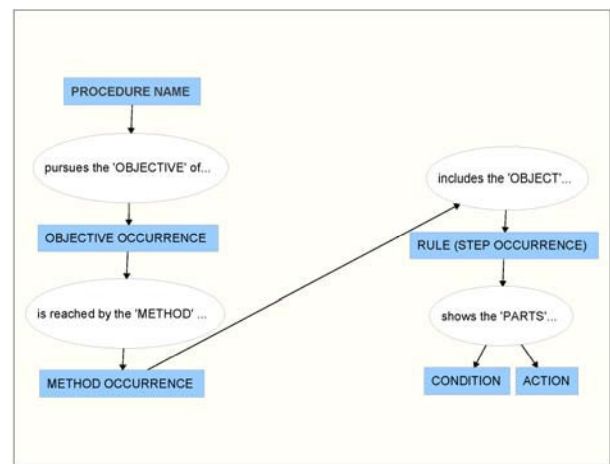


Figure 2: Procedure presentation Didactic Network

For causal principles, the specification of the complete causal chain will be useful for establishing answers in question answering applications

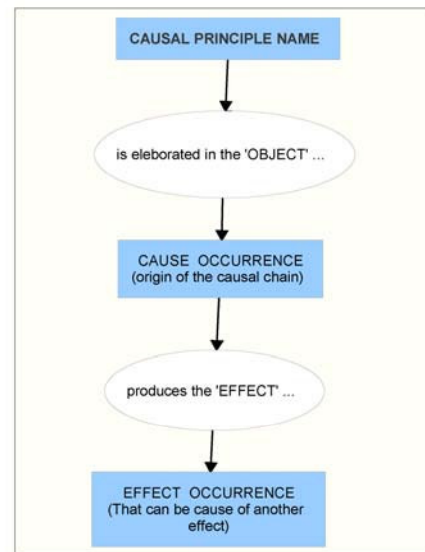


Figure 3: Procedure presentation Didactic Network

Didactic method for concept application (classification)

As another example of DN, we show below the presentation phase for concept application as a new type of semantic network oriented to e-learning generation, including all sections required by BMI:

- Prototype formation (common characteristics)
- Generalization (variable characteristics)
- Discrimination (critical characteristics)

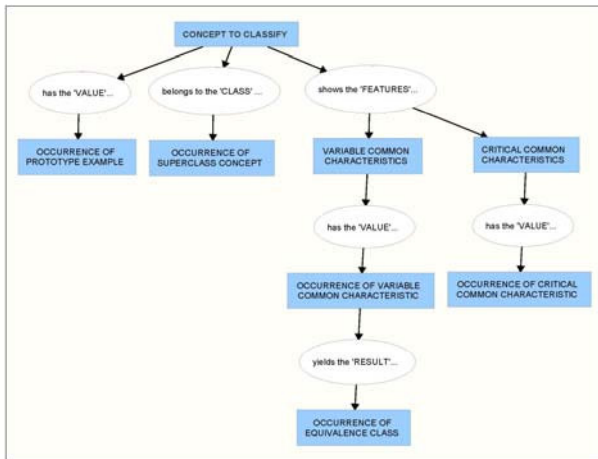


Figure 4: Concept classification network

The required exemplification of concept classification will be carried out by mean of the next didactic network, based on the concept classification didactic network.

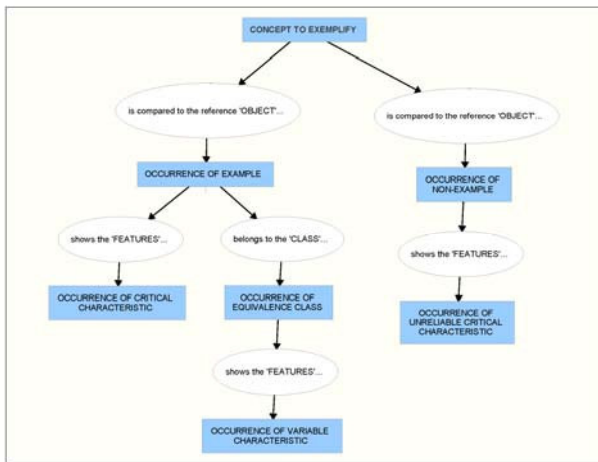


Figure 5: Exemplification of Concept Classification.

The objective is to provide a useful guide for a suitable exemplification. We should create examples that are as divergent as possible, by specifying common variable features (dimension of divergence). The contrast with a non-example showing a non-fulfillment of critical characteristics is a useful resource to complete the concept transmission.

3. PROOF OF CONCEPT. EXAMPLES

As Reigeluth suggest, as important as the correct interpretation in the current stage, is the didactic feature of the example.

We have developed a number of different examples to test our proposal, in the field of mechanical engineering, mathematics, or instructional design.

As a simple example for the demonstration of the complete process from the didactic network design to the web-learning generation: The concept of Linear Transformation.

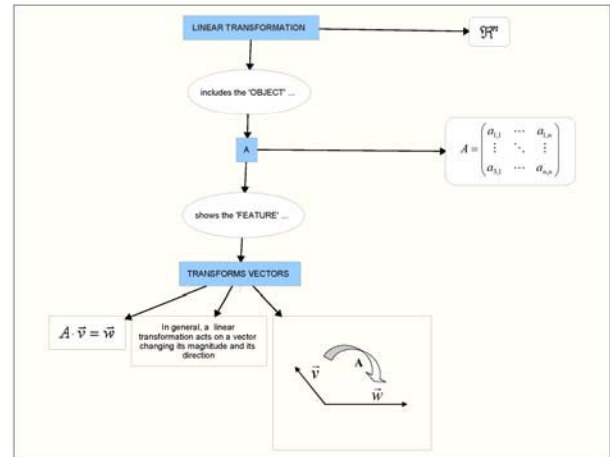


Figure 6: Concept of Linear Transformation

If we have defined a visual pattern for transforming data into a simple web page, for example:

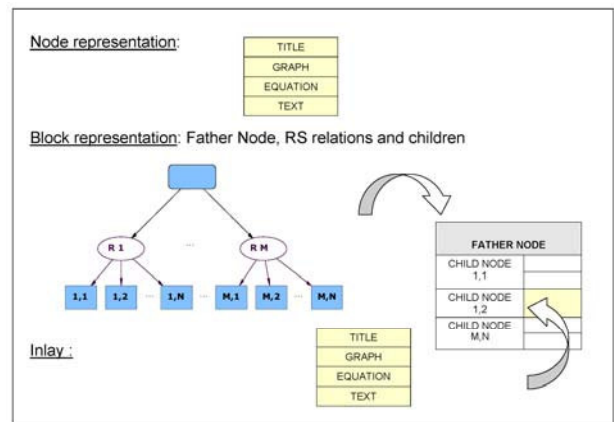


Figure 7: Visual Pattern

The resulting appearance for the automatically obtained web page will be something like we show in the next figure:

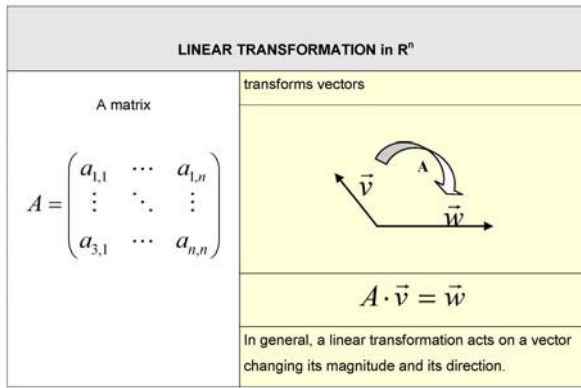


Figure 8: Application of Visual Pattern

In the same way, for explaining the concept of eigenvalue, the application of the concept didactic network is demonstrated in next figure.

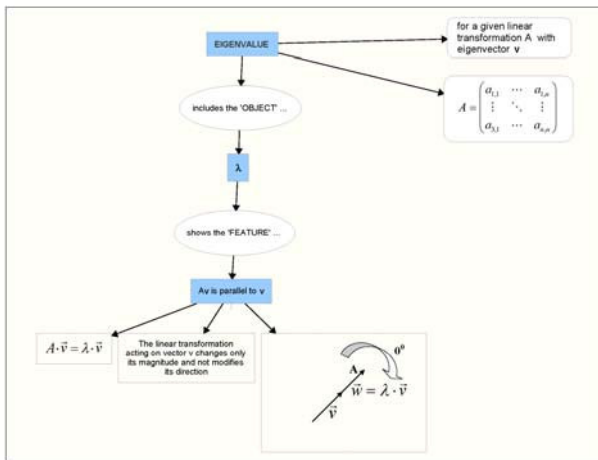


Figure 9: Concept of eigenvalue

And finally, next figure shows the didactic network for explaining the concept of eigenvector.

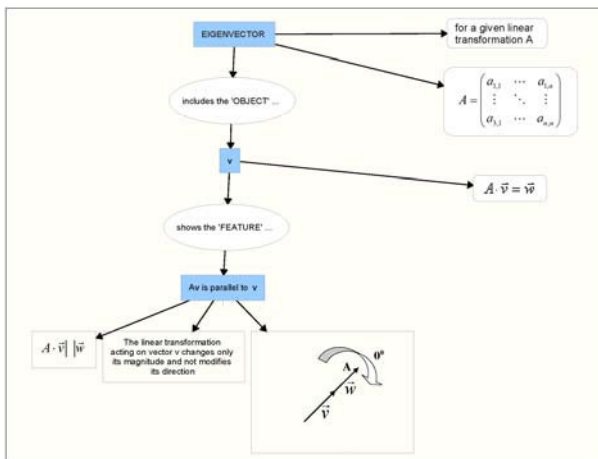


Figure 10: Concept of eigenvector

Another example, in this case of a Causal Principle Presentation: The Archimedes Principle.

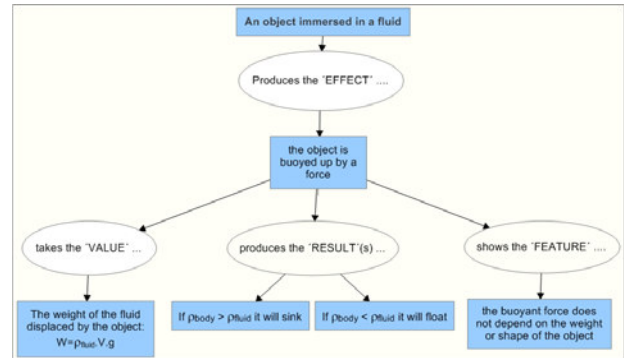


Figure 11: Example of causal principle presentation

5. CONCLUSIONS

There are five major conclusions we would like get your attention:

- I. The atomic level for knowledge representation seems to be satisfied with the RSR approach.
- II. We can use different RSR synonyms for different domain applications without losing the semantic connectivity. This provides a means for the development of natural language answering systems. It can be a means for the definition of a general ontology and relations on the semantic web.
- III. A set of FCN is necessary for covering the meso-level knowledge structure. This point is one of the essential lines of research we are concentrating on.
- IV. The set of DN based on RSR is valid for didactic knowledge representation and web-learning generation. We can express any didactical content as a network composed of nodes and relations of the defined set and the use of the suitable synonym. Examples in the present paper provide the proof for this conclusion.
- V. It is possible to automatically generate e-learning lessons, documents or Q&A systems from any knowledge base generated automatically from an RSR expression of contents.

This approach is possible because of the automatic predicates generation based on the reduced list of RSR. These predicates can be included in a knowledge database, and the QA system will be simply using queries formulation over the defined database.

6. FUTURE LINES OF RESEARCH

The main lines of research in which we are interested and in which we are intensifying our efforts include the following:

- Fundamental Cognitive Networks:

Consist on the formulation of a molecular structure of knowledge by using the patterns most frequently used by people, for discourse construction. We have defined here the causal network and the procedure network. It is important to create a complete set of network capable of generating a discourse in a productive way.

These will be the Didactic Networks for understanding
- Creation of a knowledge representation and storage model and data architecture capable of supporting the definition of knowledge networks based on RSR at the same time as well as the definition of an interchange module with common standards.
- Software development and selection for (semi)automatic web-learning generation, by using the didactic networks expression.
- A set of visual patterns definition able to transform the knowledge networks (or didactic networks) in a set of web pages.
- Elaboration of Knowledge Representation Methodology, by using rhetoric-semantic relations and knowledge networks.
- Operations on RSR (plural, inverses, combinations, verbal tens, synonyms...)
- Definition of tests, practices and simulations

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Learners' Acceptance of Learning Management Systems: Developing a theoretical framework

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ABSTRACT

The use of information communication technology to build human resources is a vital prerequisite for the development of knowledge-based economy. Learning Management Systems (LMS) do not only provide academic institutions with effective and efficient means to build human resources but also enable them to efficiently and effectively codify and share their academic knowledge. The success of learning management systems in academic institution may be initiated by instructors' acceptance; however, it survives in the long run by learners' continuous acceptance and utilization. Consequently, the objective of this paper is to provide a comprehensive look at the critical factors that influence learners' acceptance of LMS and consequently their actual use. These critical factors are related to the major entities of LMS: the learner, the instructor, the course, the classmates, the organization, and the technology.

Keywords: e-learning, Learning Management Systems, Learners' Acceptance, Theoretical Framework

1. INTRODUCTION

The use of information communication technology (ICT), to build human resources is a vital prerequisite for the development of knowledge-based economy especially for developing country. Learning Management Systems do not only provide academic institutions with effective and efficient means to build human resources but also enable them to efficiently and effectively codify and share their academic knowledge. Recently, the adoption of e-learning systems has been increasing in the academic world. In 2004, the e-learning market was worth more than US \$18 billion worldwide [33]. Current reports presented that more than 90% of all participating universities and colleges in USA [15] and about 95% of participating institutions in UK have adopted LMS for students and instructors use [6]. In the Middle East, e-learning projects are expected to exceed a compound average growth rate of 32% by 2008, based on the Madar research group [33].

Examining the acceptance of learning management systems (LMS) is essential to succeed in their deployment. In the e-learning context, the examination of end users acceptance may be carried out from the instructors' perspective or learners' perspective. This study aims to frame a comprehensive model to evaluate the learning management systems from the learners' perspective. The success of learning management systems in academic institution may be initiated by instructors' acceptance; however, it survives in the long run by learners' continuous acceptance and

utilization. Measuring users' acceptance and satisfaction is a "basic marketing element" to manage e-learning initiative [18].

Consequently, the objective of this paper is to provide a comprehensive look at the critical factors that influence the learners' acceptance of LMS and consequently their actual use. These critical factors are related to the major entities of LMS context: the learner, the instructor, the course, the classmates, the organization, and the technology.

2. LEARNING MANAGEMENT SYSTEMS

LMS Definition & Tools

E-learning is defined as "instruction delivered through purely digital technology using the Internet or private networks" [20]. It is the use of a web-based communication, collaboration, learning, knowledge transfer and training to add values to the learners and the businesses [18]. Learning management systems are used by some academic and technical training institutions to support distance learning, while used by others to supplement their traditional way of teaching. For distance learning, E-learning can be used to build a virtual classroom where all coursework is done purely online [31].

There are several learning management systems in the market such of these systems are WebCT, Blackboard, and Moodle. These systems include several tools that can be utilized to support distance learning or to supplement the traditional teaching. For example, Moodle system offers several tools that enable the development of course activities such as assignments, surveys, choices, discussion forums chats, resources (files, websites), quizzes, survey, journals, glossaries, workshops.

LMS Benefits

There are several individual and organizational benefits resulted from the deployment of online learning management system. Students can access course materials online at any time. LMS also give students some flexibility in terms of place, time and own pace [31]. Other benefits are cost-effectiveness, consistency, timely content, flexible accessibility and customer value [7, 18]. In addition, LMS allow students to interact with others, control their own learning, develop deep thinking skills, and develop a sense of community with other learners. However, the deployment of LMS may cost a lot, require new skills on content producers and require more responsibility and self-discipline from the learners [7]; thus students might be intimidated to use LMS.

3. LEARNERS' ACCEPTANCE OF LMS

User Acceptance of LMS

User acceptance of a technology is a multidimensional attitude; it may be affected by various technical and non technical factors. Technology acceptance has been assessed in the literature based on perceived usefulness, user's satisfaction, intention to use, and actual usage of the technology. Various frameworks, such as those of [2, 10, 11, 13, 40], have assessed the determinants of individuals' acceptance. Davis's Technology acceptance model (TAM) is a widely used model in the IS literature [10]. TAM indicates that two factors determine the attitude, intention and the actual use of an information system; these factors are perceived usefulness (PU) and perceived ease of use (PEOU). TAM suggests that PU and PEOU are determined by external variables relative to the use of that specific information system. TAM2 model by Venkatesh and Davis suggested that these external variables might be related to subjective norm, image, job relevance, output quality and result demonstrability [40].

TAM2 provides common critical factors that might affect the PU and PEOU and consequently the actual use of an information system; however, these factors may not be the best fit for all systems including learning management systems. The evaluation of technology-mediated learning might be influenced by several issues related to the technology, instructors, courses and learners. Issues related to the organization might also have some influence on the individuals' acceptance of learning management systems; Organizations factors such as training, incentives, strategic alignment and technical support might affect the adoption of technology in teaching [37].

The critical factors that affect the PU and PEOU may vary depending on the user type, instructor or learner. The objective of this paper is to extend TAM by proposing relevant critical factors that influence the learners' acceptance of LMS. From the learners' perspective, the critical factors of their acceptance should be related to the major entities of LMS context: the learner, the instructor, the course, the classmates, the organization, and the technology.

A number of studies investigated the learners' acceptance of the use of technology in learning such as [14, 32, 36, 38, 41, 42]. None of these studies, however, provided a comprehensive examination of all the major issues related to the learners' acceptance: the learner's characteristics, the instructor's characteristics, the course's characteristics, the classmates' characteristics, the organization's characteristics and the technology's characteristics. This paper aims to provide in depth examination on these critical issues that might influence the learners' acceptance based on these areas (see Figure 1).

Learner Characteristics

Several learners' characteristics influence learners' acceptance of LMS. This paper examines learners' characteristics in terms of self efficacy, attitude toward e-learning, e-learning experience, computer anxiety and personal innovativeness.

Learner Self Efficacy: User self efficacy is highly highlighted as an important issue in the acceptance of any information system including learning management systems. Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances." [4]. Thus, computer self-efficacy means individuals self-assessment of their ability to apply computer skills to accomplish their tasks [9]. Several empirical studies found significant effects of the computer self efficacy on the perceived usefulness of an information systems [8, 40] and LMS [32, 38]. Self efficacy was significant on perceived ease of use but not perceived usefulness [29].

Learner Attitude Toward e-learning: Attitude toward e-learning is another issue related to the acceptance of LMS. Learners are the major operators of LMS. Individuals' attitude should be considered in the investigation of LMS acceptance [12]. Besides, instructors attitude toward e-learning positively affect the outcomes of e-learning [28, 42].

Learner Experience with the Use of Technology (EUT): EUT also plays a major role with the acceptance of technology. Individual's EUT is the individual's exposure to the technology as well as the skills and abilities that s/he gains through using a technology [39]. Learners' technology experience has a major impact on the learning processes and consequently learning outcomes [41].

Learner Computer Anxiety: Computer anxiety is also a critical factor for the learner's acceptance of LMS. Computer anxiety is the fear felt by individuals when they use computers, or when they considered the possibility of computer utilization [3]. Computer anxiety is playing a major role on the acceptance of the technology [3, 28, 30, 38]. Fear of computer will negatively impact the e-learning environment and consequently the user's perceived satisfaction [28]. Sun et al. found that computer anxiety significantly impacts the learners' perceived satisfaction of e-learning [38]; whereas Raaij and Schepers found the computer anxiety impacts the learner's perceived ease of use of e-learning [30].

Personal Innovativeness: Personal innovativeness is another issue that may be critical factor on the learners' acceptance of LMS. Personal innovativeness in information technology context means person's attitude reflecting his tendency to experiment with and to adopt new information technologies independently of the communicated experience of others; "Being used to adapting to new systems and processes might reveal the usefulness and ease of use more quickly to an innovative person than to a non-innovative person [34]. In the e-learning context, learners' innovativeness was found significant on the system acceptance [30].

Instructor Characteristics

Learner involvement in e-learning environment is initiated by instructors' adoption of LMS in their classes. Thus, instructors' characteristics are critical factors on the learners' acceptance of LMS. This paper looks at the instructor characteristics in terms of instructor's teaching

style, attitude toward e-learning, control over the technology, online responsiveness and online availability.

Instructor Teaching Style: The Instructor's teaching style is a critical factor that affects learners' acceptance of LMS. Instructors with interactive teaching style are critical to the learning outcomes [41, 42]. Webster and Hackley found significance effect of instructors teaching style on the learning outcomes from the learners' perspective [42].

Instructor Attitude toward e-learning: The instructor's attitude toward e-learning is essential on the learners' acceptance of LMS. Instructors are the major drivers of LMS. Individuals' attitude should be considered in the investigation of LMS acceptance [12]. Instructors' attitude toward e-learning positively affects the learners' outcomes of e-learning [28, 42].

Instructor Control over the Technology: Instructor's control over e-learning is another critical factor on learners' acceptance of LMS. LMS also should be linked to the learning outcomes [12, 23]. Students become impatient when instructors face technical problems [23]. Thus, students may view instructors as not qualified when they have little control over the communication technology. Webster and Hackley found it significant on the learning outcomes in the context of video technology mediated distance learning [42].

Instructor Responsiveness: Instructors' online responsiveness is critical on the learners' acceptance of LMS. Instructor's responsiveness refers to the learners' perception of the instructor prompt response to their online problems and requests [38]. Instructors' prompt response encourages learners to continue adopt LMS and accept their online learning.

Instructor Availability: Instructors' online availability and support to online learning improves learners' interactions with the online community and the learning [5]; the instructor's availability is very important for learners and consequently enhances learners' involvement in electronic activities [25]. Instructor's availability is important issue on the e-learning outcomes [41].

Course Characteristics

Course characteristics are critical on the learners' acceptance of e-learning and LMS. Few studies, such as [38, 42, investigated the impact of course characteristics on the learners' acceptance of learning technology: Webster and Hackly [42], however, focused on videoconferencing mediated distance learning. This study integrates the course characteristics in terms of course flexibility and course quality as proposed by Sun et al. [38].

Course Flexibility: Course flexibility refers to the learners' perception of the effects and the efficiency of adopting e-learning [38]. Flexibility in time, location and learning is a major factor on the learners' acceptance of LMS [1]. One of the main promises of e-learning is that it enables learners to acquire education and learn with no restriction on time and place.

Course Quality: The quality of LMS-mediated course is a critical determinant of the learners' acceptance of

LMS. LMS offers several rich tools that enable the development of well-designed course. The well-designed online course should provide learners online interactive discussions, multimedia presentation of course materials and the online management of learning processes [28, 38]. It should provide a rich environment for online communication, collaboration and sharing of course materials.

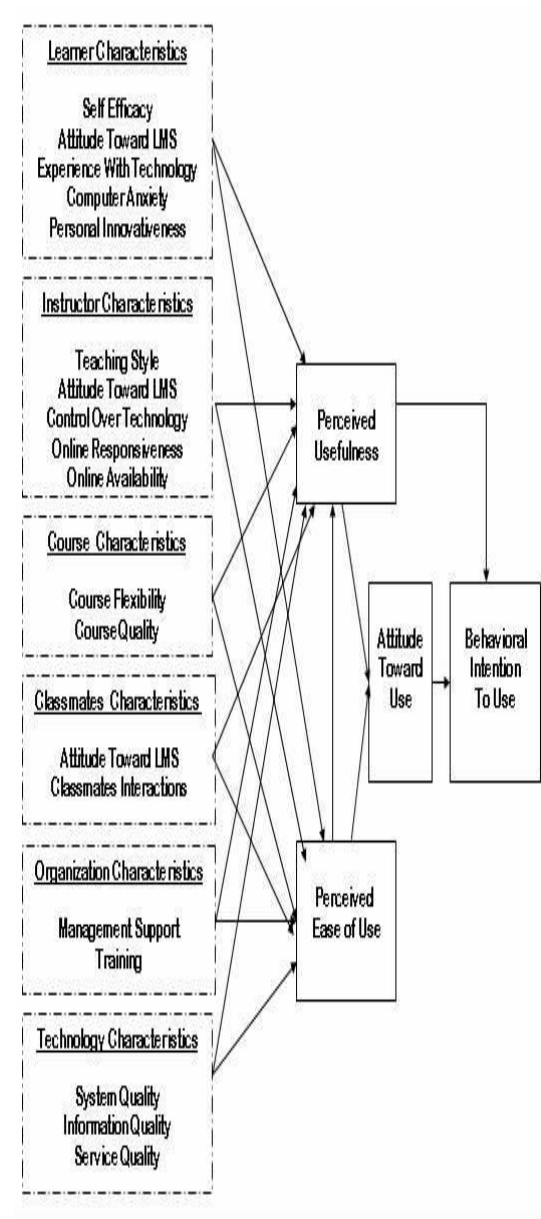


Fig 1. Learners Acceptance of LMS Framework

Classmates Characteristics

The effect of classmates' characteristics on the learners' acceptance of LMS is essential but rarely assessed. This study considers the role of classmates' characteristics (in terms of their attitude toward the e-learning and their interactions) on learners' acceptance of LMS.

Classmates Attitude Toward e-learning: The classmates' attitudes affect learning outcomes [42]. A

significant affect of classmates' attitudes on learning outcomes was confirmed from the learners' perspective [42].

Classmates Interactions: classmates' interaction in e-learning environment is a very important factor on the learners' acceptance. Interactions in e-learning environment do not only involve learners with instructor's interaction but also learners with learners' interaction [26]. The frequency, quality and promptness of interaction in e-learning environment could affect the learners' satisfaction [38]. Group members' interaction has a significant impact on learner's satisfaction [1, 22].

Organization Characteristics

Very limited theoretical and empirical studies investigated the influence of organization factors on the acceptance of LMS. This study proposes that management support and training are important organization factors for learners' acceptance of LMS.

Management Support: Senior managers' support is also important for learners to accept and adopt learning management. Senior managers should support technology deployment, clearly identify the goal of the technology and its importance for the organization's success. Management support of end-users significantly improves computer usage [16]. In the e-learning context, organization's support has a significant impact on learner's satisfaction [22].

Training: Training is considered important for end users; training is a process of gaining technology skills necessary to accomplish a task, and critical to the acceptance of the technology because it enhances end users understanding and attitudes toward the technology [17]. Training can be in form of workshops, online tutorials, courses, and seminar. Training was found significance on the acceptance of the technology [17]. Training was found significant on the learners' perceived usefulness of online learning environment [21].

Technology Characteristics

Technology or Information systems factors can be related to the system quality, information quality and service support quality [11]. LMS quality is critical on the learners' acceptance of LMS.

Systems Quality: System quality is related to the characteristics of a system. Researchers, such as [2, 11, 35] have introduced several ways to measure system quality. The common measure of system quality are response time, reliability, flexibility, accessibility and ease of use. In the context of e-learning, these system characteristics found significant on e-learning acceptance and use: reliability [41, 42]; accessibility [41] and system's functionality, interactivity, and response [29].

Information Quality: Information quality refers to the perceived output produced by the system. The common characteristics of information quality include accuracy, relevance, timeliness, sufficiency, completeness, understandability, format and accessibility [2, 11, 35]. Roca et al. measured information quality by indicators related to relevance, timeliness, sufficiency, accuracy, clarity and

format, and proved information quality significance directly on satisfaction and indirectly on perceived usefulness [32].

Service Quality: Service quality refers to the quality of the system's support services provided to the system's end users. Common measurements of service quality are tangibles, reliability, responsiveness, assurance and empathy [19, 27]. In the e-learning context, Roca et al. measured service quality by measurement related to responsiveness, reliability and empathy, and confirmed it's significant directly on satisfaction and indirectly on perceived usefulness [32].

4. CONCLUSION

Learning management systems (LMS) provide efficient and effective means to build human resources. LMS also provide academic insinuations means to store, manage, and share its academic resources and knowledge. The success of LMS in academic institution may be initiated by instructors' acceptance; however, it survives in the long run by learners' continuous acceptance and utilization.

The objective of this paper was to provide a comprehensive examination of the critical factors that influence learners' acceptance of LMS and consequently their actual use. These critical factors are related to the major entities of LMS context: the learner, the instructor, the course, classmates, organization, and technology. Figure 1 summarizes these proposed factors. This study provides useful implications and insights for researchers and practitioners on the acceptance of LMS.

However, an empirical investigation is required to validate the impacts of these critical factors on the learners' acceptance of LMS. Thus, future empirical research should develop or adopt reliable and valid measurements for researchers and practitioners to evaluate the impact of these factors on the learners' acceptance of learning management systems. Empirical investigations are also needed to verify the effects of these factors. Future studies may also look at the determinants of the instructors and organizations acceptance of LMS. Furthermore, future empirical research may provide detailed investigation of the net benefits of LMS for learners, instructors and organizations.

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Does the Use of Second Life Affect Students' Feeling of Social Presence in E-Learning?

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ABSTRACT

Due to readily available and affordable personal computers, coupled with surging Internet use, e-learning has become popular among undergraduate and graduate students. Social presence is an emerging concept in e-learning. Although the feeling of social presence is an essential factor in e-learning, achieving it can be difficult. The absence of face-to-face communication and the perception of psychological distance can lead to a poor learning experience. This article discusses the importance of social presence in e-learning. The debut of 3-D collaborative virtual learning environments has introduced a new type of communication medium and learning environment to e-learning.

This study examined the impact of using Second Life as a communication medium and a learning environment on e-learners' feelings of social presence. A prototype application called *The Village of Belknap* was developed in Second Life. The researchers compared the perceived level of social presence of e-learners who participated in Second Life sessions and those who did not participate. This study found that e-learners who participated in the Second Life sessions scored higher in their feelings of social presence.

Keywords CVE, Collaborative Learning, Second Life, Avatar, Social Presence

1. INTRODUCTION

There is a significant movement toward distance education. The recent statistics showed that more than 80% of public institutions in the United States offer either online or blended courses [1]. The wide spread of e-learning makes it important to find innovative teaching methodologies instead of just converting the face-to-face course to an

online version of the course. Due to the abstract nature of the British Literature course content, the researchers in this paper explored non-traditional teaching tools to present the learning materials of the course. The literature educators [13], stated that students would better understand the topics of the literature courses if they have a thorough understanding of the community and its environment. One of the currently emerging tools that can be used to teach complex abstract learning concepts is 3D- virtual worlds. These worlds are computer-based simulated environments intended for their users to inhabit and interact via avatars [4]. Such worlds enable learners to learn and experience situations which would otherwise be impossible and/or undesirable for availability, distance, cost, time, logistical or safety reasons [6].

One of the main factors that can support the success of learning in the 3D-virtual worlds is Social Presence. According to [2], social presence is the awareness of the existence of others that is accompanied by a sense of engagement with them. Social presence is a critical factor that affects the quality of social interaction among online learners and, in turn, influences the opportunities for collaborative learning. The research studies that examined social presence in traditional face-to-face courses and online courses through computer mediated communication tools such as teleconference, video conference, and discussion boards proved that social presence can increase student satisfaction and perceived learning outcomes [11 & 15]. On the other hand, there are few studies that examined the impact of 3D-virtual worlds such as Second Life on the feeling of social presence among students. The presented study, therefore, examined students' feelings of social presence through the use of mixed research methods (quantitative and qualitative) of one undergraduate-level online course. Specifically, this study sought to answer the following research question:

- Is there a significant effect of using Second Life on the feeling of social presence for online students?

2. CONCEPTUAL FRAMEWORK

Collaborative Learning

In collaborative learning, learners work together with other learners and with the instructor on a problem situation in order to construct collaborative learning communities. In [14], authors described a learning community as one "whose culture is characterized by commitment and professionalism". Building a community of learners is vital in that it can affect learners' satisfaction and performance. Learning communities are based on the collaborative learning theory whose fundamental premise states that learners must collaborate meaningfully in learning activities by interacting with others. Collaborative learning gives learners the opportunity to converse with peers, present and defend ideas, exchange diverse beliefs, question conceptual frameworks, and become actively engaged [17].

Scope of Social Presence

According to [8], the formation of a learning community requires a feeling of social presence among e-learners. The ability to work effectively in small groups is at the heart of social presence theory and of interest to those involved in creating communities of learners [7, 16, & 18]. When social presence is achieved, learners will wish to participate actively in community activities [2]. Social presence occurs when people are perceived as real beings despite the lack of face-to-face communication [7, 16, & 18]. In [2], authors explained that social presence occurs when users feel that a form, behavior, or sensory experience indicating the presence of another intelligence. To the degree users feel access to the intelligence, intentions, and sensory impressions of another, social presence is achieved.

The main factors that contribute to a high feeling of social presence and the building of successful learning communities are facial expression, direction of gaze, posture, dress, non-verbal, and vocal cues. In [5], authors argued that nonverbal communication cues serve two main functions: conversation management, and the communication of emotion. Today's communication media in e-learning such as MySpace, Facebook, discussion boards, online chats, blogs, wikis, and videoconferencing do not allow e-learners to express non-verbal cues. Technological advances make it possible for e-learners to express non-verbal behaviors in a socially rich distributed environment through 3-D collaborative virtual learning environments. According to [12, p. 403], "The explosion of information technologies has brought learners together by erasing the boundaries of time and place for distance learners". Therefore, 3-D collaborative virtual learning

environments have emerged as a tool that can overcome current communication limitations.

Second Life

Second Life is an internet-based 3-D collaborative virtual environment where the researchers conducted the following experiment. In Second Life, users navigate, interact, and view the world through their personal avatars. Users can communicate in a variety of ways including typed chat, private instant messaging, voice chat, as well as conveying their non-verbal expressions via the pre-programmed animations such as laughing, crying, dancing.

3. METHODOLOGY

Statement of the purpose

The purpose of this study was to determine how the integration of Second Life as a 3-D virtual world can influence e-learners' feelings of social presence. Although social presence has been characterized as an important factor in distance learning [12], there is no real attempt to investigate how the use of 3-D virtual world can influence the feeling of social presence. Therefore, this study examined e-learners' perceived value of social presence. The class that participated in this experiment was an online class that meets 100% online during the entire semester. At the beginning of the semester, the instructor presented to 25 students enrolled in the online version of the course the idea of participating in online practice sessions and the idea behind using Second Life as a learning environment.

The Second Life sessions were developed in an island called The Ville. An optional online orientation meeting was scheduled at The Ville in order to help students to learn how to navigate in the island and create their avatars. After the orientation, four students decided to participate in Second Life sessions in addition to online class activities (SL&OL) and twenty-one students decided not to participate in the Second Life sessions and only be involved in the online class activities (OL). Out of those twenty-one students six students volunteered to participate in the social presence survey at the end of the experiment. The two groups (SL&OL) and (OL) of students were expected to learn the same content.

For the (SL&OL) group of students, instructors arranged for three meetings to take place in Second Life to discuss three different topics. The researchers predicted that the students who participated in the Second Life sessions would experience a better feeling of social presence compared to students who did not participate in the sessions.

Participants

In this pilot study, ten e-learners (four: SL&OL and six: OL) are involved from the University of Louisville in the experimental study analysis. The e-learners were enrolled

in the online English 301, British Literature course. Students were of mixed age, gender and educational backgrounds. More than half of the participants (6 or 60%) were female and (4 or 40%) were male. They ranged in age from 18 to 23 years.

Experimental Design

This paper used both quantitative and qualitative data to provide a holistic understanding of the importance of 3D-virtual worlds on promoting students' feelings of social presence. The study collected the quantitative data through a survey [3]. The type of participation in the online course activities was manipulated to determine how it affected the feeling of social presence that participants experienced during the experiment. Students' participation in the online course activities was manipulated to determine how it affected the feeling of social presence that participants experienced during the experiment.

In addition to the quantitative methods, interview strategy was employed in order to get a better understanding of how the integration of 3D- virtual worlds may: (1) help students to perform better through the group activities, (2) support students' interaction with their colleagues; and (3) improve their awareness with each others' actions. The researchers used hand-written notes to record students' responses. Randomly selected students were informally interviewed after the third meeting. The qualitative data was analyzed using naturalistic techniques in order to examine students' responses [9].

Instrument

The Social Presence Questionnaire (SPQ) developed by [19] was used to collect quantitative data regarding e-learners' feelings of social presence. The social presence questionnaire consists of three factors:

- Factor 1: Perception of the assistance of group activity to learning
 - This factor is used to measure the extent to which group activities helped students to learn more efficiently than working alone;
- Factor 2: Social comfort of expressing and sensing affect
 - This factor is used to measure the extent to which students are comfortable in expressing their feelings; and
- Factor 3: Social navigation
 - This factor is used to measure the extent to which students are aware of each others' actions.

Each factor consists of a group of questions with a total number of 19 questions. Researchers decided to use 12 related questions in our experiment. The questions use a five-point Likert scale with response options ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire yields a total score ranging from 12 to 60,

with a higher score indicating a higher feeling of social presence. The overall internal consistency reliability of the questionnaire is =0.85. Alpha ranged from a low of 0.7031 for the social navigation factor to a high of 0.9218 for the social comfort of expressing and sensing affect factor.

Also, in order to collect qualitative data about the impact of integrating Second Life as a teaching tool an open-ended interview questions were employed. The interview was constructed to specifically elicit e-learners' responses that would provide the research team with a better understanding of students' perceptions of Second Life. The interview was semi-structured and focused on better understanding of e-learners' overall impression of Second Life, the impact of Second Life on increasing their awareness of other e-learners and facilitating better social interaction with their colleagues, and if the group activities in Second Life helped them to get a better understanding of the British Literature topics.

Description of the Learning Environment

A medieval village called The Village of Belknap was created in Second Life (Figure 1). For e-learners who participated in the Second Life sessions, tasks were designed to help them gaining a better understanding of issues in the 16th century in England such as romantic love, individualism, and family obligation. Students participated in three sessions of Second Life. Each session was linked to a certain learning topic. For instance, we include the description of the third scenario as an example.



Fig 1. The Village of Belknap

Before starting the learning activity, e-learners were asked to:

- Choose a village identity for their avatar from the following list: 3 courtiers; 3 ladies; 2 wool merchants; 2 weavers; 1 monk,
- Choose appropriate 16th century clothing for their avatar, and
- Update their Second Life profile to reflect their new 16th century identity.
- During the learning activity, e-learners were asked to:
 - Read the 16th century profiles of other avatars and communicate in a way consistent with the

- social role of their character in 16th century English culture,
- Learn about 16th century culture by clicking on scroll symbols placed around the village; at each scroll a note card explains the village and its 16th century culture,
- Create a note card to post on the bulletin board describing one 16th century belief about romantic love and cite a literary work that makes that claim,
- Read what others had posted,
- Debate a 16th century scenario where a noblewoman in the group is tempted to defy her family and elope with the man she loves.
- Everyone was expected to contribute to the debate using arguments that reflect the various 16th century attitudes toward romantic love, individualism, family obligation, Christian Humanism, and de contemptu mundi ethics from their character's point of view.

Once the decision was made, students learned their fate by gathering at the bulletin board to read the outcome of her decision on a note card.

Procedures

After completing the third Second Life session and one week before sending the questionnaire, the instructor sent an e-mail to e-learners to explain the purpose of the survey and motivate them to participate in the questionnaire. The survey was administered using Zoomerang, an online survey tool. Participation in the survey was completely voluntary and there were no negative ramifications for e-learners who chose not to participate. An announcement concerning the survey was also posted in Blackboard. E-learners were given one week to complete the survey.

4. DATA ANALYSIS

The quantitative data was analyzed using SPSS. The data was entered into SPSS and analyzed using Mann-Whitney non-parametric technique to determine whether the difference between the two groups was statistically significant or not. Regarding the qualitative data, the researchers generated categories, identify themes, and look for recurring patterns among the responses to the questions. The analysis of the quantitative and qualitative data allowed us to look across the data to understand e-learners' thinking about both a large and fine grain level.

Findings and Discussion

The researchers hypothesized that participation in the Second Life activities and the facilitation of more avenues of communication and interaction among e-learners would lead to a higher feeling of social presence. Based on the results of previous social presence studies, we expected that the use of Second Life would allow e-learners to experience a higher feeling of social presence during their interaction with peers.

Treatment	N	Median	Min	Max
Online Participation Only	6	40.5	37	48
Online and SL Participation	4	53	44	60

Table 1: statistical significance results at the 0.05 level.

The descriptive data (Table 1) indicates that the participants' ratings of the SPQ ranged from 37 to 60 among all participants; 37 to 48 in the online only condition, and from 44 to 60 in the online/Second Life (SL) condition. E-learners' feelings of social presence was better in the condition of online/SL (Median Value =53) compared to the online only condition (Median Value = 40.5).

The results show that e-learners' participation in the Second Life sessions affected their feelings of social presence. Although the results indicated that e-learners who participated in the Second Life sessions experienced a higher feeling of social presence than e-learners who did not participate, they did not indicate whether the differences between the two groups were statistically significant. Therefore, the Mann-Whitney test was used to examine the significance of the difference between the two groups. An alpha level of .05 was used for the statistical test.

The results show that $Z = -2.057$, and $p = .040$ (Table 2), demonstrating statistical significance at the 0.05 level. Together with the descriptive data in (Table 1), the results indicate that participants in the online/ Second Life sessions experienced a significantly higher feeling of social presence than those in the online only condition. Students with high overall social presence scores also indicate more satisfaction during interaction with team members. This implies that students' perceptions of social presence are related to the amount of interaction and/or quality of that interaction with their peers.

Social Presence	
Mann Whitney U	2.5
Wilcoxon W	23.5
Z	-2.057
Asymp. Sig. (2-Tailed)	0.040
Exact Sig. [2*(1-Tailed)]	0.038 ³

Table 2: Mann Whitney Statistical Tests Results

Researchers examined deeply students' interviews and their comments. We discovered that student comments revealed that they enjoyed the interactive nature of Second Life, enjoyed the role-playing nature of the game, and enjoyed the group activities. Students valued Second Life as a new teaching tool in order to learn difficult abstract concepts of the British Literature. We include quotes from students' comments that are organized as follows:

Regarding students' perception of Second Life as a tool that facilitates group activities and learning:

- "It was more interactive"

- “I really enjoyed it. The role playing was quite fun”
- “I think I learned more through the role playing activity than by reading a book. I personally don’t like to read that much”
- “Yeah, the village helped me very much to get a better sense of the time period”
- “Well Second Life made it more interesting and fun. I really looked forward to every meeting”
- “Fun because it was personal”

Regarding students’ abilities to express their feelings, most of the students indicated that the use of Second Life and the existence of the avatar provided them with the change to be able to express their feelings as follows:

- “SL made the class more interactive. I could get into the role and act it out without getting in front of others. In a F2F class it is harder to act it out. I am rather shy, but was less inhibited in SL. To be able to contribute, I had to make sure I was read up and prepared to make a good argument for the role play activity. The environment (the medieval village) helped facilitate getting into your part”
- “It was very nice to exchange the ideas”

Finally, students expressed that Second Life provided them with a high sense of connection that can increase students’ awareness as follows:

- “Second Life created a sense of interaction. It was a good experience and made me feel like I was not in an online course. It provided me a sense of connection”.

Responses to the questionnaire as well as students’ comments indicate that e-learners perceive social presence as one of the main requirements for exchanging ideas, giving feedback in a personal and warm context, building trust and interpersonal relationships among the team members, and building a personal atmosphere learning environment. In addition, the results indicate that e-learners believe feeling the existence of another person helped them

to accomplish the Second Life activities better and more efficiently than if they were working alone.

The unique existence of avatars in 3-D collaborative virtual environments provided e-learners with the ability to express their feelings to their peers. Avatars allowed e-learners to play various roles, select their own costumes, use body language during interaction with colleagues, express humor, and appreciate the humor of their peers in Second Life. Moreover, the use of avatars affected e-learners’ interaction with each other. The ability of e-learners to move the avatars’ body, hands, or legs to express non-verbal behaviors increased their enjoyment and rate of interaction with others. Using avatars gave e-learners the feeling and the experience of real life face-to-face interaction.

5. CONCLUSION

It is clear from the results of this study that social presence is a vital element affecting students’ enjoyment and interaction during learning activities. This study extends the research on the effect of employing 3-D collaborative learning virtual environments in e-learning. The results show that the interactive interface of Second Life encourages e-learners to share experiences and visions, and motivates them to interact with each other to complete the learning tasks.

The results of this research can be an effective source of information for both researchers and practitioners. Since social presence is a new concept in the area of collaborative virtual environments, more research is needed in both online and face-to-face learning. Studies are needed to examine the impact social presence has on students’ learning performance, perception of social interaction, satisfaction and enjoyment, and motivation. In addition, research is needed to investigate how students’ personal characteristics can influence their feelings of social presence.

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ESP ICT Vocabulary for First-Term Students at Madinah College of Technology (MCT)

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ABSTRACT

I have produced an interactive multimedia programme designed for first-term students studying in the computer department at Madinah College of Technology (MCT). These are secondary school graduates who have studied English for six plus years. Their English level is lower-intermediate; however they are good computer users. This software was produced with *Mediator 7 pro* from *Matchware Corp.* and introduces students to the technical English vocabulary they will need in their field of specialization. The general aim is to enable students to comprehend basic technical English in their field as well as preparing them for enrolment in advanced courses of similar nature. This is essentially about addressing the need for specialist vocabulary; we are entering into English for Specific Purposes (ESP) territory. This project originated when I encountered MCT (IT) students struggling with "white and black" ESP coursebooks such as "Basic English for Computing". These kinds of ESP materials have many technical terms and are relatively new and difficult for the students. I decided to design an interactive application to overcome this problem. With the help of the aforementioned book, it could act like a further aid to enhance students' understanding and help them handle the course more effectively. While producing this software, I followed Jolly and Bolitho's seven stage model for producing educational material. This paper first considers the key factor in the programme, the learners. We need to know about their linguistic status quo, so that we are able to define their needs; the keystone of any software design. Then, I reference the theories and principles that underpin the design process. Next, an evaluation procedure is adopted to identify the strengths and weaknesses of the software. The last section briefly considers how this unfinished programme can be improved and further developed.

Keywords: CALL authoring software, design process, learners' needs and formative evaluation.

1 LEARNERS' NEEDS:

Many researchers believe that learners' needs are crucial to the design of educational material [15] [6] [2]. In 1998, Jolly and Bolitho [7] made "identification of learners' needs" the first step of their seven step-model for material production. As for interactive multimedia production, Watts [16] says that there are two approaches: technology-driven approach and learner-based. He (*ibid*) posits that designers need to "break with the technology-driven model of the past and develop a more learner-based orientation". In 2003, Bax [1] traced CALL

history and proposed "three new categories: restricted, open and integrated" in lieu of the old belief which also consists of three stages: behaviourist, interactive and integrative [10]. Bax [1] argues that CALL users are still trying to make a shift from the "open" CALL, where students enjoy a great deal of freedom but little integration over their CALL programmes, to the "integrated" CALL. This application was designed to achieve greater integration with the pedagogical theories at MCT and provide students with more freedom by employing non-linear navigation and many types of activity.

Given this brief outline of the importance of learners' needs in educational software, let us now look at their needs at MCT. As previously stated, I used Jolly & Bolitho's seven step-model and began the first step (Identifying learners' needs) by identifying the targeted learners' needs. The next paragraph lists and further explores these needs in an attempt to achieve the second step, "Exploration of needs". This discussion about learners' needs will show how they have been met in the design of this programme. Below are some of the salient features of students at MCT, taken from the proceedings of the first Saudi TEFL conference in MCT:

1. Poor linguistic competence.
2. Negative attitudes toward L2.
3. Shyness and inhibition due to difficulties in memorizing specific ESP terms.
4. English is not supported outside the classroom.

This software was designed to address these deficiencies.

Learners need to consolidate their previous knowledge of basic English with the computer-related skills and terminology necessary for studying their major and functioning in their future career as well as to prepare for an adequate performance in their future professional workplace. As we have identified learners' needs, we can now state the expected aims behind the production of this software. The designer hopes that students will be able to:

- A. Grasp, acquire and use a reasonable number of basic technical terms in their field of study.
- B. Comprehend simple IT text.
- C. Understand acronyms.

In terms of language content, this software focuses on meaning-based learning tasks [12] by providing key points of computer-related vocabulary and key functions; grammatical points were not covered. This was achieved by introducing a range of 70 computing and IT terms, in seven units, which are important

for decoding texts in the students' specialism. To tackle previously mentioned student defect (1) about poor linguistic competence, the content is graded from simple to difficult with short sentences and easy language [12] [6]. In addition, the programme aims to offer a remedy for student shyness (defect (3)) through a friendly interface and easy-to-use navigation which should motivate and encourage them to use the application. Kelm [8] claimed that CALL is a "great equalizer" among students especially because it caters for passive or quiet learners. This was supported by Hubbard [6] who believed that the individualisation facility that computers offer is its "greatest strength" while "dehumanisation" is one of the most significant limitations.

To overcome students' negative attitudes toward L2 (defect (2)), the home page, which is accessible from all other pages, was designed to be motivating, and attractive [5]. I hope students' understanding about language learning will change as they find this software new, easy and fun to use [16]. To promote successful language learning, the application utilises many "instructional media" (visuals, sound and videos) to satisfy different learners' preferences and learning styles [12] as well as to provide them with extra visual and audio help traits that could enhance their competence and acquisition of the targeted vocabulary. Most importantly this seeks to convey to students that the software was specifically designed for them, the learner at MCT. It differs from other commercial software because it incorporates the Saudi flag, an MCT animation and logo, and a man with Saudi costumes who provides support and guidance in their native language. By so doing, I have applied the third stage of Jolly & Bolitho's model which concerns "Contextualisation realisation of material". According to Hubbard [6], material designers should develop cultural awareness of their learners, otherwise learners experience negative feelings in their learning because they think that their entity is "put at risk"; it "distorts their situational and linguistic reality". With regard to student defect (4), about learning being limited by time and space, learners will be able to use this software at home because mobility is actually a great advantage of CALL software [9].

Having the learners' needs and level of language in mind, most units start with tuning-in and warm-up sections, which prompt students' thought, pool their knowledge and thus encourage them to start working co-operatively. These are often based around a revealing visual or an authentic diagram [16]. They introduce new contents succinctly and are the basis for the next page which has the main input for the lesson. This section is more detailed and has more data than the previous one. As far as possible, these units rely on a straightforward presentation involving examples in the context of computing. To maintain principles such as user-task match and user-task feasibility [5], every third page is a follow-up activity where students perform simple interactive activities with easy instructions, and instant feedback to reinforce positive learning [12] without the need for teacher guidance. Here, feedback is a software response which indicates whether an answer is true or false, whereas interactivity refers to two-way communication with the computer whereby it accepts user input and delivers appropriate output. Tasks are designed as pair or individual group activities, ending with a teacher playing the role of facilitator. Activities may use Interactive White Boards (IWB) so that the whole class participates in the same task. This does not, however, mean that the teacher can dominate

the tasks or learners are marginalized, because the constructivist model is still not affected. The constructivist CALL model is a humanistic model where the learner has "greater control and responsibilities over what he or she learns ... " [2]. In essence, IWB at MCT generates learners' engagement, supports their preferred learning styles and caters for social interaction because it is innovative and new.

To summarise, in order to meet students' needs this project has adapted a pure learner control approach [6] to maintain autonomy and authenticity for the learners. Hopefully this design gives the learner complete control over "pacing and the sequencing of the content presentation", easy navigation, and quick reversal options [15]. If learners' needs and current pedagogic theories are interrelated, then this is an interesting area to investigate.

2 RELEVANT PEDAGOGIC THEORIES AND THE DESIGN OF THIS SOFTWARE:

Following Jolly and Bolitho's model, I now proceed with the fourth step, "Pedagogical realisation". The importance of current pedagogic theories in the specific context underpinning educational software production has been asserted by many CALL software researchers [5] [13] [12]. The book used with this project was a set text for the Communicative Language Teaching Approach (CLT) for intermediate learners. However, due to the huge gap between students' ability and the level of the book, MCT teachers of ESP often prefer to escape, by translating terms that are difficult to convey in the L2 by applying the Grammar-Translation Approach (GTA), claiming that they understand their own learners best. Therefore, the pedagogic approach in MCT is a blend of CLT (with a focus on vocabulary) and GTA. The design of the software interface was thus simplified and eased in terms of interaction, and semantic and syntactic content. The importance of raising learners' awareness of technical terms was born in mind throughout the whole design process and memorization was one of the significant targeted aspects. In order to maximize learners' memorization and help them remember more technical vocabulary, clear and simple visuals were used simultaneously with their names "text" using a hide and show facility. These two media reinforce each other and help learners access the two different types of memory: verbal (such as words stored either auditory or visually) and non-verbal (images and visuals). This project makes use of the *dual-coding theory* [11] which proposes that abstract and concrete words are stored in the verbal mode with only concrete words represented in the visual mode. Technical terms are concrete words and therefore have more chance of being recalled.

Other aspects of learning theory in MCT include implicit (inductive), or passive learning, where students are exposed to information and expected to acquire knowledge of that information through that exposure [3]. Such exposure, achieved by combining visuals and texts together in this application, leads the learner to develop a kind of consciousness. Later on, the learner will start 'noticing' this particular vocabulary and this is crucial for the development of implicit knowledge [3]. Hémard [5] states that high student-control design would fit better with software driven

by implicit learning theories where learners are encouraged by "memorization process [which is] based on exploratory mode". The learners' needs (promotion of L2 lexis through provision of meaning and comprehension-based activities) determine the type of design of the interface model; learner-based [13].

Hubbard [6] suggests that the language teaching approach is determined by two elements that a designer needs to understand prior to software design: linguistic and learning assumptions. Linguistic assumptions are principles adopted by the designer based on his understanding of the L2 nature and the importance of "structural, cultural and social aspects". Learning assumptions are principles adopted by the designer based on his understanding of the nature of the L2 learning process and the whereabouts of the context of this software. I have been teaching at MCT for ten years and have attempted to combine these two elements both in class and throughout the design of this software. I hope that the previous two sections have whetted your appetite and you will take a look at the design process described below.

3 DESIGN PROCESS AND PRINCIPLES OF CONSTRUCTION:

Having discussed the relevant pedagogic theories, I will now describe the design principles underpinning the production of this project. I present this section in accordance with the fifth step of Jolly and Bolitho's model, "Production of materials". Here, I start with a discussion of the term "user-interface" and then move on to discuss the design principles of the software interface. In any human-computer relationship, we firstly need to define the model of interaction, known as the user interface. Plass [13] defines the user interface as:

"the part of application in charge of communication with the learner ... [it] conveys the functionality of a computer application to the user and translates the user's input into a machine specific format".

This dynamic user-computer relationship suggests that the more effective and appropriate the interface, the more appropriate the functionality between the user and the material. Actually, the interaction can occur between the learner and any of the elements of the programme because:

"The function of the interface subsystem is to assign user input to internal representations of the application and internal representations of the application to output that is comprehensible to the user. The type of input and output modes employed by the interface subsystem determines the type of the interface" (Plass, 1998:36).

I now focus on some of these "internal representations" starting with the screen background. I have chosen a background that is dark-red with Islamic ornamentation to make it more user-friendly [5]. Hopefully this colour is appealing and attentive to young Saudi learners. In order to reduce the cognitive load on the user (*ibid*) and to maintain continuity and consistency of screen design [12] this background has been used on all pages.

In 1999, Soo [15] maintained that when designing high learner control interfaces, learner-computer interaction should be easy and that this could be attained by providing simple navigation with organized button and menu locations. Thus, buttons were explained in the audio help, self-explanatory and consistent [12]. In addition, this project follows both a tree (hierarchy) and linear model to guarantee that the learner is free to initiate and take the actions he wishes. Exiting is possible from all places by returning to the home page and is indicated by a door icon. Because users sometimes exit an application when they do not actually want to, pop-up text is displayed before exiting, asking the user whether he really wants to quit. I have also tried to avoid add-ons which distract learners' attention [2].

The same font is used throughout with different sizes to indicate titles and subtitles [12]. I selected "Arial" because it is a sans-serif font which optimizes text readability [5]. I used a permanent font because it has a significant invisible effect on the reader in that every font has three basic attributes: first, size, measured in points; second, weight, which is a "relative measurement of the thickness of the strokes that make it up"; and third, style, which is Roman, Bold or Italic [4]. Changing font means changing these three attributes, with a potential effect on the reader and impact on text readability, continuity, and consistency of screen design. Elsom-Cook [4] claims that Serif fonts are best for body texts and Sans-serif for headings, but my learners seem to favour sans-serif; therefore I have used the latter throughout the project. However, I agree with Elsom-Cook that left-justified texts are easier and quicker to read. Therefore all my texts are left-justified. Important linguistic features are highlighted with a different colour that causes no colour contrast (light golden texts over the dark red background which is framed with saturated purple) to draw learners' attention [12]. Green was used for positive feedback because it indicates happiness in Arabic culture while dark blue, connected with sorrowfulness in the learners' L1, was used for negative feedback. To maintain the standardization of the display [5], only a few specific screen information elements, such as fonts, colours, shapes, and menus, were used.

Most of the images were self-captured with digital camera and then digitised with *Adobe Photoshop elements 3.0* or *Snag it 7* Software. The most difficult task was combining separate parts of pictures into single images. I faced difficulties in the image layers' transferability by changing the file extension of the images e.g. from GIF to JPEG in order to ensure less image size. Images were not generally used for decorative purposes but to convey meaning, explain complex relationships and attract attention with visual clarity [13].

I have used two self-made videos to explain things which either are difficult to convey using text or demand motion. These videos were meant to be short, clear and easily understood; the language used was Arabic, the learners' native tongue, because the targeted learners have low level English ability. Moreover, I maintained the synchronization of video with audio as this seemed more important than the quality of the display [15]. Videos were used to add to the learning experience and learners' integration. To maximize learner interaction, students can stop, rewind, forward and start the videos at any time so that they can freely discuss the content. To digitise the videos, I used *Adobe Premiere elements 6.0* and found it to be problematic, time-consuming,

demanding of extensive preparation, and the most expensive form of digitisation. Photos that look like icons of video tapes were used to signal that video is available.

Sound was given less significance in this project than video and images simply because the software does not target students' pronunciation skills. Perhaps one reason for students' good pronunciation skills is that most computer vocabulary does not have a counterpart in the students' L1, so they are called by their English names in shops and at home, e.g. "laptop". Students need, therefore, to understand what a "motherboard" is, not how to pronounce it. However, when audio was used (in the feedback and instructions) good-fidelity was taken into consideration as long as it provided a "customized and recognizable display" [16].

I will now move on to discuss other principles guiding design of the display starting with the screen layout. Though many researchers accentuate the importance of permanent screen information [5], it was impossible to adopt one specific layout, or what Hubbard [6] terms a "Presentational scheme", because different technical terms are represented with different pictures that need different spaces.

"The presentational scheme as the core of the procedure section strongly influences the remaining elements: screen layout, control options, ... and help options" (Hubbard, 1996:28).

Moreover, the content of the cognitive load of each unit requires different types of comprehension-check activities. However, it is hoped that optimization of the screen [5] was maintained, in that all views are uncluttered and the information displayed can be quickly understood. Bearing in mind the users targeted, and other factors like the simplicity of the project, I felt it unnecessary to include facilities such as On-line help, Error-recovery [15], or a search-engine [12]. However, the last section "What is this word?" was supposed to offer lexical help for the uncommon words e.g. "peripheral" but unfortunately *Mediator 7 pro* does not seem to support Arabic text. Let us finish this section by acknowledging the importance of metaphor [15]. Although metaphor is highly beneficial in interactive software, I was unable to use it due to the nature of the software and the learners' English ability.

To summarise; despite the plethora of design principles scattered throughout the literature of CALL software, I have mentioned only the important ones in this paper and adhered to only a few of them in my material. The next section will discuss one of the most pivotal stages of software production; evaluation.

4 EVALUATION OF THE STRONG AND WEAK ASPECTS OF THIS MATERIAL:

Whilst this project adopted Jolly and Bolitho's model [7], unfortunately the sixth step, "students' use of material", was not feasible because of space and time boundaries of the context. However, I was fortunate to find low-level learners who could test it for me, enabling me to apply the last step in the model which is "evaluation". In material production, undoubtedly the evaluation process is as vital as considering the learners' needs. Its significance has been stressed by a number of researchers who have developed different models of software evaluation. Slater and Varney-Burch [14] argue

that software evaluation covers three main areas: technical consideration, e.g. installation and networking; multimedia design criteria, e.g. aesthetics and help; and pedagogical factors, e.g. integration and fulfilment of learning objectives. Hubbard [6] develops an evaluation model that is based on two main approaches, each with relevant sub-elements: teacher fit and learner fit. He (*ibid*) perceives the evaluation process as the inverse of the development process in that the latter aims to produce courseware whereas in the former the courseware is given in order to fit with those aims.

Here, I am more concerned with software interface evaluation and will apply formative evaluation [14] that aims to improve the quality of the product. I managed to convince three MCT students to try this software and provide me with feedback. Their views were quite astonishing in that they perceived more advantages than disadvantages. I will begin with the strong points. These were that the project was easy to navigate, the background was engaging, there were high quality images, it was Saudi content-related, and it benefited from use of videos and careful selection of colours. Most importantly, they liked the different types of activities (true and false, fill in the gaps, multiple choice, and drag and drop) and the implantation of a show-and-hide facility which is a "positive feature" [12]. They did, however, spot some glitches. The font size and display window were too small, the screen sometimes appeared cluttered with text (e.g. unit 6), some images have garish colours (e.g. unit 4). They would also have favoured a different way of viewing large images such as the scroll bared motherboard image in unit 5. They would have preferred the "hotspot" facility where the cursor changes into a hand when moved to a specific area, and clicking it shows that location in detail. I have optimized the prototype to the best of my ability, but intermittent weaknesses will appear for many reasons. Chief among these are time constraints, lack of practical knowledge as a novice programmer, and economic limitations. Thus, I would have been able to provide a better multimedia (visuals, sound and video) quality only if I had been able to afford the required hardware and software. These disadvantages could, however, be avoided in the post-production development process which the next section suggests.

5 FURTHER DEVELOPMENT:

A great advantage of multimedia technology is that there is room for further development, even post production. A number of improvements to this software have been suggested in previous sections but I will now specify the ones I have been working towards. With autonomous learning in mind, I thought it is useful to include a print facility so that learners could obtain print-outs of specific pages. Blogs could also be attached to reinforce the memorisation process. Moreover, students in classes other than English could also benefit from this software if the Arabic version, which I have marked on the home page, was available. Furthermore, the display of L1 and L2 could trigger comparisons between the two languages that yield deeper understanding of both languages in terms of similarities and differences.

Another option might be to include videos in English to allow learners to choose their preferred language, giving more exposure to L2 and increasing authenticity [3]. Still on the

topic of media and having in mind Paivio's dual coding theory [11], sound could be added to provide aural examples so that multimedia caters for increased memorisation. Kozma [9] supports this view, claiming that recall is more likely to occur given a combination of sound and visuals, rather than either one in isolation. Furthermore, more activities could be created to enhance other language skills, (listening and reading) by providing actual recorded interviews or authentic

simple texts. Also, the integration of games could highly motivate and maximise learning experience. As a believer in the lexical importance of ESP courses, I feel that anchoring dictionary access, be it bilingual or ESP monolingual, will yield fruitful results for students. At a later stage, provision of internet chat or online help websites would help students of a similar level to exploit this facility and interact with peers with shared interests.

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Evaluation of High Fidelity Simulation within a Baccalaureate Assessment Course: Bridging the Challenges of Academia within the Classroom

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ABSTRACT

The purpose of this quasi-experimental research was to investigate the impact of high fidelity simulation on knowledge and confidence levels among undergraduate baccalaureate nursing students within a Health Assessment course. Due to the decrease in nurse educators and limited clinical placements in hospital settings, innovative teaching methodologies to teach clinical and assessment skills need to be integrated within nursing programs. The participants in this study were first semester junior level nursing students from three baccalaureate level Health Assessment classes. Two classes of approximately 15-20 students each were exposed to simulation- an actor (standardized patient) or a high fidelity simulator while the third group experienced a traditional classroom and lab without simulation. A pre and post test was designed to measure knowledge and a survey instrument was used to measure student confidence levels before and after the learning experience. Results of the study have implications on the development and integration of innovative teaching pedagogies for nurse educators.

Keywords: Simulation; high fidelity simulation (HFS); innovative pedagogy; nursing education; education; standardized patient

INTRODUCTION

Simulation has been used in a variety of ways in diverse environments. Business and education have incorporated the idea of simulation as problem-based case scenarios within a realistic setting [1] whereas, in healthcare, simulation adds the benefit of a device, such as *VitalSimTM* that students integrate within a case-based scenario in order to assess a patient.

For the past forty years, both the nursing and education profession has relied on “apprenticeship” models to assist students to gain critical knowledge and skills. In nursing, the apprenticeship model uses clinical instructors to teach eight to ten students at a time on hospital units or in other clinical settings. Unfortunately, the apprenticeship model does not provide for consistency in learning outcomes. Student experiences depend on what type of patients are at the facility during their clinical experience. Inconsistency of experiences, lack of placements for students, and decreased faculty have created a void in nursing education that could possibly be filled with the integration of innovative technology [2]. One such innovation is the use of high fidelity simulation within the classroom and on campus in a nursing lab environment. Simulation as an instructional technique can provide a learning environment in the classroom that is as realistic as possible to the clinical setting (patients on nursing units at the hospital). There are several nursing schools throughout the country that are investigating the use of simulation to replace or enhance clinical experiences at health care facilities [2]. Nurse educators around the country are engaged in debate over the issue of simulation replacing clinical instructional time for students at hospitals and clinical settings [2].

The integration of simulation in the curriculum can assist students to retain knowledge and develop and refine their critical thinking skills for nursing and education students. According to Griffin-Sobel (2006), simulation provides an opportunity for students to practice both cognitive skills (critical thinking), such as knowing what to do and psychomotor skills, such as the actual teaching [3]. There is a plethora of technology that surrounds everyone, both in academia and the work environment. Within the nursing profession for example, technology is used in multiple media

such as PDAs (personal digital assistants), bedside computers, and continuous monitoring equipment in acute and community based settings [4]. Therefore, it is imperative that nursing students gain proficiency performing clinical skills, in addition to retaining factual knowledge.

To be effective, simulation should be aligned with goals, skills and knowledge acquisition, competency testing, critical thinking, and best practices while integrating a variety of realistic case scenarios [5]. The integration of simulation as a teaching and learning pedagogy has been shown to be effective in teaching nursing students [6]. One of the more recent types of simulation is the integration of standardized patients, or actors, trained to perform for specific training purposes in a safe learning environment [7] [8]. The purpose of this study was to determine whether or not there was any difference between three instructional techniques (simulation with use of *VitalSim*TM or actor and traditional classroom learning) in terms of knowledge acquisition and confidence among undergraduate baccalaureate students in a Health Assessment class.

PROBLEM STATEMENT

To what extent can simulation as an instructional technique assist students in learning basic nursing knowledge?

This study investigated whether simulation technologies increased nursing students' knowledge and confidence.

Significance

This study investigated whether simulation technologies increased nursing students' knowledge and confidence. Simulation can provide consistent learning scenarios in which every student experiences a variety of "patients" and is guaranteed similar learning experiences. In this way, students may be better prepared academically and more likely to gain knowledge. Simulation can assist in promoting consistent learning and supplementing or replacing clinical placements in hospitals and clinics. These placements are becoming increasingly difficult to locate as more schools of nursing are expanding enrollments and there is increased competition for sites. At the same time the demand for nurses in the workforce is growing. As many of these health care facilities are dealing with nursing shortages, it is becoming more difficult for them to accommodate large numbers of students [2]. Moreover, nursing programs have increased their enrollment of nursing students, and therefore need more patient care units to teach the

students in the hospitals. Simulation is an effective instructional technique that can promote teaching consistency, reduce the need for clinical placements, and provide a less stressful environment to prepare students for actual patient care. The results of this study may be useful for nursing schools in the improvement of instructional techniques in nursing education and assist with the clinical learning environment that are becoming more difficult to find. Additionally, results from the study can be extrapolated to educating teachers as well.

SETTING and SAMPLE

The sample used in this research was a sample of convenience, consisting of 51 undergraduate junior first semester nursing students preassigned to three different health assessment classes from a mid-sized, comprehensive Mid-Atlantic metropolitan university.

Participants

Approximately 94 percent of the students were females, leaving 6 percent (3 students) that were males and coincidentally 1 male was in each class. Approximately twenty percent (10) of the students had earned previous bachelor's degrees and one student had an associate arts degree. Out of the ten students that previously earned a bachelor's degree, two had business degrees, and three had degrees in biology. Ten percent of the students were not born in the United States and their first language was not English. Approximately 75% of the participants in this study were single unmarried Caucasian female between the ages of 20 and 30.

RESEARCH HYPOTHESIS

In order to understand the impact of simulation on knowledge acquisition and confidence levels, the following hypotheses will guide the research:

1. There will be no difference in student knowledge based upon the instructional treatment – integration of HFS (*VitalSim*TM), integration of actor (standardized patient), or traditional learning. $P < .05$
2. There will be no significant difference in student learning retention (one month) based upon the instructional treatment – integration of HFS (*VitalSim*TM), integration of actor (standardized patient), or traditional learning. $P < .05$
3. There will be no difference in students' confidence levels based upon the instruction treatment – integration

of HFS (*VitalSim*TM), integration of actor (standardized patient), or traditional learning. $P < .05$

LIMITATIONS

This study was conducted with the following limitations acknowledged:

1. The selection of participants was limited to 51 eligible students taking a nursing course in the fall 2007. The sample was one of convenience and therefore, introduced bias. Results of this study were not generalizable beyond the sample.
2. The high fidelity simulator that was used is one of many, but was selected for its ease of use. A limitation of this system was that only selected lung sounds are available for use with this high fidelity simulator.
3. There are several other simulators on the market. Since the study was limited to the integration of the one simulator, results can only be generalized to the integration of the selected simulator.
4. While each class had the same instructor who used the same text book, lesson plan, and syllabus, it is possible that the instructor employed different teaching methods within each class on the specific day that the lecture was presented.
5. The research used student self assessment of self confidence levels. Although it is assumed that students will be truthful to themselves, students might not have taken the time to read questions, and this might have caused variation in some of the results.

RESEARCH DESIGN

This study was conducted in the fall 2007 semester and used a sample of convenience. The course, from which the sample was drawn, is a 15-week, three-credit course, consisting of a lecture and laboratory component. Students attended class one day a week for five hours while simultaneously attending a four-hour clinical day with another instructor at a facility off-campus, but within a ten-mile radius of the university. The course entitled, "Health Assessment across the Lifespan" is a requirement that every first semester nursing student must take and pass in order to progress in the program. There are three sections of the course, each with an enrollment of approximately 15-20 students. The class is offered to current first semester nursing students in the junior level of college every fall and spring

semester. Students are enrolled in this course, along with five other courses taken concurrently in the first semester, totaling 17 credits.

The design specifically used in this research was a nonequivalent control group design. Three different classes of Health Assessment were used in this research. The groups were formed by the administrative assistant who assigned students to classes based on when they sign up for classes. She assigned students to different groups and that determined which classes the students attend. While the class assignments are not random, students are placed alternately in Health Assessment sections based on when they see the administrative assistant to register for classes. The administrative assistant does not take requests for students to be in specific classes. The instructional treatment was assigned randomly to the three groups by tossing a coin to determine which group specifically received the specific learning intervention.

Tools

There were two tools that were used in the study. The first tool was a pre-post knowledge test was developed and reviewed by six experienced faculty members in the area of content, testing and evaluation with a Chronbach coefficient alpha of 0.74. Additionally the knowledge test had a content validity index (CVI) of 0.93. The second tool was a self-perceived confidence survey developed by Ravert (2002) and had a Chronbach coefficient alpha of 0.76 [9]. The confidence survey consisted of twenty questions rating each question using a scale from 1 (not confident at all) to 5 (extremely confident). Both the pre knowledge and pre confidence survey were administered prior to the content being taught. The post-test and survey were administered within one week of the case study experience and again one month prior to the case study experience, whether it was the simulation or non-simulation experience. Students were informed that the results of the tests and surveys had no implication on their overall course grade. The study was approved by the University's Institutional Review Board (IRB) for Research Involving the Use of Human Participants granted under the Exemption Number 04-1X09 on December 12, 2006.

DATA COLLECTION PROCEDURE

Data collection for this study was conducted using a hand written pre-post test and confidence tool completed the pre-test post-test and confidence survey at three different intervals: 1 week prior to the lecture (pre); at the conclusion of the

simulation (post 1); and 1 month after the simulation experience (post 2).

Groups and Procedures

All three groups were given the pre knowledge test and confidence survey prior to being exposed to the respiratory content which occurred one week prior to day one since students prepare for class by reviewing the textbook and notes before the content was presented. The second week students received a Power Point in class lecture, had access to videos online, presented with a case study pertaining to the material, and listened to audio tapes containing lung sounds in class with access for out of class review. The following week (week 3) the post test and confidence survey were given to all students. One month after the instructional treatment was given, students were once again given the knowledge test and confidence survey. Students were made aware that completing the pre test post test and confidence survey had no effect on the student grade or status within the nursing program.

The research was conducted over a five week period of time where students were also exposed to one weekly four hour day with a clinical instructor to practice assessment skills including respiratory assessment. Additionally students attended four other classes consisting of pharmacology, skills, a writing course, and pathophysiology. The nursing program is rigorous and students are exposed to a massive amount of information weekly.

DATA ANALYSIS

Data was entered into a statistical analysis package (SPSS) for analysis. A dependent t test analyzed the difference between the post-test scores among the three groups. An analysis of variance (ANOVA) determined the difference between study groups on the student confidence survey composite scores. A one-way ANCOVA was used to equalize the groups since the groups were not the same at the beginning as demonstrated by the preknowledge test results.

FINDINGS

All three groups had improvements between the pre and post 1 knowledge test and confidence survey. A statistical significant difference was found between the Actor and Traditional groups after the post 1 knowledge test favoring the traditional group (see Figure 1). The *VitalSim™* group improved significantly in

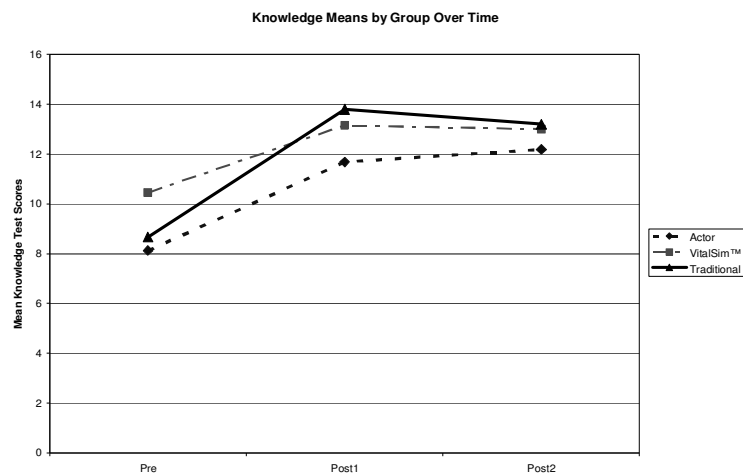


Figure 1 Mean Knowledge Scores by Group over time

confidence between post 1 and post 2 survey results (see Figure 2). Post hoc confidence comparisons demonstrated that the *VitalSim™* group was more confident in: appraisal, assessment, history, and auscultation.

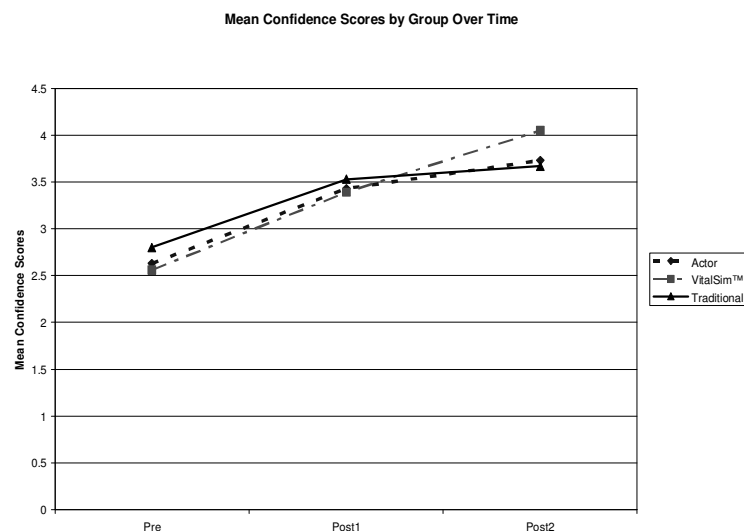


Figure 2 Mean Confidence Score by Group over time

Patterns in the individual questions from the twenty question Confidence survey were analyzed. Pairwise t-tests were performed on the individual items on the confidence survey. Group differences and individual item responses were tested using pairwise t-tests. Upon analyzing individual items on the confidence survey over time in groups, there were significant differences found in four items of the confidence survey. The four items out of twenty that showed a consistent difference were appraisal, assessment auscultation (listening to sounds with a stethoscope) and history. The *VitalSim™* group demonstrated statistically significant higher confidence means

for all four items compared to the Traditional group and three out of four items compared to the Actor group.

The *VitalSimTM* provided the opportunity for students to learn by taking their time observing, assessing, and deciding the intervention for the patient without the fear of something detrimental happening to the patient. The other sixteen items refer to areas that the *VitalSimTM* might not have an advantage over such as: taking vital signs and counting respirations (items 1, 2); applying and monitoring oxygen (items 5, 6, 7); talking, touching, initiating conversation, and questioning the patient, (items 10, 11, 12, 14); working in small groups (item 13); documenting, observing respirations, intervening (items 17 - 20). It was expected that the *VitalSimTM* would have had an advantage over determining abnormal lung sounds (item 16); however, the students might not have the ability to accomplish this at the first semester of the nursing program.

Summary of Findings

Descriptive statistics were calculated which revealed that all groups had improvements between the pre and post 1 knowledge test and confidence survey. A one-way ANOVA was computed to determine if there was a significant difference between the three groups after the pre knowledge quiz was administered. There was an overall significant difference found between the groups so Bonferroni adjustments were made in order to conduct post hoc comparisons. A one-way ANCOVA was performed to determine if there were any statistically significant differences between groups in knowledge and confidence scores. There was a statistical significant difference found between the Actor and Traditional group after the post 1 knowledge test favoring the traditional group. There was no significant difference found between the simulation groups, or between the *VitalSimTM* and the Traditional groups on post 1 knowledge test and confidence survey scores. Additionally, there were no significant differences found between the three groups after the post 2 knowledge tests or in the confidence survey.

There was a significant overall difference in confidence at post test 2. Post 1 to Post 2 confidence mean scores within groups and item differences within the confidence survey were explored. T-tests demonstrated that the *VitalSimTM* group improved significantly in confidence between post 1 and post 2 survey results. Post hoc comparisons were performed on the individual items on the confidence survey. The areas that students were more confident were appraisal, assessment, history, and auscultation. The *VitalSimTM* group had statistically

significant higher mean confidence scores in the areas of appraisal, assessment history, and auscultation than the other two groups.

CONCLUSIONS

The results of the study demonstrate that simulation can be an effective instructional pedagogy. Simulation incorporates both Bandura [10] and adult learning theories [11] which provides an interactive learning environment. This study also demonstrated that simulation does assist students with increasing their confidence and knowledge retention within a safe learning environment integrating debriefing, immediate feedback, and guided reflection. To be effective, simulation should be aligned with goals, skills and knowledge acquisition, competency testing, critical thinking, and best practices while integrating a variety of realistic case scenarios. Simulation is an effective adjunct to the clinical setting, providing close to real-world learning while incorporating kinesthetic learning with groups of students gaining knowledge together versus the clinical setting where fewer students gain while maintaining patient dignity and confidentiality.

Simulation currently is integrated within hospitals to train medical personnel to acquire new skills and techniques as new medical equipment is purchased. Lower cost simulators, such as the *VitalSimTM* have been shown to be cost effective for training purposes.

Simulation has enabled students to demonstrate the link between theory and practice, synthesize knowledge and gain clinical confidence. Future research is necessary to connect the increase confidence levels with improvement in critical thinking; best simulation practices; and demonstrating the effects of simulation on clinical learning. Educators whether in the business, teacher education, or nursing classroom, need to develop and integrate realistic case-based scenarios, standardized simulation forms, and reliable testing checklists while making the simulation available to students.

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Managing the Google Web 1T 5-gram with Relational Database

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ABSTRACT

On Sep 19 2006, Google released *Web 1T 5-gram*, an n-gram corpus generated from a source of approximately 1 trillion words. It provides a valuable reference of English usage since there is no other comparable corpus of this data size. However, it has not been widely used in language education due to the difficulty in managing the huge data size. In this paper, a practical approach of using relational database to store, index and search the corpus is described and implemented with commodity hardware. Basic search queries are also designed for performance testing. Sample performance results are recorded which show acceptable data processing and search response times. It is shown that the 5-gram corpus can be managed using relational database and commodity hardware. Further search queries can be designed and implemented to make better use of the corpus in language education.

Keywords: Google Web 1T, 5-gram, N-gram, Mysql, Corpus, Relational Database, Language education

1 INTRODUCTION

The use of corpora in language education has been widely discussed in publication such as *Rethinking language pedagogy from a corpus perspective* [1]. As mentioned in one of the paper in [1] by Aston [2], the use of corpora in teaching languages take into account the frequencies and characteristics of language usage by native speakers which are ignored by traditional syllabus and teaching materials. In that sense, the bigger the corpus size, the better the representativeness of the language usage. Recent technology has already allowed researchers to harness the resources of corpora with notable sizes such as *The British National Corpus (BNC)* [3] containing 100 million words and *The Corpus of Contemporary American English (COCA)* [5] containing more than 385 million words.

On Sep 19 2006, Google released an English corpus, *Web 1T 5-gram Version 1* [6]. It contains English word n-grams and their observed frequency counts. The length of the n-grams ranges from unigrams (single words) to five-grams. The n-gram counts were generated from approximately 1 trillion word tokens of text from publicly accessible Web pages. Its data size is about 10000 times bigger than BNC and about 2500 times bigger than COCA. It provides a unique reference of global English language usage since there is no other comparable corpus of this data size. Here is an overview of its data sizes:

Number of tokens:	1,024,908,267,229
Number of sentences:	95,119,665,584
Number of unigrams:	13,588,391
Number of bigrams:	314,843,401
Number of trigrams:	977,069,902
Number of fourgrams:	1,313,818,354
Number of fivegrams:	1,176,470,663

Physically the data are distributed in 6 DVDs, as gzip'ed text files. Each gzip'ed text files contains exactly 1,000,000 grams or less and their frequency counts except for the unigram file which contains all of the unigrams. All the raw data amount to around 25GB in gzip'ed format.

In this paper it will be described in details how the Google 5-gram corpus can be stored and organized using relational database (RDB) with common commodity machine hardware. Two kinds of search queries are implemented to demonstrate the feasibility in running searches on top of RDB. Results and performance will be discussed.

2 RELATED WORK

There are a few researches related to managing and extracting data from the Google N-gram corpus that are found for references. Their main purposes of using the corpus are for NLP tasks. Here is a summary of

their approaches in handling the corpus:

Research	Strategies
Hawker etc. [7]	- hash-based strategy that pre-process queries and/or data - reducing the resolution of the data to give only approximate frequency counts and sometimes false positive counts - data compressing
Islam etc. [8]	- only 5-gram data are processed - reducing the size of the data set by deletion and substitution of grams - sorting data into different files based on query word as indexing strategies
Sekine [9]	- customized trie indexing - index all of the 5-grams using a index file 277GB of size

NLP tasks involve numerous statistical queries on the data. It may justify the approaches of designing complex indexing methods and softwares, and sacrificing the accuracies of the data as they aim to return query results within a fraction of a second.

However, for usage such as language education, such approaches can be redundant as time factor is not as essential and priority should be put in the ease of setting up the system, the flexibility of designing queries, and the ability to browse accurate data. Under such conditions, it justifies more to use existing RDB softwares in handling the corpus for language education as they have readily available internal storage and indexing functionalities that can be leveraged. This paper will explore the practicability and feasibility of such means.

3 PROPOSED APPROACH

This section will propose in abstract terms how the corpus can be processed and organized into a RDB and afterwards be indexed by it.

3.1 Data Modeling

In order to efficiently store and index all the n-grams data into a RDB, each of the unique English words in the corpus is given a numeric *word_id* since storage and indexing of *integers* require less space and execute faster compared with *strings* data type. The following relational data models are proposed:

Unigrams Table

Field Name	Data Type	Description
<i>word_id</i>	<i>integer</i>	A unique id ranging from 1 to 1,024,908,267,229 identifying the English word
<i>word</i>	<i>string</i>	The English word
<i>frequency</i>	<i>integer</i>	The frequency count of the English word

*All columns are to be indexed by the RDB

Bigrams, Trigrams, 4-grams, 5-grams Tables

Field Name	Data Type	Description
<i>gram_id</i>	<i>integer</i>	A unique id identifying the gram instance
<i>word1_id</i>	<i>integer</i>	The corresponding <i>word_id</i> of the first word in the gram according to the Unigrams table
...
<i>word(n)_id</i>	<i>integer</i>	The corresponding <i>word_id</i> of the <i>n</i> th (up to 5) word in the gram according to the Unigrams table
<i>frequency</i>	<i>integer</i>	The frequency count of the gram

*All columns are to be indexed by the RDB

The assignment of *word_ids* should be done when creating the Unigrams table. Considering the large scale of the data, the following problems may arise if each sets of the two to five grams is stored into one single table:

- The actual file used by the RDB software to store the table may exceed the maximum file size of the underlying operating system
- The number of entries in a set of grams (e.g. 4-grams has 1,313,818,354 entries) may exceed the limit of the maximum number of rows in a single table of the RDB software
- If the index size of a single table is too big, the index may not load or effectively load into the RAM, affecting search speed

Thus, each of the two to five grams tables is split into smaller tables to avoid the mentioned problems. The optimal way to split the tables depend largely

on the architectures of the hardware, the operating system and the RDB software. Since the aim of this paper is to explore the feasibility of using RDB to handle the data rather than how to use RDB to handle the data optimally, a naive splitting method is proposed here. Each sets of the two to five grams is split into the same number of tables as the number of raw text files containing the whole set. E.g. The set of 4-grams come in a total of 132 text files so the set of 4-grams will be split into 132 tables accordingly with each table holding the data of one of the text files.

3.2 Search Queries

Two kinds of queries are proposed here to serve the purpose of demonstrating the feasibility of searching the corpus processed into the proposed data models.

1. Exact Query

Two to five words or the special wildcard character * are to be input. The number of words and wildcards together are taken as the grams to be searched. All matching instances are returned sorted in descending frequency order. E.g. If "Apple *" is the input, all bigrams will be searched and all instances with the first word matching "Apple" (case sensitive) and the second word matching anything (wildcard) will be returned sorted in descending frequency order.

2. Keyword Query

Two to five words and the number of grams to search are to be input. Then any instances in the specified grams to be searched containing all of the keywords are returned in descending frequency order. E.g. If "apple tree" is the query and the search is specified to 5-grams, then all matching instances of 5-grams containing both the word "apple" and "tree" (case sensitive) will be returned in descending frequency order. Moreover, another optional wildcard * can be used in between words. E.g. If "apple * tree" is the query and the search is specified to 5-grams, then all matching instances of 5-grams containing "apple" as the first and "tree" as the last word will be returned.

These two queries are for demonstrating possible usages of the data and are not designed for any specific purposes. Many other possible queries can be further designed and implemented to extract data from the 5-gram corpus for specific purposes in language education but they are out of the scope of this paper.

4 IMPLEMENTATION

4.1 System Setup

Hardware and OS

In this research two machines are used. Their specifications are as follow:

	Development Machine	Server Machine
CPU	Intel Core(TM)2 Duo CPU E8400 3.00GHz	Intel Xeon Quad-Core E5506 2.13GHz
Memory	4GB	8GB
Harddisk	200GB	1TB
OS	Ubuntu 9.10 64-bit Server	Ubuntu 9.10 64-bit Server

The development machine's specification is common to most desktop machines. It is used for developing the scripts and codes before deployment and for comparison of speed with the server machine. The server machine is for final deployment and physically holds the database that contains all the data in the 5-gram corpus.

RDB and Programming Language

Mysql [10] is a free, open source, popular, easy to set up, and stable RDB software. Mysql version 5.0 is used in this research. Python [11] is an expressive interpreted programming language which provides good balance between coding time and execution speed. Python version 2.6 is used in this research.

4.2 Data Processing

First, the Unigrams table is created according to the data model described, assigning a *word_id* to each of the English words. Then, algorithm 1 is used for reading each n-gram raw text files and inputting them into Mysql.

The mapping of the English words to their *word_ids* and the insertion of data into the Mysql table are the heaviest tasks in this process. The mapping is done using an on memory cache of Python data structure dictionary to make it fast. The cache holding the mappings of all words implemented by Python dictionary takes up about 1.7GB of RAM.

It is essential that the insertion into Mysql table is done in a batch to minimize the overhead of each insertion calls to Mysql. The *INSERT* statement in Mysql supports multiple rows insert in one SQL command. Batch size of 10000 table rows is used in this implementation.

Indexes are to be created after all the insertion of one file instead of during insertion or it will slow the process down. Locking the table during insertion gives

a better performance.

Algorithm 1 Processing a two to five grams text file into a table in Mysql

Require: Unigram file, one of the n-gram files, Mysql connection

- 1: Create an empty Python dictionary data structure *cache*
- 2: $i \leftarrow 0$
- 3: **for** each English word in the unigram file **do**
- 4: $cache[word] \leftarrow i$ {Assigning an ID to the word. Same assignment is used in creating the Unigrams table.}
- 5: $i \leftarrow i + 1$
- 6: **end for**
- 7: Create a Mysql table to hold the data according to the data model
- 8: Lock the table for faster insertion
- 9: **while** Lines can be read from the n-gram file **do**
- 10: $batch \leftarrow$ Create an empty data structure (e.g. array or list) for temporary storage
- 11: $lines \leftarrow$ Read as many as 10000 lines from the file
- 12: **for** each *line* in *lines* **do**
- 13: Split *line* to get individual words in the gram and its corresponding frequency
- 14: Use the *cache* dictionary to get the *word_ids* for each words in the gram
- 15: Save all the *word_ids* and the frequency count into *batch*
- 16: **end for**
- 17: Insert all data in *batch* in a single batch into the Mysql table
- 18: **end while**
- 19: Unlock the Mysql table
- 20: Create index on each columns in the Mysql table

After processing all the raw n-gram text files, the Mysql database contains the following tables:

	No. of Tables	Physical Size
Unigram	1	1.3GB (data: 463MB, index: 878MB)
Bigram	32	19.7GB (Each tables - data: 201MB, index: 430MB)
Trigram	98	73.3GB(Each tables - data: 239MB, index: 527MB)
4-gram	132	116.1GB (Each tables - data: 277MB, index: 624MB)
5-gram	118	119.4GB (Each tables - data: 315MB, index: 721MB)
Total	381	329.8GB

4.3 Search Queries

Algorithm 2 and 3 describe how the exact and keyword searches are implemented respectively.

Algorithm 2 Exact Search

- 1: $query \leftarrow$ Get user input
- 2: Parse *query* to get individual words and wildcards
- 3: $n \leftarrow$ the total number of words and wildcards
- 4: Query the Unigrams table to get the *word_ids* for all the words in the query
- 5: $table_stacks \leftarrow$ Create an empty data structure (e.g. array or list) for holding temporary Mysql table data
- 6: **for** each *n*-gram tables **do**
- 7: Execute an SQL query to return only the first instance in descending frequency order matching all the *word_ids* in the right word positions
- 8: **if** result are returned **then**
- 9: Append the result, frequency count, row offset (which is 1 now) and table name in *table_stacks*
- 10: **end if**
- 11: **end for**
- 12: Sort *table_stacks* with descending frequency count
- 13: $cache \leftarrow$ Create an empty Python dictionary to cache *word_ids* mappings
- 14: $result_set \leftarrow$ Create an empty data structure to store results (grams and frequency sets)
- 15: **while** *table_stacks* is not empty **do**
- 16: $top_table \leftarrow$ Pop the top table (highest frequency count), its cached offset and cached result from *table_stacks*
- 17: Replace the word ids in the cached result in *top_table* with actual words using *cache*, if the mappings are not found in *cache*, query the unigram table and cached them in *cached* for later use
- 18: Append the gram and frequency in *top_table* to *result_set*
- 19: Try to fetch a new row from *top_table* with the same matching condition
- 20: If fetched then, append the result, frequency count, row offset and table name in *table_stacks* and sort *table_stacks* by descending frequency count
- 21: **end while**
- 22: return *result_set*

Algorithm 3 Keyword Search

- 1: *query, ngrams* ← Get user input for keywords and grams to search
 - 2: Parse *query* to get individual words and get their corresponding *word_ids* by querying the Unigrams table
 - 3: *table_stacks* ← Create an empty data structure (e.g. array or list) for holding temporary Mysql table data
 - 4: **for** each *n*-gram tables of *ngrams* **do**
 - 5: Execute an SQL query to return only the first instances in descending frequency order matching all the *word_ids* in any word positions or positions that match with the wildcard criteria
 - 6: **if** result are returned **then**
 - 7: Append the result, frequency count, row offset (which is 1 now) and table name in *table_stacks*
 - 8: **end if**
 - 9: **end for**
 - 10: Sort *table_stacks* with descending frequency count
 - 11: Follow step 12 to 22 described in the Exact Search algorithm
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5 PERFORMANCE

5.1 Data Processing

Development Machine

It takes around 150 seconds to insert and index a bigram text file into a Mysql table while it takes around 230 seconds for a 5-gram text file. Trigram and 4-gram files take more time than bigram but less time than 5-gram. Let us generously assume that the time to process one text file (there are totally 381) is 4 minutes, it would take 1524 minutes, 25.4 hours, only a little bit over a day to process the whole Google 5-gram corpus into Mysql and index them, with a commonly available desktop machine specification.

Server Machine

It takes around 210 seconds to insert and index a bigram text file into a Mysql table while it takes around 340 seconds for a 5-gram text file. Trigram and 4-gram files take more time than bigram but less time than 5-gram. The process takes longer in the server machine than the development machine probably due to the bigger overhead in utilizing a bigger RAM size and a bigger harddisk size. However, the performance can be largely compensated by running multiple processes in parallel to process several text files at the same time. In this research, up to four processes are running in parallel processing 4 different text files at the same time. Again, for easy calculations, let us generously assume that three parallel processes are run and the time to process one text file (there are totally 381) is

6 minutes, thus, the average time to process one file becomes 2 minutes. It would then take 762 minutes, 12.7 hours, only a little bit over half a day to process the whole Google 5-gram corpus into Mysql and index them.

5.2 Search Queries

Exact Search

The following table gives some examples of execution times of the wildcard search implemented. All of the query return within one minute which is very acceptable in querying a corpus of this data size. Second runs are much faster due to the caching mechanism of Mysql.

Query	Time taken to return the first 100 results (in seconds)	
	1st run	2nd run
"banana *"	0.4	0.1
"* banana"	11.9	0.5
"cake * * * *"	4	0.2
"* * cake * *"	33.6	1.6
"* * * * cake"	47.3	1.7
"day dream * *"	3.6	0.2
"day * * dream"	3.7	0.2
"* * day dream *"	31.7	0.5
"* * * day dream"	54.1	0.5

Keyword Search

The following table gives some examples of execution times of the keyword search implemented. Some queries take up to 6-7 minutes to return. Second runs are much faster due to the caching mechanism of Mysql. The search is now running in a sequential manner, querying Mysql tables one by one and does not take any advantage of the possibility of distributed computing. The way how the data models are proposed, the data can actually be stored across several servers in the same network running Mysql. By running the part from line 6-11 described in algorithm 3 in parallel across for example *n* machines, the speed would be shortened by close to *n* times theoretically.

Query	N-gram	Time taken to return the first 100 results (in seconds)	
		1st run	2nd run
"love"	2	45.2	0.5
"love"	3	209.3	1.7
"love"	4	371.6	2.3
"love"	5	394.8	2
"book library"	3	191.1	1
"book library"	4	314.4	1.5
"book library"	5	321.6	1.5

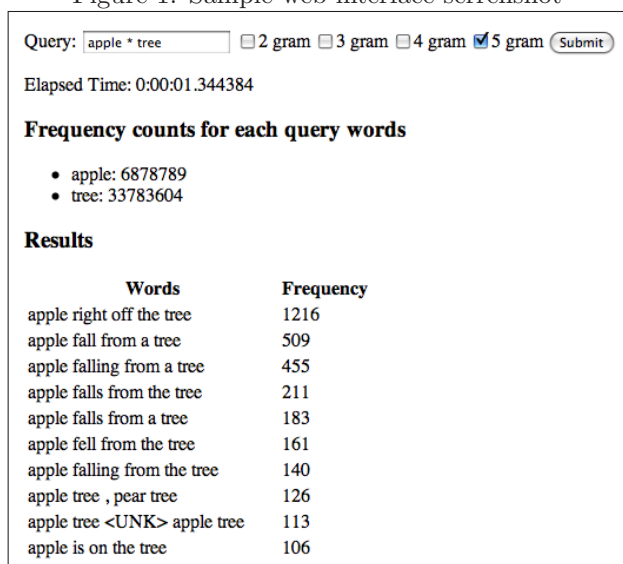
6 FUTURE WORK

The Google 5-gram corpus can serve as a valuable resource in language education. It is shown and documented in this paper how the Google English 5-gram corpus can be handled by using commodity machines leveraging the power of readily available relational database softwares. Furthermore, search queries are also implemented on top of the proposed data models to demonstrate the feasibility of designing useful searches. With this knowledge, the Google 5-gram corpus can now be set up easily and be examined, browsed and considered for use in language education.

Currently, web interface has been setup to allow teachers and students on campus to use the implemented search functions. Figure 1 shows a sample screenshot of the web interface. After more testing and usage data collection, more meaningful searches tailored to language education can be developed and search performance can be optimized according to actual needs.

Finally, as Google has also released n-grams corpora in Japanese and other European languages, the same way of handling data can be extended to those corpora and thus can benefit language education research in those languages.

Figure 1: Sample web interface screenshot



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Technology and Development of Higher Education in Botswana

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Abstract:

Botswana is a small country with 1.8 million population. Development of Higher Education assumes greater importance in Botswana to meet the aspirations of people in the Society. Government of Botswana through its National developmental plans has been introducing several initiatives to develop Higher Education. In the process, several consultancies took place to bring the rational approach to the development of Higher Education. In recent times, Distance Education came in to being and trying to provide education with the use of technology. In addition to Distance Education initiatives, there have been remarkable changes that took place especially in the area of technology driven learner centered education aimed at increasing access to higher education. This paper while providing a brief background for the development of Higher education in the country, analyses the following:

1. *Development of Higher Education - Back ground*
2. *Role of University of Botswana in the development of Higher Education*
3. *Government's Commitment to technology based higher education*
4. *Development (recently) through WebCT, e-learning*
5. *Other institutions and their role in the development of Higher Education in Botswana*
6. *Way forward for further growth in the development of Higher Education*

In the process of analyzing the above, in addition to secondary data on the growth and access to higher education figures, informal meetings/interviews with the heads of Institutions and policy makers will be organised. Finally, a way forward and projections to growth rates are provided in the development of Higher Education with the help of technology.

Development of Higher Education-Background

Botswana got independence in 1966 and at the moment, it has got 1.8 million population. It is one of the best economies within Africa. In the field of education, several initiatives were taken to develop primary and secondary education in the early days. Later, in 1977 the National Commission on Education reviewed the situation and recommended necessary measures to develop education both in formal and non-formal set up. In 1994, the Revised Policy on Education brought several changes to develop Higher education in particular and education in general. With the revised policy, several

initiatives were proposed and the Government supported the same in the process of developing higher education.

In the context of Botswana, even prior to independence, the teachers in Botswana received training from Zimbabwe between 1960 and 1965 (Jones 1979) and trained about 48% untrained teachers in Botswana (Jones 1981). Later in 1978, the Department of Non Formal Education (DNFE) was established in the Ministry of Education, and started functioning as a Distance Education Division (DED) of the DNFE. In 1991, the Centre for Continuing Education (CCE) was established and it became active in programming. Later in 1999, the government of Botswana established Botswana College of Distance and Open Learning (BOCODOL) to take care of pre-tertiary education in the country through distance mode. The above scenario of non-formal education was also part of the process in the development of higher education.

In the recent times, development of higher education assumes greater importance more especially in Africa where the countries used to send the students to developed countries for training and to obtain higher qualifications. Botswana is no exception to this phenomenon. Botswana has got only one University established in 1982. The University was mostly concentrating on certificate, Diploma and first-degree courses until 1994. Later, as the demand and necessity increased, the University wanted to move towards higher degree qualifications in a phased manner. Apart from a few Private institutions that have started offering tertiary education very recently, University of Botswana was and is the only leading Higher Education Institution in the country. Plans are at the advanced stage to start a new University soon to offer tertiary education. Apart from Distance education, which was used mostly at pre-tertiary level, there was also some first degree programmes developed through this mode. It has been noticed that the development of higher education through face to face is expensive and delays the access to masses, it has been decided (Various Policy document of the University of Botswana) to use a variety of technology in the development of higher education.

The possible Learning methods to be used in the Higher education are: e-learning/WebCT, video conferencing, etc. All these methods complement each other in transforming teaching and learning through use of appropriate technologies.

Development of Higher Education – Role of the University of Botswana

The University of Botswana was established in 1982. Since then, it has made a steady progress in the development of Higher Education, exclusively face-to-face method until very recently. This is the only higher-level institution in the country until recently. As things change, the emergence of technology-based education has become eminent. There has been a very high demand for the programmes and the spaces were very few. Almost 40% of applicants were rejected admission for want of spaces. This scenario continued until 2007. Later on, quite a number of Higher Education institutions come into being trying to offer higher qualification degrees through face-to-face method. Although these institutions rescue some percentage of demand, the question needs to be answered of how to make Higher Education accessible to masses and hence the requirement for technology.

The following table gives us the enrolment figures for the University from 2003-04 to 2009-10.

Table 1: University of Botswana, Enrolments

Year	Full time	Part-time	Distance learning	Enrolments
2003-04	13104	2080	241	15425
2005-05	12771	2605	349	15725
2005-06	12602	2724	384	15710
2006-07	12935	2820	484	16239
2007-08	12401	2584	499	15484
2008-09	11348	2548	524	14420
2009-10	13413	2033	522	15968

Source: University of Botswana - Annual reports

The above table depicts the development of Higher Education in the University in terms of student numbers. This also signifies the enormous growth envisaged within the single University. There are at the moment 8 faculties offering programs. With the starting of the new University next year, there will be high competition for quality and even for budgetary requirements from the Government and ofcourse increase the out put of graduates with higher qualifications.

Government’s commitment to technology based Higher education

Botswana Government recently approved a new tertiary education policy; it was intended to increase the country’s research capacity and innovation is to be expanded from a single National University to other tertiary institutions and a second public University. The overall objective, as part of the county’s vision 2016, which calls for an educated and informed nation after 44 years of independence, is to transform Botswana into a knowledge society.

The developing economies have realised that the conventional classroom based education became very expensive. In the light of the financial constraints and to make process of education user friendly, the Government of Botswana has taken a firm decision on the use of technologies for the development of Higher education in particular and all levels of education in general. The recent slogan of the Government “to build informed nation by 2016” is also based on technology driven activities making education accessible to all people in the country. It was also mentioned that the e-mail in internet facilities have to be provided in all rural settlements which in turn lead to rural development. In the same period, Botswana Technology Centre was established as a mark of nation’s commitment to technology.

Development through e-learning/WebCT

The University of Botswana embarked aggressively on a programme of technological transformation (Uys, Nleya and Molelu, 2003). Educational Technology Unit has been charged with the responsibility of the technology transformation at the University. The Unit carries out the Training of academics in the effective and appropriate use of educational technologies at the University. A major undertaking was the launching of University – wide e-learning initiative (UBel) in 2001. The University made substantial progress in e-learning process since 2003. In 2002 there were about two courses introduced by on-line. WebCT offers a full suite of online learning tools including chat facilities, bulletin boards, assessment tools, student tracking, e-mail, content uploading and student administration. Later, a state of art e-learning support centre has been implemented as the first wireless network application at the University. Subsequently learning support centre has been used

to train academic staff through about 40 workshops in a year. After a year or two, an e-learning support classroom has been designed for flexibility in sharing information. Later a video-conferencing system; POLYCOM was installed to conduct video-conferencing locally and internationally.

The rationale for using e-learning at the university is:

1. Increase the quality of learning
2. Supporting new research opportunities
3. Reducing administrative and teaching pressures on staff
4. Making teaching more rewarding and exciting for staff.

The development in terms of e-learning and WebCT may possibly be measured through the number of trained designers of e-learning, number of workshops/training programmes held in the first place. Out of 800 teaching staff, 231 were trained as e-learning designers. It means close to 25% of total staff were trained which is a remarkable achievement in the University. Only during 2009/10 academic year 179 staff were trained. If the present situation continues, all the staff could be trained within 5 years period.

The figures in the following table will inform the growth in terms of courses put on e-learning over a period of time and as a qualitative measurement of students' satisfaction over the e-learning technology, which will reduce the pressure on both the student and the teacher. Since the data was not available for other institutions, it is decided to take a case study of e-learning at the University of Botswana.

Table 2: Number of courses developed through e-learning

Year	Number of courses
2002/03	23
2003/04	42
2004/05	121
2005/06	179
2006/07	258
2007/08	314
2008/09	375
2009/10	369

Source: Centre for Academic Development, University of Botswana.

Total numbers of courses available at the University are 1554 and at the moment, there are 369 active courses in operation through e-learning. Having committed to e-learning process, the number of courses put on e-learning will inform the audience the level of development.

Other institutions and their role in the development of Higher Education

It is a recent phenomenon that a few institutions having registered with Tertiary Education council (TEC) of Botswana making their efforts to offer higher education degrees and diplomas. Sixteen institutions have registered with TEC to offer tertiary education in Botswana. Out of 16 institutions,

only a few of them have started Diplomas programmes. The few prominent among these 16 institutions are; Limkokwing University, Botswana College of Distance and Open Learning, Gaborone institute of Professional studies, BA ISAGO College, ABM College and DAMELIN College. Again among these six prominent institutions only Limkokwing and BA ISAGO College have started the Diplomas and Degrees and others only Diplomas. The enrolments data is not available for these institutions. Informal discussions with these two institutions revealed that they have so far achieved close to 30% success in uploading their courses on e-learning.

Although 16 Private institutions have registered with Tertiary Education Council (TEC) only the University of Botswana is offering the full qualification degrees and Diplomas and for the last 5 years the enrolments have increased substantially in Graduate programmes. The other private institutions have started recruiting students for degrees and diplomas but they lack resources to develop Higher Education. Most of them are face-to-face and a few of them recently embarked on e-learning mode of delivery. The situation in the use of e-learning technology will further improve in future and all these institutions will compete to offer programmes on e-learning to make higher education accessible to masses.

Way forward

The potential for growth is there as seen by a number of initiatives taken by the University of Botswana. Once the courses are increased, the blended approach could yield benefits and develop more courses on e-learning mode. Having seen the demand for higher education, it is imperative that the e-learning coupled with other technologies will make a big difference and go a long way in the development of Higher Education in the country.

Table 3: Future projections in terms of courses and enrolments for next five years

Year	Number of courses	Part-time	Distance Education	Graduate studies	Under- graduates	Total Enrolments
2010-11	1600	2094	538	1660	12418	16710
2011-12	1650	2156	554	1760	13040	17510
2012-13	1700	2221	570	1868	13719	18378
2013-14	1750	2288	587	1985	14464	19324
2014-15	1800	2356	605	2112	15288	20361
2015-16	1850	2427	623	2250	16209	21509

Source: University of Botswana-Enrolment Strategy document

The above growth rates are projected in view of the University’s recent decision to increase enrolments keeping in view the Graduate courses and the need for e-learning initiatives. The informal discussions held with University management and other policy makers were very encouraging and set the need for e-learning mode of delivery for higher education. As a matter of policy, the University has decided to have e-learning committees at Faculty level to plan and monitor the progress of uploading courses through e-learning. In addition, there are e-learning groups on campus where colleagues share their views on e-learning and make future plans. The Centre for Academic Development at the University is also conducting e-learning workshops regularly to promote e-learning among staff. The projected growth figures in table-3 will also put pressure on e-learning processes as the face-to-face mode cannot handle the increasing demand from the people seeking Higher education.

Conclusion

Our experiences show that we can only train very few participants with face -to -face mode of delivery. Taking the advantage of technology, it is possible to make the education accessible to many people. It correlates positively with the growing demand for Higher Education in all fields. The situation in the market has changed quite a lot as there is no value for lower qualifications in terms of getting employment or the required levels of knowledge demanded by various sectors of economy.

Offering education (more especially) hitherto was done in face- to- face mode with a direct contact between the learner and tutor. While there is no doubt on the success of this method, the accessibility was limited to few people. On the other hand, the demand for Higher Education has been on increasing trend as 40% applicants were unable to find the place at the university(Until 2007) The **subscription** rates were very high and only 60% applicants were admitted in the University due to lack of space as dictated by infrastructure and other requirements for teaching and learning.

In the present day competitive market, especially in private sector, the demand for Higher Education and people wanting to upgrade their qualifications has been on increasing trend. In the same way, there is demand for Higher Education and employers were never hesitant to spend on training as long as the staffs acquire the skills through higher qualifications. As most people were looking for spaces in the conventional system, the institutions in Botswana especially the Higher Education institutions/colleges were unable to cope with the demand due to insufficient resources available at their disposal in face –to- face method of imparting education. Hence, the way forward for more technology based Higher Education in Botswana. It is also suggested that in addition to the initiatives taken by the institutions, the Government should also encourage and invest more and more in e-learning processes to make education more accessible, flexible and learner centered.

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Random Automated Encryption Data Model (RAEDM): Envisages the Security of e-Learning Materials Dispatched Online

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ABSTRACT

This work, envisages the Random Automated Encryption Data Model (RAEDM) which allows a user to firmly protect the e-Learning education materials sent through on-line. The model was designed to encrypt heterogeneous data materials and dispatch them from the source to the targeted destinations. To avoid the none-authorized users to manoeuvre in gaining access into the system, the model was purposely made with unfixed authentication mechanisms and log-in parameters such as user-name and password. In this way, the non-authorized user would not have obvious and fixed authentication parameters to play around with. The RAEDM authentication mechanism was designed to randomly take in a Key at the time of data entry and online dispatch. The system's architecture employed the SEMINT DBMS Specific Parser which automatically extracts information from the data source. The extracted information would be encrypted in the Key Evaluator component and the cipher text transported through the network to the Decryptor Evaluator. Then the Decryptor Evaluator decrypts the data into its original state and the user accesses it for its intended educational purposes. In this way, the RAEDM helps both the teachers and learners exchange education materials in a secured environment. The system is also user friendly, especially for the non-IT/ICT specialist.

Keywords: Random Automated Encryption Data Model, e-Learning, encrypt, decrypt, authentication mechanism, key, and cipher text

1. INTRODUCTION

As e-Learning has become a famous mode of teaching-learning delivery many disciplines have adopted it. However, the technology has also been vulnerable to information, software and hardware attacks. In view of this, the Random Automated Encryption Data Model (RAEDM) security system

was designed. It was designed to protect the e-Learning education materials sent on-line. The model has the capability to randomly encrypt either homogeneous or heterogeneous data materials and dispatch them from the source to targeted destinations. The model was purposely made with an unfixed authentication mechanism. The system randomly takes in a Key at the time of data entry and online dispatch. In this way, the non-authorized user would not have obvious and fixed authentication parameters to play around with.

The RAEDM system architecture uses the underlying heterogeneous data resources that are fed into it. From the Heterogeneous Data Sources (HDS), the data being dealt with is passed on into the Key Evaluator (KE). The KE is automated with the public and private keys that are used to encrypt the data into cipher text. Once the data is encrypted, the cipher text is sent through the network. The transmitted cipher text is received by the Decryptor Evaluator (DE). The DE is automated with a private key. The DE decrypts the data into its original format and it is deposited into the Recipient Data Source (RDS). At the RDS, the recipient accesses the data for use.

Statement of the Problem

As the information is being exchanged online, the non-authorized users increasingly tamper with the system in order to access the data. Many naive internet users generally do not complicate their authentication information. They rely on the related data surrounded by their environmental affiliation, such as date-of-birth, user's names, children's names, ID numbers, house numbers, etc. To make matters worse, the Network Administrators assigns the username from the surname prefixed with an initial as a User Name. The combination of the two may be vulnerable to an intruder, who may try, by applying the environmental affiliation information, to get access to the systems. By trying a number of times, one may break through. Therefore under such a scenario, during heavy

utilisation of the system, the naive user may not manage to handle the security of the data. Especially during the handling and dispatch of the educational materials, the intruders may take any advantage to abuse the information. In this way, it is imperative that a well-secured information system is built to allow any type of user to use it without undergoing a cumbersome process of protecting the data.

Generally, most of the systems have the security mechanism of using the user name and password. Fixed authentication mechanisms such as these have attracted intruders who keep on trying with their best assumption of information surrounding the user. Actually, the system administrators normally assigns the new user with the User Name from her/his surname prefixed with an initial. Thereafter, the new user creates her/his password. The intruders frequently guess the user's authentication details such as: date of birth, user's names, children's names, ID numbers, house numbers, etc. These details in this paper are referred to as Associated Concepts (ACs). In this case the intruder easily assumes the username from the surname prefixed with the initials. He then guesses at the password with his/her knowledge of the ACs.

2. RELATED WORK

As e-Learning is widely used, the exchange of information or data through the network has become vulnerable to non-authorised users. Even the intended audiences have started abusing the educational content, for example accessing the information at the wrong time for examination malpractice.

In view of this many researchers investigated the measures and methods of protecting the information that was being passed through the network. The Information Security became the concerned issue in the areas of e-Learning. In [1] they pointed out that it was vital that all necessary steps be taken by educational institutions to ensure information is properly secured within the eLearning environment. They further argued that the use of ICT however, could lead to many possible Information Security risks that could have had compromised information. In order to address the protection of data, they proposed the four (4) main e-Learning pillars that could help institutions in securing their information against harmful attacks. These were: first, ensuring the e-Learning Information Security Governance. This is where the top management is ultimately responsible for ensuring that Corporate Governance was implemented within the institution. This was also supported in [2], who stressed that Information Security Governance consists of the leadership, organizational structure, processes and technologies that ensure that information was never compromised. They also emphasized that the main purpose of Information Security Governance was to protect against the risks that could have impacted on the confidentiality, integrity and availability of all electronic resources. The second was to ensure that before any institutions could start managing Information Security, they should have an e-learning

Information Security policy in place. The emphasis here was that e-learning Information Security policy was to be used as a guideline as to what must be managed and how this should be done. In fact, the e-learning Information Security policy like any other policy was seen as a document that addressed the rules and regulations regarding e-learning within the institution and should directly relate to the institution's e-learning policy. The third was the implementation of Information Security countermeasures or services that included the identification and authentication, authorization, confidentiality, integrity, Non-Repudiation and availability. In [3] they pointed out that Authentication could be done by means of something the user knows, such as passwords, something the user has, such as an access card or something the user is uniquely identified by, such as fingerprints. The fourth was the Information Security compliance monitoring which was the establishment of procedures and processes that were implemented in an organization to monitor whether they were working as they should or not. The monitoring process was to ensure that institutions knew their Information Security situation within the e-learning environment at any given time. In that way, it helped the Top Management in their decision-making process to ensure that if there was a security incident, it could be resolved before the availability, integrity and confidentiality of information was compromised. If any difficulties were identified by the monitoring process it was essential that the e-learning Information Security policies and Risk Management procedures were updated at regular intervals.

Various encryption or cryptographic algorithms such as RSA, DES, MD5, Hash, AES etc., were researched. The RSA algorithm [4] was invented by Ronald L. Rivest, Adi Shamir, and Leonard Adleman in 1977. Evans Jones described the RSA algorithm as based on the properties of prime numbers, so finding them was critical. To be secure, the primes should be very large and randomly chosen. He further pointed out that commercial implementations took great care when generating random numbers to decrease the probability of an attack correctly guessing the keys. In the Cryptographyworld, they gave the details that the key used in RSA for encryption was different from (but related to) the key used for decryption. They point out that the algorithm was based on modular exponentiation. Numbers e , d and N were chosen with the property that if A was a number less than N , then $(Ae \bmod N)d \bmod N = A$. This meant that one could encrypt A with e and decrypt using d . Conversely one could encrypt using d and decrypt using e , though doing it this way was usually referred to as signing and verification.

The DES [5] background was given by stating that in 1972, the National Institute of Standards and Technology (NIST) decided that a strong cryptographic algorithm was needed to protect non-classified information. The algorithm was required to be cheap, widely available, and very secure. NIST envisioned something that would be available to the general public and could be used in a wide variety of

applications. In 1974 IBM submitted the Lucifer algorithm, which appeared to meet most of NIST's design requirements. Thereafter, the Lucifer algorithm was adopted by NIST as a federal standard on November 23, 1976. Its name was changed to the Data Encryption Standard (DES). The algorithm specification was published in January 1977, and with the official backing of the government it became a very widely employed algorithm in a short amount of time.

In [6] they also described the Data Encryption Standard (DES) as a symmetric block cipher developed by IBM. They reported that the algorithm used a 56-bit key to cipher/decipher a 64-bit block of data. The key was always presented as a 64-bit block, every 8th bit of which was ignored. However, it was usual to set each 8th bit so that each group of 8 bits had an odd number of bits set to 1. At that time DES was the most widely used symmetric algorithm in the

world, despite claims that the key length was too short. In fact, ever since DES was first announced, controversy had raged about whether 56 bits was long enough to guarantee security. This algorithm was best suited to implementation in hardware, probably to discourage implementations in software, which tended to be slow by comparison. However, modern computers are so fast that satisfactory software implementations are readily available.

3. THE SYSTEM ARCHITECTURE

The RAEDM system architecture illustrated in Figure 1 is composed of four major functional components. These are the Heterogeneous Data Resource (HDS), the Key Evaluator (KE), Decryptor Evaluator (DE) and Recipient Data Source (RDS).

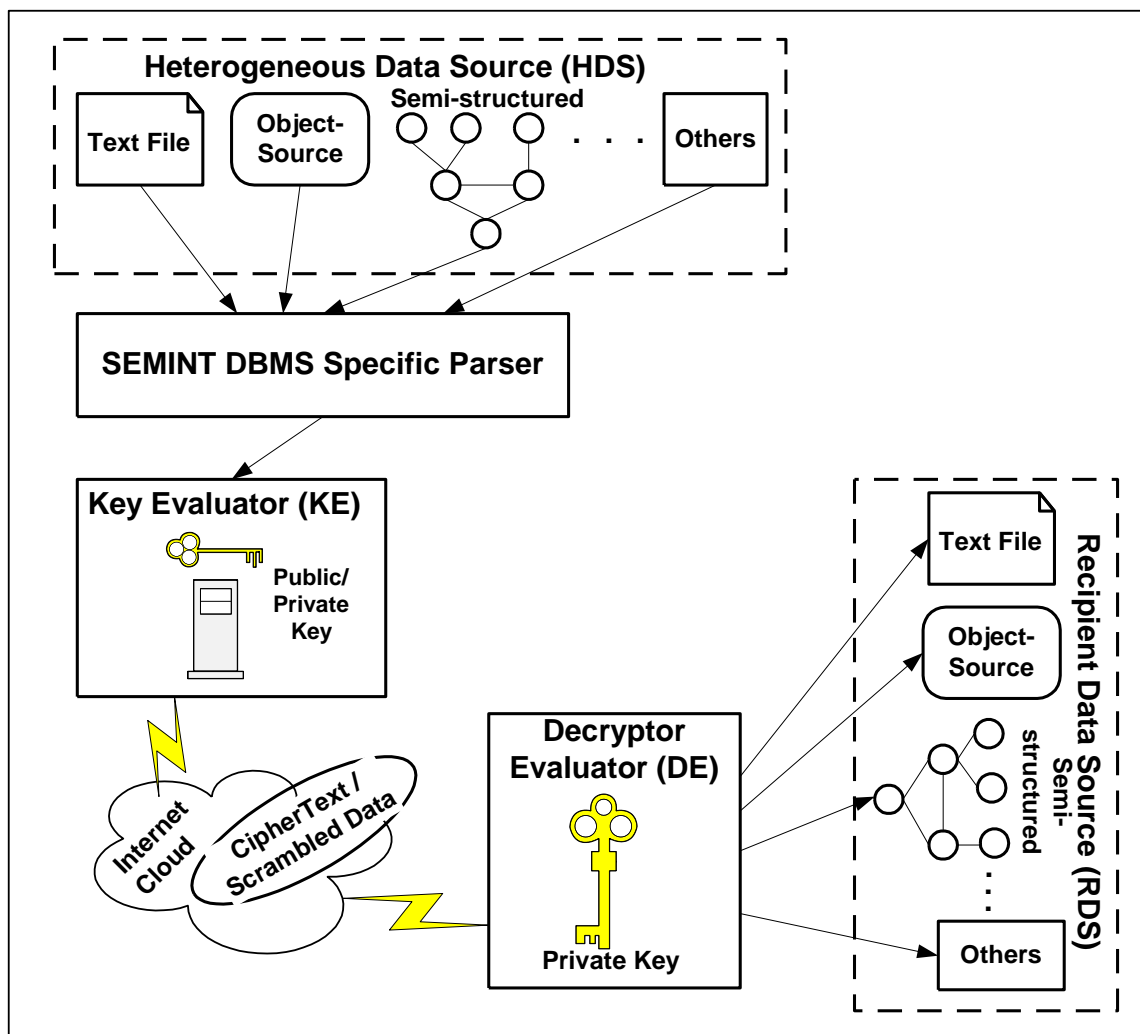


Figure 1. RAEDM System Architecture

Heterogeneous Data Source

The HDS is a component which holds different data sources such as text files, object source files, semi-structured data and others built under different models. The heterogeneous data sources are extracted by the SEMIT DBMS Specific Parser discussed below.

SEMINT DBMS Specific Parser

In this work we intend to employ the framework of the SEMINT DBMS Specific Parser [7]. This automatically extracts metadata from involved data sources. SEMINT Parsers [7, 8] automatically extract schema information and constraints from the database catalogs and statistics on the data content using queries over data. In [9] they emphasize that the adequate utilization of the improved SEMINT Specific Parsers and Agents make the architectural components highly knowledgeable to manoeuvre with context, reconciling semantics and acquiring independent source communication. In this way the parser in the RAEDM would extract from the HDS component the particular data source as activated by the user and passed onto the Key Evaluator (KE).

Key Evaluator (KE) Component

Note that both the KE and DE are automated components and in this work they use the asymmetric-key cryptography technology to encrypt and decrypt the data respectively. The asymmetric-key cryptography uses public and private keys. The public key is automated in this KE, whereas the private key is in the Descriptor Evaluator (DE). The public key is used to encrypt the data from the source site. The encrypted data is automatically changed into cipher text or scrambled data. This scrambled data is then transported into the network or Internet clouds up to the DE.

Descriptor Evaluator (DE)

The DE receives the encrypted data as its input. The DE is also an automated component and it has a private key as stated earlier on. In this component, the private key decrypts the cipher text into the normal text that is then passed on into the RDS.

Recipient Data Source (RDS)

The RDS receives the decrypted data as its input, which is deposited for application use. The decrypted data is deposited in its category or original state such as text file, object source, semi-structured, etc.

4. RAEDM GRAPHICAL USER INTERFACE

The RAEDM operational graphical user interface is discussed and presented. Figure 2 demonstrates a complete RAEDM system application. The graphical

user interface on this figure shows the two user application parts of the system and these are the Source and Destination/Remote Sites. The Source Site is where the sender dispatches the eLearning materials to the Remote Site. At the Source Site the graphical user interface has the following features: the prompt for entering the key, the input window for entering/typing in the data; the button for executing and sending the data, a prompt area for confirmation of the key used, the window that displays the encrypted data and the button for uploading the file in case the user wants to send a file.

The Destination/Remote Site is where the recipient accesses the teaching-learning materials that were dispatched by the sender. At this site, the graphical user interface has the following features: the decrypt button for accessing the incoming teaching-learning materials; the decrypting key prompt area, for confirming the key used; the decrypted data window which displays the required materials. This explains the total application transmission of the eLearning materials.

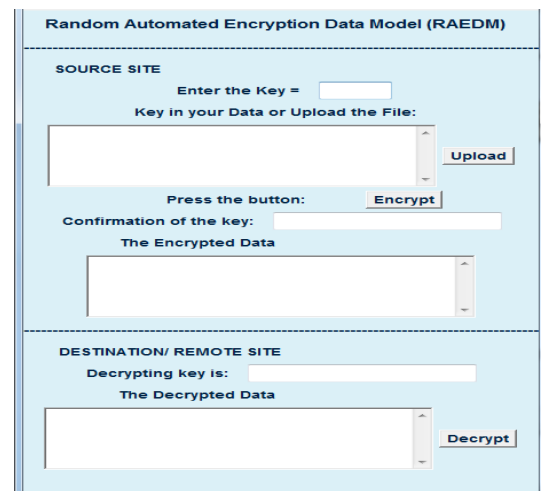


Figure 2. Complete RAEDM Graphical User Interface

Source Site

The application of the Source Site is as follows: the user enters any number of choices as the key at the “Enter the Key” prompt. In this case 17 was entered as the key. Thereafter, the instructor entered her/his assessment material as shown in Figure 3:

- “Lecturer: Dr. J. Mbale
 Instruction: Answer All Questions
 Q1. What is eLearning?
 Q2. Discuss the advantages of eLearning.
 Q3. What are the limitations of using e-Learning in rural areas?”

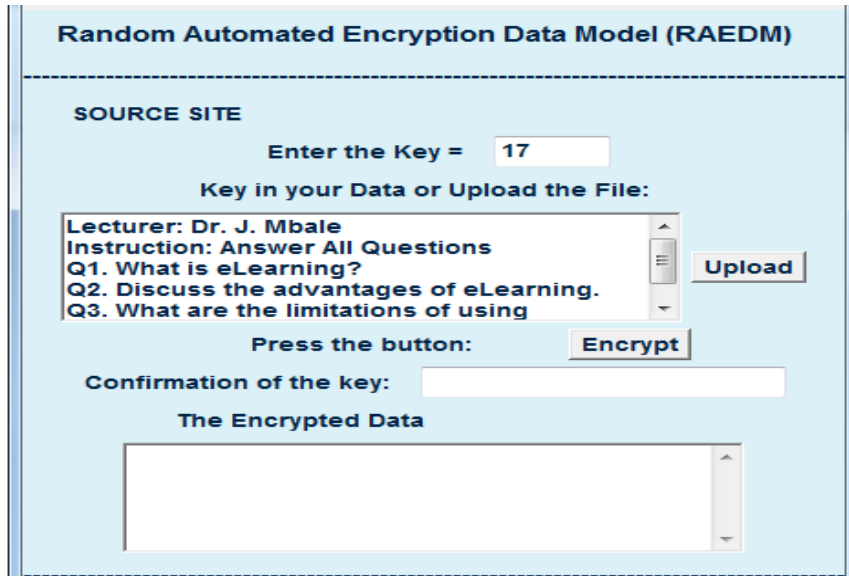


Figure 3. Entry of eLearning Materials in the Key in Prompt Window

Having entered the eLearning materials, the user would then press on the “Encrypt” button and the materials would be encrypted and dispatched. The encrypted material would be displayed in the Encrypted Data window and a key confirmation is also

shown in the Confirmation prompt box as shown in Figure 4.

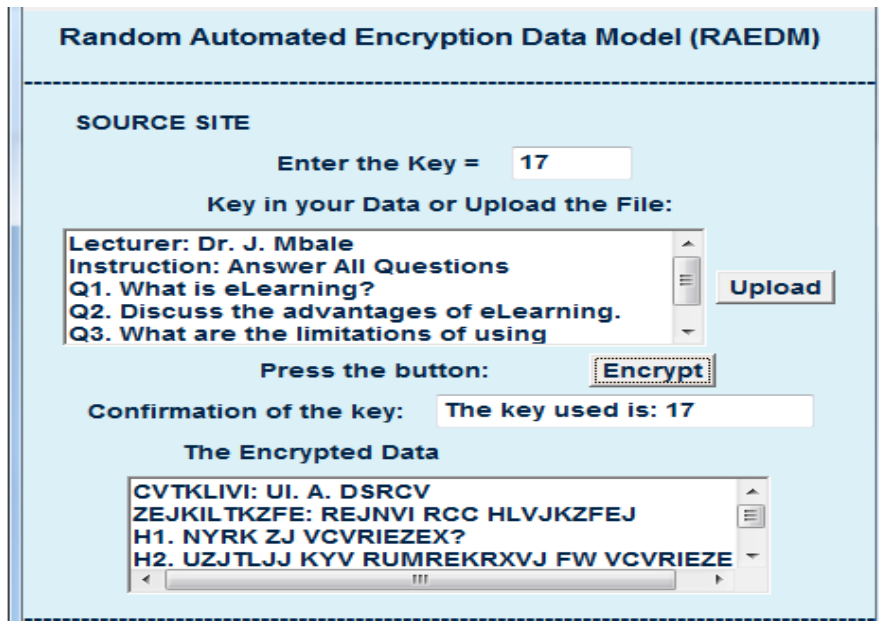


Figure 4. Encrypted Data Window Displaying Cipher Text

From Figure 4, the cipher text is displayed whereby the letters and words are scrambled in such away that they do not carry any meaning.

Destination/Remote Site

The Destination/Remote Site is the receiving end. When the user presses the “Decrypt” button, the system automatically decrypts the cipher text. The decrypted data would be displayed in the “The Decrypted Data” window as shown in Figure 5.

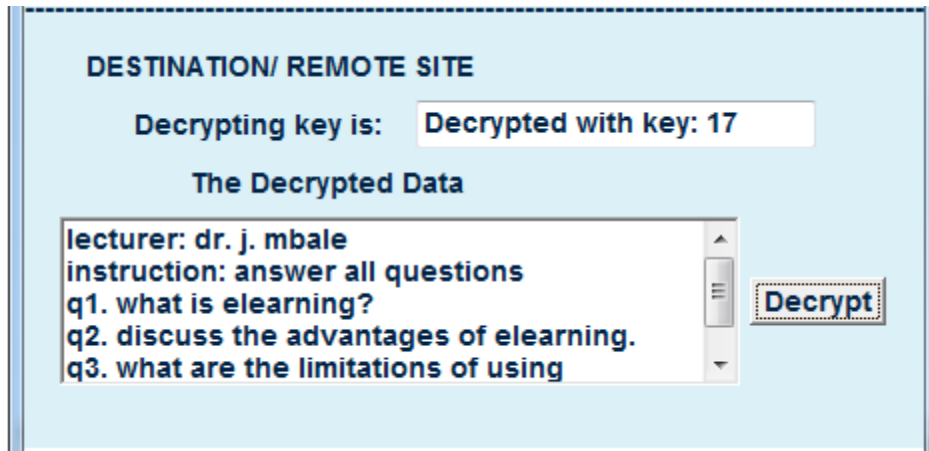


Figure 5. Decrypted Data Window Displaying Plain Text

The above graphical user interface, demonstrates how the eLearning materials could be securely dispatched and received at the remote site safely. The graphical user interface also demonstrates how the RAEDM is user-friendly especially to non-IT/ICT experts. From the example used, the Instructor deposited and sent the assessment which was well secured. The student received the scrambled materials and applied the key to open it into a normal text.

5. CONCLUSION

This work introduced the RAEDM automated security system that randomly encrypts the data. Its mechanism of randomly securing the data makes it invulnerable to intruders, hackers or any unauthorised user since intruders often try to enter into a system by collectively attempting to use the user's personal information such as date of birth, surname, first name, children's names etc. Novice users are often tempted to use their personal information as it is easy to remember those details. In this way, systems are left vulnerable to intruders who take advantage of novice users. Therefore, this led to the development of a RAEDM where a novice user would use keys that are not fixed as opposed to the systems which have got a permanent user name and password. Under RAEDM, a user might pick a key like 17. This may just be used once all the time, it might encrypt data in either direction. The system is robust and the HDS can accommodate any format of the data. From the HDS, the user may enter or upload the source data which would be passed on into the KE where the data would automatically be encrypted. The encrypted data would be transported through the network up to the DE. In the DE, the data is automatically decrypted into its original state and is deposited into the RDS where the user would access it for the intended application. The benefits of the RAEDM are far beyond other security mechanisms in that the user is not required to create a password or a user name but only enters the key. During an e-Learning session, much of the

information would be sent frequently. This means under the usual security mechanism, the user would be prompted to create and remember the user name and password respectively, and this may be a burden where as in RAEDM the user will input a key every time he sends information. Of course these keys should secretly be communicated to the recipient.

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Implementation of Time and Frequency Response Analysis for Web-Based Laboratories

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Abstract—The University of Dar Es Salaam has developed the web-based laboratory for Time and Frequency Response Analysis. The purpose of this web-based laboratory is the utilization of real data from real experiments, in terms of instrumentation and experimental circuits, rather than simulations. The use of web-based laboratory came after realizing the difficulties imposed by the traditional laboratories. Web-based laboratories allow students and educators to interact with real laboratory equipment located anywhere in the world at anytime. This paper presents the implementation of web-based laboratory of single stage common emitter, resistor capacitor coupled amplifier using National Instruments Educational Laboratory Virtual Instrument Suite platform. Two components are deployed: time response analysis and frequency response analysis. The experiment allows students to carryout time and frequency analysis of the amplifier. The modular can be used to any microelectronic circuits to carry out any time response and frequency response analysis. Both the time response and frequency response analysis results of the amplifier are validated.

Keywords—Batched ilab shared architecture, Client, labserver, NI ELVIS, Service broker.

1. INTRODUCTION

Web-based laboratory means online experimentation on real processes. Contrary to simulations, which rely on mathematical models, remote laboratories deal with real signals. Laboratory experiments provide students with practical experience that help them better understanding the theory taught in classes. However, traditional laboratory instruments are usually expensive such that many educational institutions cannot afford the instruments they require for their students. Sometimes students are overcrowded in laboratory sessions. In addition, laboratory personnel need to be hired to operate the facilities, thus imposing additional costs.

The goal of the web-based is to remove the problems imposed by the traditional systems and give hands-on

experiences in real hardware, in real time. Web-based laboratories enable the students and educators to access experiments any time from anywhere through the internet. By providing remote access to laboratory to students, the problem of costly traditional laboratories can be overcome by using the few laboratory resources available at that institution. In addition, web-based labs will increase the range of experiments available at institution as not only the students will use the experiments at their institutions but they will be able to share the experiments with other educational institutions. Moreover, web-based laboratories will be suitable to open universities and other distance learners to enable them to get the hands-on, real-time experiences. Furthermore, students will experiment with freedom at their own time and have relevant experience. Developments of such laboratories are useful in developing countries where funds for education resources are hardly available.

The web-based laboratories existing over the decade now, but many of educational institutions use expensive equipment which is difficult for the developing country to deploy. In addition, many of available online laboratories are ad hoc systems and tailored for certain laboratory devices [1].

This paper describes the implementation of web-based laboratory of a single stage CE, RC coupled amplifier. The objective of this experiment is to enable students to carry out time domain and frequency domain analysis of different microelectronics circuits online. The National Instruments (NI) provided the affordable Educational Laboratory Virtual Instrumentation Suite (ELVIS) kit which interfaces the different components with the web server. Graphical User Interface (GUI) developed using Java facilitates the on-line access and control of experiment parameters. The architecture used is known as ilab (internet laboratories) developed by Massachusetts Institute of Technology (MIT) iLab team in 2002. The iLab offers unifying software framework, which supports single sign-on online access to a wide variety of laboratories.

2. SYSTEM ARCHITECTURE

The architecture used is client-server architecture consists of labserver, servicebroker and client [2], as shown in Figure 1. First tier, **Lab Server** has the connection to the real laboratory device. It executes experiments requested by Service Broker and notifies ServiceBroker when results are ready [3]. It knows nothing about the students using the system, but it stores temporary experiment specifications and results. MIT started iLabs development from batched experiments, where user defines all parameters at a time for lab device before running. MIT has released an interactive version of the ilab, where user can specify parameters from a fly to the Lab device, but comparing to the batched version it requires more effort to develop and wider bandwidth for efficient use. Therefore, batched experiments are more practical alternatives in Tanzania and other countries with low bandwidths and unstable electricity. Additional benefits for batched experiments are that those are not that sensitive for power cuts and do not require Service Broker or Labserver time during specifying parameters for the experiment running.

Service Broker as middle tier is responsible for authentication, authorization and to forward the communication between Client and Labserver as well stores students experiment specification and results under its account. It offers user interface for administration task (for example setting permission or adding new Lab servers to the system) and it is the first place where student comes to require permission to a lab.

Third tier, **Client**, provides user interface for student to specify parameters for running experiments. Architecture supports Java application, applets or html-based clients. Client is downloadable from Service Broker and running on students own machine. Especially with batched experiment, student can set up values without using Service Broker or Labserver time.

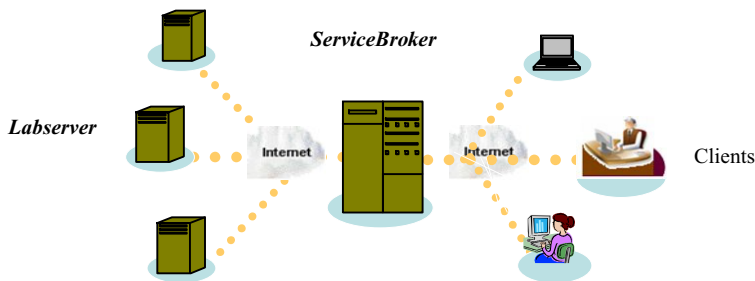


Figure 1: Overview of the batched experiments architecture

3. IMPLEMENTATION OF RC COUPLED AMPLIFIER

The single stage CE, RC coupled amplifier experiment is constructed in NI ELVIS prototyping board. The Data Acquisition Card (DAQ) is PC 6251. First, the input and output voltages are determined (time response analysis), followed by frequency response analysis.

Time Response Analysis (Transient Analysis)

Time response analysis of the single stage CE, RC coupled amplifier is a measure of the input and output voltages. The transient analysis uses Function Generator (FGEN) and Oscilloscope (SCOPE) instruments. The input to the circuit is connected to the FGEN and the SCOPE is connected to the output. Figure 2 is the experimental setup of single stage CE, RC coupled amplifier. To create the experiment setup, the image of the circuit is loaded on the client's window. Once the image is loaded, the Transient Analyze is chosen. Then, the students set the experimental input specifications. The input specifications are then sent to the labserver to perform the actual experiment through the servicebroker. When the experiment is done on the hardware, the results are passed back through the Dynamic Link Library (DLL) to the setup and then call to the experiment engine. The experiment engine stores the results in the labserver database in the ExperimentResultXML file. The experiment engine then notifies the service broker that the results are ready. The service broker fetches the results from the labserver database and passes to the client where the results are displayed to the student. In the labserver, the processing of experiment is divided into two main parts: Labview and Visual Basic.

Labview

Time response analysis in Labview has three main parts:

- (a) **TransientAnalyze.vi:** This is the main entry to the labview code. This is the first class called by the compiled DLL from the Visual Basic in the labserver visual basic. This module passes clients' parameters to the FGEN.vi
- (b) **FGEN.vi:** This VI calls the various hardware instruments. It calls function generator and Data Acquisition (DAQ) card.
- (c) **RunFGen.vi:** Calls function generator and DAQ functions. The function generator generates the requested waveform and the DAQ to sample the analogue signals.

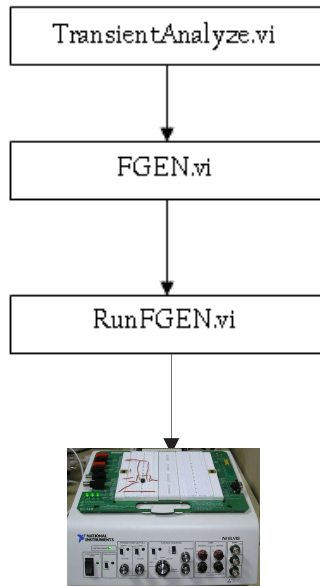


Figure 2: The Time Response Analysis hierarchy

Visual Basic

Visual basic contains of eight components. But the main componentse are:

(a) Experiment_engine: Checks the queue, if any experiment, de-queues it. Then it calls the setup, which has parseXMLSpec method and parses the experiment specifications. Then the setup calls the terminal that creates the terminal from the specific terminal class to get the specific parameters of that instrument. When the experiment is done on the ELVIS hardware, results are returned back through the labview, to the experiment_engine. The data points are then put into an XML file called the “Experiment Results.” and sent back to the client for display to the client.

(b) Setup: This class has the method parseXMLSpec. This method parses the experiment specification (an XML file that contains the experiment parameters chosen by the client. It parses the XML parts from validation engine and delegates each parsing of each terminal to Terminal class. The parsed data elements are loaded into class variables for processing by other private and internal methods. The setup will determine whether the experiment being run is time response or frequency Response. This is done depending on the parameters send by the client and the instrument selected by the client whether it is a FGEN or BODE.

(c) Wrapper : This class provides a wrapper around the Labview dlls that communicate with the ELVIS board for the ACAnalyze experiment. It runs an experiment that is in the setup (assumes that setup is validated before passing to this function). It returns an arrayList with the waveform values generated by running the experiment. The RunExperiment() method in the TransientAnalyze class calls the compiled LabView DLL with the specified parameters. The DLL runs the experiment on the ELVIS hardware. Once the experiment is run, it returns from the TransientAnalyze class back to the runExperiment() method in the experiment engine with an array

of data for graphs that will be displayed to the client. The data points are then put into an XML file called the “Experiment Results” and sent back to the client for display to the client.

(d) Validation_engine: This is the first thing that is called before the job is queued for execution. It checks whether the inputs specified by the user meets the specification set by the designer of the experiment when setting up the assignment. It works the same way as the parseXMLSpec() method in the execution engine to extract the experiment parameters and checks these values against the values stored in the database.

(e) LabServer Administrative Interface and Database:The labserver administrative interface is an active server page (ASP) website where experiments are created. It interacts direct with the structured quel language (SQL) database.

Client as Third Tier

The client is where the students/users specify the parameters to be used in the experiment. It is a Java Applet launched from the service broker. It uses Simple Object Access Protocol (SOAP) to communicate with the service Broker as shown in Figure 3.

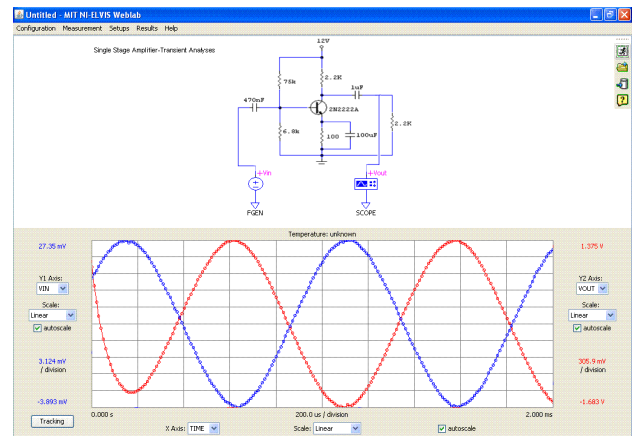


Figure 3: Input and output voltages of the single stage amplifier and its waveform. The input is shown in blue and output shown in red

An Example: Frequency Domain Analysis (AC Analyze)

The Bode Analyzer is used to display frequency response and the corresponding phase angle (Bode Plot) of the circuit. The magnitude against frequency and phase angle against frequency are obtained by making use of sweep feature of function generator and analogue input capability of DAQ device. The same circuit used in transient analysis is used in frequency analysis. Figure 4, shows the waveforms obtained when testing the frequency response in NI ELVIS.

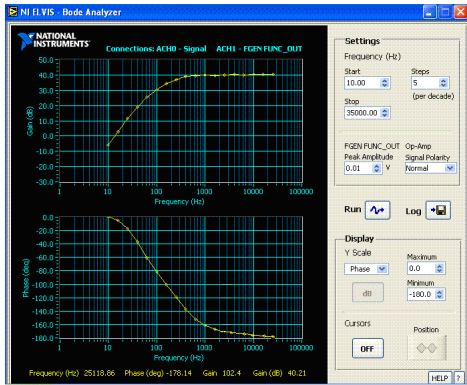


Figure 4: Gain and phase of single stage amplifier in NI ELVIS

After that, the virtual instrument.vi is created in labview. The hierarchy of how the frequency response of a single stage amplifier is created in labview is illustrated in figure 5 and figure 6. Labview in frequency response has two stages: BodeAnalyzer.vi and ACAnalyzer.vi.

BodeAnalyzer.vi is first created in the LabView. This vi runs Bode Analyzer parameters from the client and the function generator hardware to sweep the sine waves as shown in figure 5. The BodeAnalyzer.vi utilizes the Bode Analyzer VI Express which is provided in Labview to run the ELVIS functionalities. This vi is then put in ACAnalyzer.vi as a subvi.

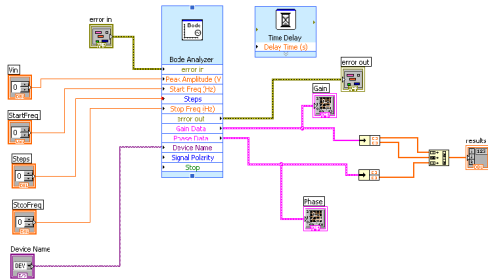


Figure 5: The BodeAnalyzer.vi

The ACAnalyze.vi is the entry point to the labview from the DLL. This enables the parameters from the client to get to BodeAnalyze.vi, which runs the experiment on the ELVIS board as shown in figure 6. When the experiment is done, the results are collected in the result waveform in the BodeAnalyze.vi and passes back to ACAnalyze.vi to DLL.

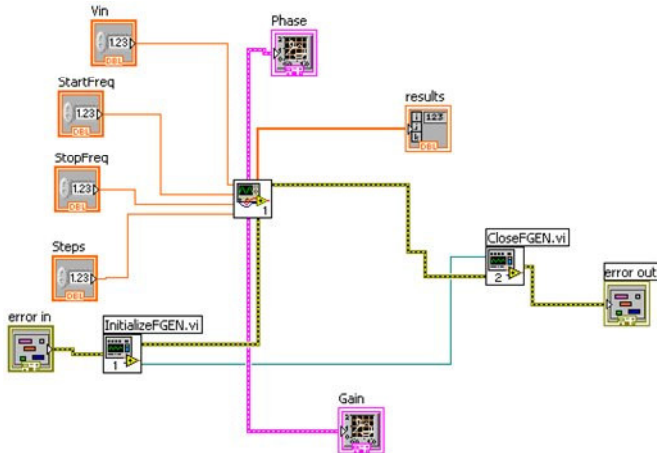


Figure 6: TheACAnalyze.vi

In visual basic, the same path used in transient analysis, is the same in frequency analysis. As in transient analysis, the client launches the single stage amplifier with the bode analyzer parameters. These parameters are amplitude, start frequency, stop frequency and steps. The results are the gain in dB against frequency in logarithm scale and phase in degrees against frequency in logarithm as shown in figures 7(a) and 7(b) respectively.

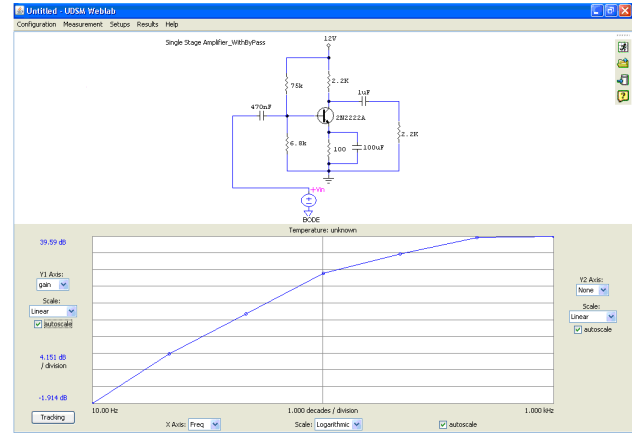


Figure 7(a): The gain against frequency

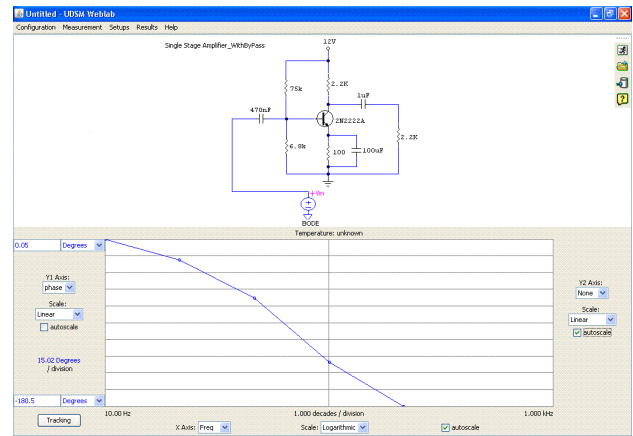


Figure 7(b): The phase against frequency

There is a debate on the technical value produced by the web-accessible labs. Figure 8 shows the comparison of traditional, simulation and web-based laboratories.

Results of the three types of laboratories: traditional, simulations and web-accessible of the amplifier without the bypass capacitor.

Freq(Hz)	Vin (V)	Traditional		Simulations		Web-Based	
		Vout (V)	Gain(dB)	Vout	Gain	Vout	Gain
10	0.007	0.003	-5.3	0.03	-7.0	0.041	-4.6
100	0.007	0.007	26.4	0.16	27.0	0.16	27.0
1k	0.007	0.204	29.3	0.45	28.1	0.229	30.3
10k	0.007	0.617	38.9	0.48	40.1	0.684	39.8
35k	0.007	0.668	39.6	0.64	40.7	0.716	40.2

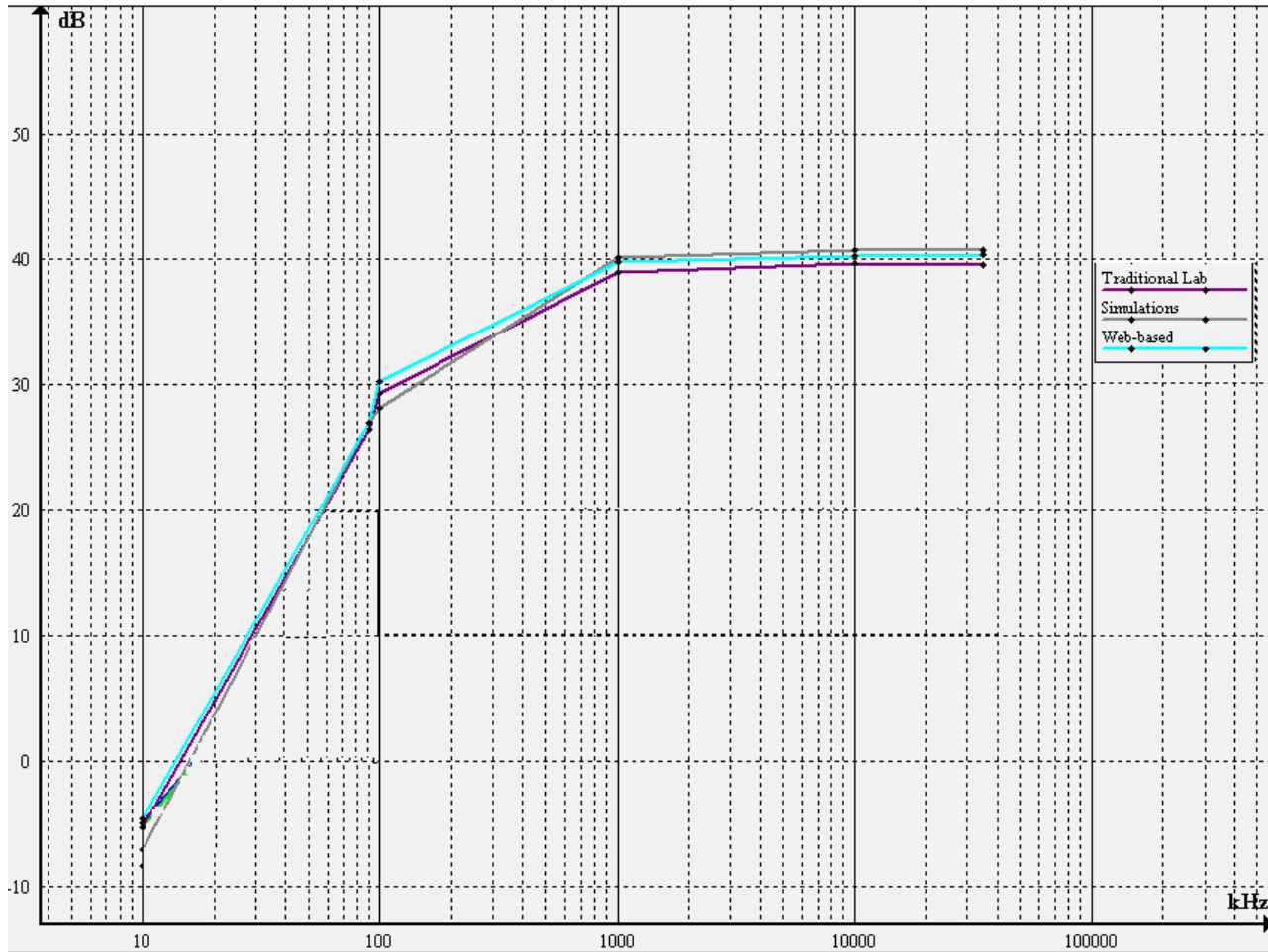


Figure 8: Comparisons of traditional, web accessible and simulations results

4. CONCLUSION

As many educational institutions have difficulties in providing hands-on experiments to their students due to many limitations imposed by traditional laboratories, the presented web-based laboratory is intended to provide students with the same interaction to real hardware as traditional ones. The presented paper is an effort to explore the capabilities of web-based laboratories in science and engineering education. The aim is to make students to get the same quality of education using user friendly environment. The effort is underway to make sure that many instruments are deployed in the modular so that students can explore many real experiments without hindrance of laboratory equipment. In addition, with web-based laboratory, e-learning institutions will be able to provide hands-on experiments to their students.

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Employment Satisfaction at Higher Education Institutions of Lahore Pakistan

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ABSTRACT

The aim of this study is to explore Employment Satisfaction at higher education institutions of Lahore Pakistan. Lahore city being capital of Punjab province and 2nd largest metropolis of Pakistan is famous for its higher educational institutions. Therefore a pertinent questionnaire research on 145 educators has been carried out to expose the insightful portrait of Pakistan's academia. At national level, the study is unique of its nature because it involves modeling of numeric and non-numeric factors which can affect employment satisfaction. The data was analyzed using Multinomial Logistic Regression models. It has been challenging to predict measurement of satisfaction behavior on a quantitative scale. Results indicate higher satisfaction in private universities, which is caused by work environment, affiliation with the institution and remuneration. Interestingly, significant factors which may increase/decrease satisfaction for public sector faculty are health and medical facilities, training and development programs and policies of institution.

Key words:

Multinomial logistic regression, Employment satisfaction, Education, Higher Education, Lahore and Pakistan

1. INTRODUCTION

Higher education always plays a vital role in the development of a state. Higher education in Pakistan is equally flourishing in both public and private sectors under the guiding principles of Higher Education Commission of Pakistan [1]. In stipulations of employment both sectors have their merits and shortcomings. Keeping this fact in mind, the institutions of both sectors are included in the research. [2]

The primary focus of paper is on the satisfaction level of the employees of higher education institutions under certain indicators. An attempt has been made to find out those indicators or elements which can enhance the satisfaction level of faculty members. To formulate research hypothesis and questionnaire, several past studies have been reviewed and some of them are presented in the following paragraphs.

Dua [3] assessed Job stress through 21 job-related questions from 1,028 staff members of the University of New England and reported that workplace conditions, work load, less promotion opportunities and job-insecurity are the factors affecting their satisfaction with university.

Lacy and Sheehan [4] examined features of academic personnel's satisfaction with their job across the eight countries Australia, Germany, Hong Kong, Israel, Mexico, Sweden, UK and USA). Job satisfactions were strongly higher for the Australian data, and found the affect of work environment on job satisfaction. Results showed that factors related to work

environment in which academics work, including university environment, morale, sense of community, and relationships with academic colleagues, are the greatest predictors of job satisfaction. Whereas in another study [5] statistical test of differences conclude that the significant factors affecting satisfaction are: management position, characterized by seniority in age, designation, and experience.

Volkwein and Parmley [2] examined the employment satisfaction in public and private sector. They found that the hypothesized public and private sector differences are restricted only to satisfaction with extrinsic rewards, and even these differences vanish when all related variables are controlled for using regression analysis. In both public and private sectors, job satisfaction is most significantly linked with work environments, teamwork and small levels of interpersonal difference.

Ward and Peter [6] used ordered Probit analysis to examine the data of 900 faculty members of five Scottish universities. Gender remained non-significant, whereas salary of respondent and academic work place is affecting job satisfaction.

Titus and Hickson [7] not only found how satisfied UK academic staff with their basic duties of teaching and research, but also their satisfaction with salary. A binomial logit analysis on a survey data was used and yields a strong positive relationship between salary satisfaction and gender, indicating that women academics are more satisfied than the men employees. Satisfaction was negatively affected with increase of age and work experience in higher education. Salary satisfaction was positively associated with the designation. Another study [8] reviews the literature on studies related about the relationship of job satisfaction and age, gender, designation and experience.

Sesanga and Garrett [9] carried out a research in Uganda which identifies the factors contributing considerably to the satisfaction or dissatisfaction of academic staff of higher education institutions. A sample of 182 respondents from two universities in Uganda determined most significant factors affecting employment satisfaction: behavior of colleagues, supervision, salary, authority, research, promotion, and work place.

After reviewing extensive literature, five broad headings for the questionnaire were finalized along with questions for each section:

1. Work environment (8 questions)
2. Policies of institution (11 questions)
3. Health & medical facilities (8 questions)
4. Training & development opportunities (12 questions)
5. Family benefits (5 questions)

2. METHOD

Universe

Universe under study includes only sixteen higher education institutions of Lahore Pakistan which are recognized by Higher Education Commission of Pakistan (HEC). Medical colleges, engineering universities and fine arts institutions are not considered in the universe.

Sampling Plan

A sample of 145 educators was selected from six HEC recognized universities using a two stage cluster sampling technique. On the first stage universities were chosen and on the second stage proportionate sample of individuals was selected from each institution.

Table 1: The Sample Breakup of six selected institutions

Institution	Size of faculty	10% of size of faculty	Successful Interviews
PU	550	55	54
GCU	202	20	20
LCWU	298	30	26
LUMS	152	15	15
FCC	199	20	21
UCP	30	3	9
TOTAL			145

Questionnaire

A robust questionnaire of 50+ questions was designed after reviewing relevant literature. It was also evaluated by academicians, psychologists and research practitioners. A pilot of 5 interviews was used for modifications and improvements in questionnaire. After capturing demographic information respondents were requested to complete five broad sections. The response of most questions was recorded on five point Likert scale. The categories of scale were: Highly satisfied, Satisfied, Just OK, Dissatisfied and Highly dissatisfied. Some examples of 50+ questions are given below:

1. Type of employment (Permanent or contractual)
2. Monthly remuneration
3. Life insurance benefits
4. Work environment is cooperative
5. Education assistance for children
6. Subject trainings
7. Medical facilities for spouse & kids
8. Learning opportunities are available
9. Office timings etc.

Data Collection

Considering the power failure problem and lack of email usage in some professors of higher age group, it was decided to choose face to face interview method. The participants were motivated to take part in the survey by freely voicing out their opinion and they were also told that their opinion is vital to complete this research which would benefit the society at large. Some of them were provided ample time to fill questionnaire and the completed one was collected on second visit.

3. ANALYSIS

Reliability

The researcher has entered and analyzed data in SPSS. After data cleaning and validation, reliability of questionnaire was examined with the use of Cronbach's alpha statistic. Value of Cronbach's alpha remained 0.955 for 54 items which exhibit that the questionnaire data is reliable for analysis and can be used for insights and reporting. Nunnally (1978) has indicated that the 0.7 value of the Cronbach's alpha is an acceptable reliability coefficient. Reliability of complete questionnaire was further verified by Guttman split-half coefficient. The value of coefficient of Guttman Split-half was reported as 0.871, which seconds Cronbach's alpha result.

Multinomial Logistic Regression Modeling

Many researchers have been using this technique during the analysis of their research data. Bauer [18] used multinomial logistic regression to research on "Sexual Behavior and Drug Use among Asian and Latino Adolescents". Alderson et al [19] applied multinomial logistic regression for their research study "Social status and cultural consumption in the United States". Schemp et al [20] used multinomial logistic regression models in their research study "Maternal age and parity-associated risks of preterm birth: differences by race/ethnicity".

Agresti [10], Hosmer and Lemeshow [11] have explained the situations to use logistic regression modeling. It is used when the response variable is categorical and has two or more categories. If response variable is categorical and has two categories, a Binary or Binomial logistic regression is used, while multinomial logistic regression is applied in case of more than two categories of response variable. In this study the question treated as response variable was: "Overall how do you rate your employment satisfaction today?" with five possible categories; Highly satisfied, Satisfied, Just OK, Dissatisfied and Highly dissatisfied. On the other hand predictors include mixture of both continuous and categorical variables.

The Model: To treat the response variable which is typically dichotomous in logistic regression, we say that the response variable can take the value 1 with a probability of success (π), or a value 0 with probability of failure ($1 - \pi$). Such variables are known as Bernoulli variables. While the applications of logistic regression have been extended to cases where the response variable is of more than two categories, known as multinomial or polytomous, Tabachnick and Fidell (1996) used the term polychotomous.

The predictor variables in logistic regression can take any form continuous or qualitative. That's why logistic regression has no assumption about the distribution of the predictor variables. They do not boast to be normally distributed, linearly related or of equal variance within each group. The relationship between the predictors and response variable is not a linear function in logistic regression, instead, the logistic regression function is used, which is the logit transformation of π :

$$\pi = \frac{\exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_i X_i)}{1 + \exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_i X_i)} \quad \text{Eq. (1)}$$

Where β_0 is constant of equation and β s are the coefficients of independent variables. For the interpretation purpose it can also be expressed as:

$$\log it[\pi(x_i)] = \log\left[\frac{\pi(x)}{1-\pi(x)}\right] = \beta_0 + \beta_1 x_1 + \dots + \beta_i \quad \text{Eq. (2)}$$

The results of first attempt to apply multinomial logistic regression model could not remain successful because it cannot pass statistical requirements of logistic regression: model was in-significant, invalid values of odd ratios, strange values of regression coefficients and very small values of Pseudo R-squares etc.

Hence it was decided to see the outlying observations. Logistic regression does not offer full diagnostics for multiple responses as compared to the binary response. Therefore the graphical representations of predicted probabilities and the residuals are used to omit the outlying observations from the data.

In figure No. 1 the residuals are plotted to see the influence of observations on the model. The observation number 4, 56 and 133 are dissimilar and distant from all other observations. This exhibits a high probability of error on these three points. The observations 4, 56 and 133 were omitted and the residual plot was regenerated. Figure No. 2 shows the residual plot after omitting the observations of high errors. Similarly, the predicted probabilities were plotted to see the influential observations. One observation was omitted when found influential. The omitted observation had least probability for prediction i.e. 0.3366 whereas other observations had greater than 0.5 probability of prediction, even most of them were close to one.

Large number of variables was also reduced by summing scores in each section of questionnaire. Finally, the following 19 predictors were used in multinomial logistic regression model: designation of educator, education of educator, experience of educator, overall satisfaction with health & medical facilities, overall satisfaction with work environment, overall satisfaction with recreation and family benefits, overall satisfaction with training & development Programs, overall satisfaction with policies of institution, institution size, affiliation (experience in current institution), sum of scores for health and medical facilities, sum of scores for work environment, sum of scores for recreation and family benefits, sum of scores for training and development programs and sum of scores for policies of institution, tenure of appointment (contracts), age and salary of the educator.

Finally, the fitted models for both public and private sectors passed the following statistical requirements:

- -2log likelihood model fitting criteria approved by effect selection Chi-Square test (sig<0.05 for all entered models)
- Chi-Square likelihood ratio test (sig=0.000)
- Chi-Square goodness of fit (sig=1.000)
- Pseudo R-Square (Cox & Snell, Nagelkerke and McFadden were more than 0.700)
- Asymptotic correlation matrix (missing values are observed to check redundant parameters)
- Asymptotic covariance matrix (zeros are observed to check redundant parameters)

Fig 1: Residuals before exclusion of outlying observations

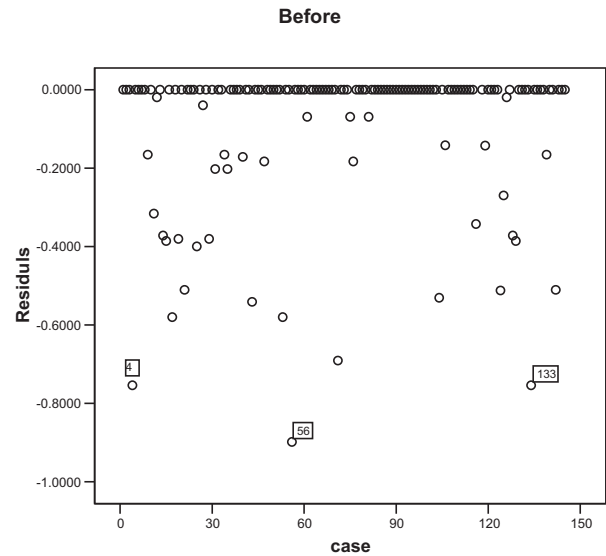
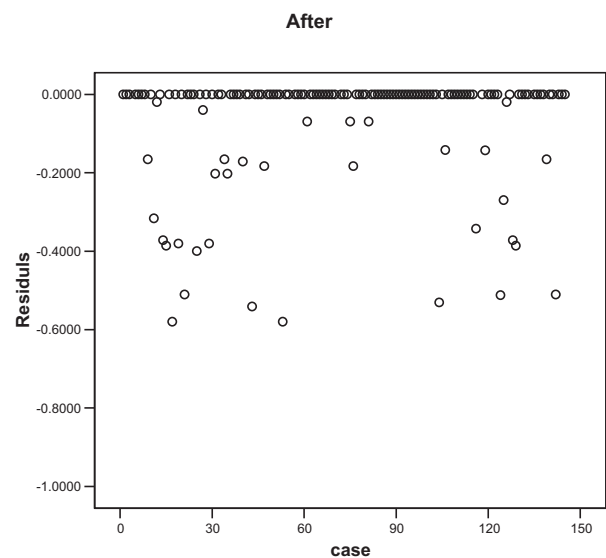


Fig 2: Residuals after exclusion of outlying observations



4. FINDINGS FROM MULTINOMIAL LOGISTIC REGRESSION

Public Sector

As the classification table of model output in table 2 shows that model has predicted 96% cases correctly. The factors which effect employment satisfaction of public sector educators are:

- Score for health & medical facilities (*sum_a*)
- Score for training and development programs (*sum_d*)
- Score for policies of institution (*sum_e*)
- Overall satisfaction with health & medical facilities (*ah*)

The final logit model is obtained as:

$$Y^n = \beta_0 + \beta_1(\text{sum_a}) + \beta_2(\text{sum_d}) + \beta_3(\text{sum_e}) + \beta_4(\text{ah}) \quad \dots\text{Eq. (3)}$$

Table 2: Classification table for Public Institutions

Observed	Predicted					
	Highly Dissatisfied	Dissatisfied	Just OK	Satisfied	Highly Satisfied	Percent Correct
Highly Dissatisfied	2	0	0	0	0	100%
Dissatisfied	0	8	0	0	0	100%
Just OK	0	0	59	2	0	97%
Satisfied	0	0	2	19	0	91%
Highly Satisfied	0	0	0	0	6	100%
Overall Percentage	2%	8%	63%	21%	6%	96%

The fitted data model can produce several predictions. For instance if a public sector employee is dissatisfied with overall health and medical facilities and his score for health and medical facilities is 12, score for training and development programs is 13, score for policies of institutions is 19. The prediction about overall satisfaction of employee would be ‘Highly dissatisfied’ with a probability of 0.999.

Similarly if a public sector employee is dissatisfied with overall health and medical facilities and his score for training and development programs is 53, score for health and medical facilities is 19, score for policies of institutions is 43. The prediction about overall satisfaction of employee with the institution would be ‘Satisfied’ with a probability of 0.9300.

Private Sector

As the classification table of model output in table 3 shows that model has predicted 76% cases correctly. The factors which effect employment satisfaction of private sector educators are:

- Scores for work environment (*sum_b*)
- Affiliation (experience with current institution) and
- Monthly salary

The final logit model is obtained as:

$$Y'' = \beta_0 + \beta_1(\text{sum}_b) + \beta_2(\text{affiliation}) + \beta_3(\text{salary}) \quad \text{..Eq. (4)}$$

The above model can produce several predictions. For instance if a private sector employee drawing monthly salary of PKR 47,000 and his affiliation with current institution is 4 years and his score for work environment is 35. The prediction about overall satisfaction of employee would be ‘Satisfied’ with a probability of 0.8333.

Similarly if a private sector employee drawing monthly salary of PKR 31,000 and his affiliation with current institution is 1 year and his score for work environment is 12. The prediction about overall satisfaction of employee would be ‘Highly dissatisfied’ with a probability of 0.9999.

Table 3: Classification table for Private Institutions

Observed	Predicted					
	Highly Dissatisfied	Dissatisfied	Just OK	Satisfied	Highly Satisfied	Percent Correct
Highly Dissatisfied	2	0	0	0	0	100%
Dissatisfied	0	4	0	0	0	100%
Just OK	0	0	13	3	0	82%
Satisfied	0	0	3	11	3	65%
Highly Satisfied	0	0	0	2	3	60%
Overall Percentage	4 %	9%	38%	36%	13%	76%

5. RESULTS

Entire Sample

Out of total 145 respondents 49 (34%) are satisfied, 16 (11%) are dissatisfied and 80 (55%) are neither satisfied nor dissatisfied. The average satisfaction remained 3.28 out of 5. Result is different from a previous study of United States where the average satisfaction of employees was reported 4.13 out of 5 [12]

Public and Private Sectors

The employees of private sectors reported a higher satisfaction 49% as compared to public sector where 27% employees are satisfied. In private sector the factors which contribute significantly for increasing satisfaction are work environment, affiliation with the institution and monthly salary. Salary and workplace affect significantly on employment satisfaction in Scotland [6]. Work environment contribute significantly to increase the satisfaction in turkey [13]. Salary contributes significantly to increase the satisfaction in Singapore [14].

In public sector, the factors which contribute significantly for increasing satisfaction are related with health and medical facilities, training and development programs and policies of institution. Another overseas study concluded different results; work environment and team work contribute significantly to increase the satisfaction of public sector employees [2]. Public sector employees of Italy differ from private employees with safety and health facilities [15]. Health and welfare benefits contribute significantly to decrease employment satisfaction in Italy [16].

Remuneration

Overall 65% were satisfied among those educators whose monthly remuneration is more than 50 thousand Pakistani rupees, followed by 54% satisfied with a salary between 41 to 50 thousand, 48% with 31 to 40 thousand, 41% with 21 to 30 thousand and 17% with a salary of less than 20 thousand rupees. The average monthly salary of public sector employees is PKR 21,492.13 and for private sector employees is PKR 47,866.67

Insights from other Demographic Details

Gender: Males are more satisfied than females. In 90 male respondents 32 (36%) are satisfied while in 55 females 17 (31%) are satisfied. This seconds the findings of National Survey of Post-Secondary Faculty in United States where satisfaction of males was reported higher i.e. 85% followed by females 82% [17]. Whereas, in England females are more satisfied [7]

Designation: Assistant professors are more likely to be satisfied as compared to lectures, professors and associate professors. Among assistant professors 53% were satisfied followed by associate professors with 48%, professors 43% and lecturers 20%. This is contrary to: Assistant professors are less satisfied than others [17].

Age: Educator's age has a very strong correlation with educator's experience (Pearson Correlation=0.931 with Sig=0.000). The percentage of satisfied respondents is 50% among those who are more than 60 years of age, followed by 41-50 years of age with 43%, in 51-60 years 39%, in 31-40 39% and 24% in less than 31 years of age. This is contrary to a previous study of United Kingdom, which reports that increase of age and experience decrease satisfaction [7]

Qualification: The percentage of satisfaction among MS degree holders is higher i.e. 86%, followed by 62% who have PhD, 33% M. Phil and 19% MA/MSc.

6. CONCLUSION AND DISCUSSION

Study concludes that more educators raise their thumbs by reporting higher satisfaction for their current institutions. However, perhaps 80 are fence sitters who could not voice their opinion on overall satisfaction. Classification table of multinomial logistic regression classify 5 of them into the satisfied category and interestingly no one of them have been classified into dissatisfied category by the model. This reveals a fact that on the basis of other indicators these 5 respondents are likely to be satisfied which is a good sign for administrators of higher education in Pakistan. Most of the fence sitters may become satisfied after putting little administrative effort for the improvement of limited areas identified by model for each sector.

Using analysis results the overall satisfaction of higher education employees could be increased. For instance private institutions which have not been surveyed in this study could improve satisfaction of their employees by providing them better work environment, competitive salaries and longer tenures of appointments/contracts to improve their affiliation with institution.

The satisfaction level of public sector employees is observed lowers which is linked with relatively lower remuneration. Analysis results has revealed that satisfaction of public sector educators could be improved by providing better salaries, better health and family facilities, introducing new training and development programs and introducing new institution policies. The public sector administrators need to place more efforts as compared to the private sector administrator.

Some demographic information has also revealed insights about common trends in Pakistan's academia. The pleasure of

working in academics is higher for those who hold MS degrees. One of the reasons for higher satisfaction among MS degree holders is foreign qualification and foreign qualified faculty enjoy good designation and better remuneration in Pakistan. Most of the faculty members who are qualified from Pakistan are MA/MSc, M. Phil and PhD because after 2004 some Pakistani universities started introducing BS/MS Programs. Some universities are still following older system of MA/MSc.

It is quite common in Pakistan to offer a higher remuneration to more experienced educator. This is one of the reasons of higher satisfaction among educators of higher age groups. As the experience of faculty member and age exposed a very strong positive correlation. Therefore, it could be assumed that educators of higher age groups are more experience than others. Being more experienced they are enjoying higher remuneration and hence their satisfaction is higher.

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Promoting and measuring values in non-formal education

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ABSTRACT

A wide range of non-governmental (civil society) organizations that epitomize non-formal education in many countries have taken the lead in public awareness and response to different social problems. These organizations are ethically driven, faith-based, environmentally concerned or include promotion of values as part of their core activities, as these values can be the main drivers for changing individual behavior. By means of various projects, which include education in different forms and formats, they aim at promoting certain values in their target groups (e.g. the general public, youth and children, businesses).

In the ESDinds project (a research project funded by the European Commission with the title The Development of Indicators and Assessment Tools of Civil Society Organization Projects Promoting Values-based Education for Sustainable Development) we have had an opportunity to explore how several civil society organizations promote and cultivate certain human values and how they are delivered to their members and target groups. In our contribution, we focus on the values changing among youth participants involved in one out of five cooperating non-governmental organizations involved in the project – The People's Theater based in Germany.

Key words: value-based organizations, values, research in values changes, education for sustainable development

1. INTRODUCTION

Values are an important (and popular) theme these days. When you try to find this term in literature or on the internet you get hundreds of books, papers and web pages focusing on this issue.

We speak about values in a variety of contexts; values are at a heart of general public interest, politicians, businessmen, various non-governmental organizations, researchers, schools, etc. They may have different attributes, such as human, cultural, personal, intrinsic (core), instrumental, global, and it

is possible to distinguish among several levels of values in terms of target groups – individual, organizational, team, community or project.

No wonder. As mentioned, for example, by Gorman, *values represent standards by which we can assess what we do, measure how near we are to, or how far we are from, an objective. They provide a basis for argument and discussion and a set of premises needed for fruitful interaction with other people and with other groups* [1]. Dahl describes values similarly (in the sense of interaction with other people and groups): *Values provide basic rules governing human interactions. They indicate what is good or bad, desirable or undesirable* [2]. It is thus obvious that values are a necessary component of our personal and professional life and that's why values are currently a hot topic.

In addition to the many contexts, attributes and levels of values in the literature, there are a lot of definitions. Values are often defined in relation to attitudes and beliefs. So is the Rockeach definition that we have chosen for the purpose of our contribution (and project): *A value is an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence. A value system is an enduring organization of beliefs concerning preferable modes of conduct or end-states of existence along a continuum of relative importance* [3]. As we can see, Rockeach equates a value with a belief. Other authors see a link between the values – belief and behavior (action) as an external expression of values of people or groups (e.g. [4]).

We see this link (values – belief – behavior) as a crucial link for promoting the sustainable development concept in all of its three pillars (social, economic and environmental).

A central question, well captured by Schlater and Sontag, is whether values can be measured at all and if yes how to measure and indicate them [5]. Values are intangible – they cannot be weighed or counted directly. However, behaviors associated with these intangibles – values – can be observed, measured and reported. Although there is enough knowledge about human values - and that is crucial to understanding

human behavior - methods for the study of values are as yet relatively underdeveloped. In the empirical world, value subscription can manifest itself through discourse and overt action. The crucial test of value presence (or change) is consistency between the two. In investigating discourse the primary tool of value study is a content analysis of appraisals, justifications, recommendations etc. of one's own or others' actions. In investigating action, the principal tool is budget analysis of patterns of resource investment (e.g. time or money). A dual approach using both modes of values manifestation should give maximum credibility to values studies. In Section 3 we exemplify our methodological approach towards measuring value changes.

2. CONTEXT OF RESEARCH

One of the purposes of the ESDInds project is to understand which values are important to different civil society organizations, and to identify the role of values in different contexts. The ultimate goal of the project, based on the empirical findings, is to then develop and test methodologies for helping civil society organizations with promoting their values by the most effective ways and methods.

One out of five civil society organizations participating on the ESDInds project is The People's Theater (PT) based in Dietzenbach, Germany.

The People's Theater seeks to support self and social competencies in youth and children, thereby contributing to the prevention of violence in schools, as well as initiating integration processes. Its main educational method is theatre shows that treat the theme of conflicts (e.g. vandalism, racism, and chicane), for example, by an entertaining and provoking way by using talk show and theatre elements. Its goal is to find and get positive solutions by showing, discussing and arguing in different ways with the audience (pupils). Since its inception, The People's Theater has run over 1,500 performances and 200 projects in schools. That means that about 37,500 children in Germany experienced some of the many performances provided by this organization.

The People's Theater performances are performed by approximately ten young people (youth participants) aged 18 to 25 who serve the society voluntarily for one year and who work full time for the organization. There are ten participants in the year 2010. The youth participants work together five days a week and live together the whole time in one house. This means they share the same place at home (incl. cooking, shopping, cleaning, etc.), at work, and they also spend part of their free time (outside of work and home) with others. It is thus clear that good relationships between the youth participants are a necessary condition for all the project processes and obviously for project success. Values play then a crucial role in relationship development.

For monitoring possible shifts or changes in values professed by the youth participants, who are our target group in the research, we use an event-based **diary method**.

3. METHOD

Diary method description

A diary can be defined as a document created by an individual who has maintained a regular, personal and contemporaneous record. The entries are made at the time or close enough to the time when the events or activities occurred. The entries record what an individual considers relevant and important, and may include events, activities, interactions, impressions and feelings [6]. It is possible to identify different models of diaries. Allport distinguishes three main models: *intimate journal* (the entries are uncensored and record the private thoughts of a specific person), *log* (kind of listing of events with little commentary), and *the memoir* (the author of the diary/autobiography intends to publish the diary) [7]. These three models of diary represent types of autobiographical diaries. Another category of diaries that is most appropriate for our research is diaries or diary methods which are a base for different social studies. Bolger at al. discuss three broad types of research goals that can be achieved using diary designs: *obtaining reliable person level information*, *obtaining estimates of within-person change over time*, as well as *individual differences in such change*, and *conducting causal analysis of within-person changes and individual differences in these changes* [8]. Our research corresponds with the second mentioned category.

The diary method (event-based diary) we use in The People's Theater represents a unique chance for researchers to collect data and learn more about the value changes of young people. It means we make an attempt to use the diary method to find out what events/situations in the project cause value changes by participants and what are the shifts in their values. On The People's Theater side the diary represents in addition a multiple assessment tool: It gives feedback to the youth participants over a one year period (they can recall and analyze their attitudes, beliefs and behavior during this one year), and helps indicate to the PT staff those events that significantly affect (positively or negatively) the young people in the project. It requires a special diary structure that fulfills all the above mentioned aspects.

Procedure

The event-based diary has an on-line form because of the simultaneous ease of accessibility by both youth participants and researchers. Every youth participant has their own **anonymous** personal on-line diary and makes their entries weekly. The anonymity enables the youth to explain all their feelings about themselves, about others and about the project. Completion of the diary is not compulsory.

The diary is structured in the sections below described:

- a) **Event of the week.** This is the most common section of the diary (70% of the diary). In this section we ask the youth to write down the positive or negative events of the week. The purpose of this section is to help the

participants recall in the future events that affect their thinking about values, change their value priorities and help remind them which of the project events affect them very negatively or very positively.

- b) **Values test.** There are three value tests in the diary – at the beginning of a participant’s engagement, in the middle and at the end of the project. We ask the youth participants to do three personal value tests. The test involves asking the participants individually about thirty values that are important to them. Then the youth participants are asked to prioritize the values – including deciding which values they would give up or trade off if they face inevitable contradictions (conflicts of different life goals-values etc.). Finally, they choose only fifteen of the most important values. After the second and third personal values test the youth are asked to compare the first/second choice of values with their current value choice, and find the relationship between the value changes (if there are any) and concrete events/situations described in one of the diary sections “Event of the week”. The meaning of this section is to capture the shifts in a participant’s value priorities and connect them with concrete situations.
- c) **Value Session** There are five core values of The People’s Theater organization they hope to provide to youth. The participants are asked to describe their understanding and feelings about a concrete core value and its application in their everyday work. The previous entries from “Event of the week” session help them recall the events connected to concrete values (e.g. unity). The sense of this section is to capture how the participants understand and put into practice the values in an everyday context.
- d) **Positive/Negative event** While in the Event of the week sessions the participants may choose whether they describe a positive or negative event of the week, in this section they have to describe the positive/negative situation they experienced in the positive/negative session entry. Each section is repeated twice in the diary. The purpose of the sections is to detect the events connected with the project which the participant perceives to be the **most** positive or negative within a specific time-frame.

Data analysis and results

As mentioned above, the main purpose of the diary is to indicate a participant’s value change during the project and provide this necessary information to The People’s Theater staff. The diaries epitomize the assessment tools which should be useful for improving the project in its next phases. The data analyses should then be adjusted to this main purpose while maintaining the core criteria of results quality. Thus, we are not focusing on the psychological aspects of the participants value change but only on the events which are convincingly connected with the project by the data analysis.

The entries contained in the diaries are analyzed using a qualitative analysis method based on the induction of categories. The categories are created on the basis of specific events which affect the participants in some sense.

Each of above described sections is analyzed separately, excluding the sections “Event of the week” which epitomize from our point of view the support for other diary sections. In all entries in each section we try finding more general categories that demonstrate to the PT-staff which events cause the changes among participants and hence presents a potential improvement/deterioration for the course of the project. Some first results are described below.

In the positive event section, three main categories of events describe a change of values and attitudes by the PT youth. These are: *positive experience with the school children* (two out of five participants), *positive experience with the youth team empowerment during the school performance* (two out of five participants), and *positive experience with conflict resolution* (one out of five participants). The sample in this section presents 50% of all participants.

These events (in terms of value or attitude change) lead to:

- better conflict resolution abilities of the youth (*the participant had reflected their bad attitude to problem solving and it was their first conflict he/she resolved in another way – better than usual*),
- greater willingness to help pupils in schools (*the participants experienced a positive change in school children’s attitudes in different situations after their own attitude/ value had changed positively*),
- greater appreciation/appraisal of team empowerment (*the participant was in bad work situation and other team member/members empowered them*).

Two main categories of events in the negative event section were detected that described situations when the participants thought a lot about the meaning of the value “Unity”. These are: *negative experience with a member’s exclusion from the team and their subsequent possible removal from the team* (five out of six participants) and *negative experience with absence of adherence to stipulated rules* (one out of six participants). The sample represents in this section 60% of all participants.

These events lead to:

- thinking about the meaning of unity in the context of common work and living (*the participant reflected on their own behavior and compared it with the behavior of the problematic member/members of the team*)
- thinking about the team empowerment (*the participants considered what extent of team members empowerment should have the problematic team member/members*)
- greater appreciation of compliance (*the participant experienced the absence of compliance and appreciated more people and her/him self which adhere to rules*).

We included some first results from the diaries in our contribution in the sections where the data analysis may have been completed. The diaries are still in progress. We hope to gain a more comprehensive picture about changes in youth values and attitudes by June 2010. We envisage presenting these results at a conference as well.

4. CONCLUSION

The main purpose of our contribution was to present information and share first experiences about the assessment tool we have designed in cooperation with the civil society organization People's Theater. We are aware of the benefits and limitations of using an event-based diary. On the one hand, the diaries permit the examination of reported events in their natural context and provide comprehensive information about the participants. On the other hand, the diaries require the constant attention of the participants over a long time period, and when there is a lack of participant interest the information we gain is no longer so comprehensive and honest. Little is also known about the effect diary completion itself on participant experience or responses [8].

Despite these limitations, the first results show that the entries describe a real situation in the project that leads to participant values and attitudes changing. Participant events recorded in diaries corresponds with the perception of The People's Theater staff (without knowing their entries) of the participants' changing values. There are a lot of commonalities between the diary entries of the youth and the statements of staff gained from structured dialog.

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An intelligent screening agent to scan the internet for weak signals of emerging policy issues (ISA)

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Abstract

The political issues of the last decades have proven that there is a dramatic increase in complexity and potential damage of political decision. To better anticipate these future opportunities and threats, a variety of new methods like foresight and other forward looking activities are used in the foresight community. Being aware of these developments, the purpose of this publication is to present an Internet Screening Agent (ISA) for scanning the WWW for weak signals of emerging policy issues. ISA is developed as a support software for the foresight community. With ISA the community can identify relevant topics for their weak signal assessment processes. In addition to this, ISA is developed to deliver relevance indicators to this processes and in general to supply quantitative data to assessment-, transformation- and issue interpretation processes of this community.

The concept of ISA is, to use “wisdom of the crowds” for efficient data acquisition, issue management and community structuring. ISA is developed in a way, that uses machine learning to improve his classification rate. So the more user participate in the classification process the better ISA will get.

Keywords: Strategic planning, emerging issues, weak signals, political agent, intelligent agents, issue management, text mining

1. Introduction

The political issues of the last decades, like limited economic growth- limited resources debate, global climate change, economic crisis, terrorist threats, digital revolution and others have proven that there is a dramatic increase in complexity and potential damage of political decision. To better anticipate these future opportunities and threats, a variety of new methods like foresight and other forward looking activities are used to initiate discussions within policy on future developments. However, these activities tend to identify issues that are more or less mainstream and they do not identify emerging issues that are not yet on the policy radar. To overcome this problem, the SESTI project¹, funded by the European Commission under the

¹ <http://www.sesti.info/sesti/en/project-overview>

7. Framework Program, was set up. The participating partners (TNO, minOCW, JRC, AIT, MIOIR, MCST)² are developing a new approach for weak signals identification so that new social issues can be addressed by the policy arena in an early stage. This will be done by using different methods of early warning scanning. Whereas the SESTI project addresses a number of different concepts in early warning scanning, like wild cards, electronic weak signals, social weak signals, hypes, future trends, emerging issues [3], this paper will present a specific method for internet scanning of social weak signals, developed by AIT and used in the SESTI project as one method beside others for weak signal scan.

The overall process [3] of early warning scanning in SESTI includes a

- weak signal scanning,
- weak signal assessment,
- signal transformation
- and an issue interpretation.

This publication will describe a specific method, used in the first stage of these processes and will concentrate on WWW as data source.

The purpose of internet scanning for weak signals is to identify relevant topics for the weak signal assessment process and to deliver relevance indicators to this process, to supply quantitative data to the assessment process. The final purpose of the overall early warning scanning in SESTI is than to discover social issues that are not yet on the policy radar and can have major impact on our society. These issues will be prepared in a way that they can be discussed with high level policymakers in a systematic and productive way.

2. Emerging policy issues

The concept of “emerging issues” is often mentioned, but is not well defined from a text mining point of view. The concept is inextricably connected to semantic interpretation. In strategic

² TNO Institute for Applied Research
minOCW Dutch Ministry of Education, Science and Culture
JRC Institute for Prospective Technology Studies
AIT Austrian Institute for Technology
MIOIR Manchester University
MCST Maltese Council for Science and Technology

planning discussion of politicians with the research community the concept is often used to express the focus on a specific research paradigm. Obviously it is best for most researchers in this business to do research on emerging issues. So researchers tend to expect that the most important emerging issues will come up in their subject. Political lobbyists are more reliable. They know that the most important social issue will come up in their promoted subject.

In contrast to this, a topic is a more neutral term, often with a singular character. However an issue represents something that lasts longer, and needs to be taken up, to further deal with, whereas the topic does not imply, that it needs to be taken up by a politician. Generally an issue is defined as an important social question and can cause a social dispute.

As mentioned in the SESTI working paper on emerging issues [3], an established issue is already on the relevance list of frequently discussed things, whereas an emerging issue is something that is still not that widely taken up, but has a high potential of being put onto this list quite soon. This can be due to different criteria, e.g. because of its high criticality within certain contexts or because the community attracted to it gets larger. This can be done by the majority of the group or by a small power group, that has a personal interest in pushing the issue.

Thus the concept of emerging issues [3] is closely related to signals. If a signal of a priority change from a political issue remains a singular occurrence that is soon forgotten or develops into an issue is not easy to estimate at the beginning. But other observations can indicate a possible take up. If observations that relate to a specific happening that was once discovered as weak signal, aggregate, the probability rises that this cluster of observations could lead to an emerging issue. This means that after the detection of a weak signal the environment should be scanned for other happenings that relate to this. Taking this definition, an issue is not a single event, but the result of a multitude of events that tend to lead towards a certain direction.

3. Concept of weak signals

In communication theory a signal is a sign with a specific meaning to the receiver of this signal. If the communication is build up with a carrier signal of white noise, than a signal with a specific meaning has to be different from the white noise. So, as a core concept in signal processing, the signal is more or less the peak that transfers the information from the sender to the receiver. A weak signal is than a signal, which is statistically not very different to the carrier signal. Not very different can be calculated with a small but existing stochastic significance.

In our text mining process, the basic corpus, or more precise, the word frequency matrix of the basic corpus, is used as a kind of white noise (even if there is some structure) in which words have a “normal” frequency according to their meaning. In the process of weak signal discovery changes in word frequency are used to as an indicator for semantic changes.

In addition to this a second concept of weak signal will be used in scanning process. Our screening agent will use search frequency data from Google to identify an increasing social interest in specific terms. As the search frequency is very sensitive on human interest it is considered as weak signal for increasing social relevance.

4. System Architecture ISA

Building up on the concept of weak signals and the definition of emerging issues, as discussed in [3], it is obvious, that scanning the WWW for weak signals of emerging policy issues is a resource-intensive and expensive task. Google indexes about 1.3 Trillion sites, so that it is obviously not a good idea just to crawl the web and set up a text mining on this results. In addition to this there are a large number of different file formats, character sets and languages, which will cause additional problems.

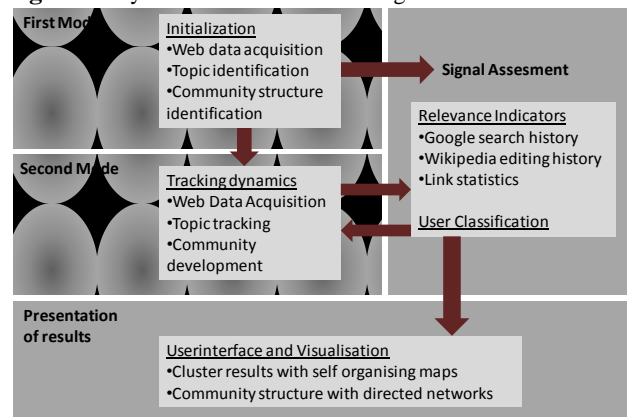
Finally, network centrality of texts in the internet is reached with a large number of inbound links, so that it is easier to find old files, with a good reputation, than new files, which is disastrous for the purpose to search emerging issues. This situation is getting worse in time.

One starting point for the engineering process was that more than 99.9% of the files on web servers are irrelevant for our issue. So the idea is to identify the relevant subset of the WWW and to use “wisdom of the crowds” for filtering and selection in the following analytical process.

James Surowiecki [14:10] mentioned "diversity of opinion (each person should have some private information, even if it's just an eccentric interpretation of the known facts), independence (people's opinions are not determined by the opinions of those around them), decentralization (people are able to specialize and draw on local knowledge), and aggregation (some mechanism exists for turning private judgments into a collective decision)" as elements for a wise crowd decision and we will show how this concept can be helpful for finding emerging issues on the internet.

The following graphic gives an overview of the overall system architecture of the Internet Screening Agent ISA, which is described in the following.

Figure 1: System architecture of ISA agent



Source: AIT

As screening for weak signals of emerging issues is a dynamic task, the screening agent will work in two different modes. The first mod is developed to set up the “white noise” for the screening process and the second mod is developed to calculate the differences for each follow up screening, so that weak signals can be identified as a pattern, that is different to white

noise from mode one. In each mode, the agent will conduct a number of tasks, to build up and maintain his knowledge base.

First Mode: Initial Data Acquisition

In first mode the agent loads a specific text corpus, considered as relevant for our issue detection. In a test run, we considered each site on the internet with the phrasem "emerging issue" as relevant. A search in Google for this phrase let expect 105,000 results. Yahoo search informs their user, that they have stored about 526,003 results and on the Bing search engine, the search results statistic let the user expect 37,100 000 results (which seems strange and might be a mistake). However a normal user will only take a look at the first few results. This is very important for understanding user search strategy on the internet. A normal user take the search results as a starting point for a semantic search, which he processes like a snowball system, in which he likely will click on a link, when he expects relevant content behind the link. In a abstract sense, the agent works quite similar to the human scanning and we expect that this behavior is cost effective and efficient. Nevertheless, it is very time consuming for the user to track a larger thematic community, manually. In contrast to this, the agent can scan issue developments with high speed and thus in a short time period. A disadvantage is however, that the agent cannot understand the real semantic meaning of the sites he is crawling. So he has to rely on artificial intelligence to calculate his relevance indicators, as we will explain later in more detail.

First, the agent makes use of wisdom of the crowds in a way, that he uses the yahoo search engines relevance algorithm to download a list with highly relevant links for our issue. As our potential text corpus on the internet contains hyperlinks, the text corpus can be thought of as a directed network, with authorities and hubs, whereas an authority node is a site with a lot inbound links and a hub is a site with a lot of out bound links. Due to the relevance algorithm of the search engine, the authorities are higher ranked than the hubs, so that we get basically a list of authorities, related to our specified search strategy.

Next, the agent follows each link, which was extracted from the search engine result list texts and downloads the corresponding text information. In case, that this text contains the search string, ISA, extracts title, keywords, main text and links from this site and writes the results to his database. This step is a mixture of human search strategy and automatic crawling. In traditional automatic crawling you download all the sites which are reached by a specific crawling rule, e.g. all links from a specific domain or all links up to a certain threshold. In human crawling usually only the links are used, which let the user expect a highly relevant result, according to some kind of semantic interpretation of the user. Up to now our agent follows the links, where the text of a site contains the search string. In future version of ISA we plan to increase the "intelligence" of the agent by using text classification algorithm like Naïve Bayes or Support Vector Machines, so that the agent can learn from human user behavior. For the first version it was enough to keep this as simple as possible.

In a third and final step of data acquisition, the agent follows all extracted links, extract the site attributes and test whether the main text of the site contains the search string. To prevent the agent from "black holes" for internet crawler, the agent will not download more than about 100 documents from a single domain. All text results are grouped by domain, so that there is a consistent domain –text/date relation in the database. This

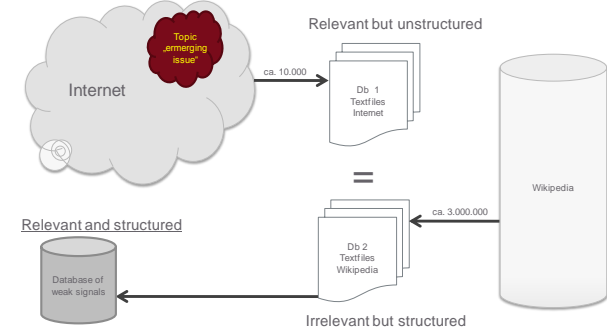
database forms our data source for topic identification as next step and network analysis as follow up analytical.

First Mode: Initial Topic Identification

For topic identification, we use the text corpus from initial data acquisition, enriched by organization names from whois databases, so that each text information is related to a specific domain and thus to a specific organization (the owner of the domain). From this data set topics are identified with a cluster analysis from the word vectors of each text.

The problem is that it is not possible to generate topic title and topic description for each cluster automatically. Thus generally speaking, the dataset is expected to be relevant but unstructured in a sense, that there is no title and no description for each topic. Wikipedia articles in the opposite are structured with title and description but most of them are obviously irrelevant for our purpose. So the idea is to combine a topic text from cluster analysis with title and description from Wikipedia. This results in a structured list of well-known issues for the addressed community. The whole process is symbolized by the following graphic.

Figure 2: Topic identification with Wikipedia DB



Source: AIT

To combine our cluster with Wikipedia articles it is necessary to calculate a distance measure for each cluster-article relation. In May 2010 we found around 3.5 million articles in the English Wikipedia database. So for each cluster it is necessary to calculate 3.5 million distance measures from their word frequency matrixes, to find out which article fits best to the cluster, which limits the number of cluster. After this, the agent has a cluster – title - description relation in his database. With the relation text id – organization from the earlier mentioned whois request it is possible to map the identified cluster topics with organization.

This dataset can be interpreted as “white noise” of well known issues in a specific community, on which new signals might come up, e.g. when the topics attract more organization or disappear over time. However, to find weak signals for emerging issues, some analytical steps are necessary. The concept of “weak” implies that there are small but important changes in time with high impact. So, the following steps of community structuring will help to focus on the relevant signals.

First Mode: Initial Community Structuring

A network analysis is set up with the existing data set from the text mining process to enrich the results of the topic identification. For detection of weak signals it is helpful to connect topic dynamics with organization, their community position and their interests. Therefore we use hyperlink

information from our database to calculate a directed network of organization, with domains as nodes and the amount of hyperlink as connection between the nodes.

Each hyperlink from domain A to domain B is interpreted as vote for trust from domain A to domain B. As a result we get a kind of community network in which the domains, which are related to (owned by) a specific organization, can have a specific position (hub and authority position). As each node is although a member of a topic cluster, it is possible to visualize each thematic cluster in the network with a specific color. We expect that position changes within a thematic subnet or across, will give hints to a shift in community attention to specific topics, which can be interpreted as weak signals for upcoming issues. However, we are aware of the fact, that changes are only visible, if the whole process of data acquisition, text mining and network analysis is at least performed twice. So we do not have results for network dynamics in the first test run.

However up to now we saw, that the network structure is quite different for our test search strategies. While in the text corpus from the search strategy "emerging issue" e.g., the community network has quite a lot of inbound links between community members, the text corpus from the search strategy "human enhancement" has more outbound links to homepages with no "human enhancement" on the site. Up to now, we only recognize these differences. Further empirical experience will show, whether these patterns can be used to identify emerging issues.

Second Mode: Data acquisition, Topic tracking and Community development

The development of the second mode is not finished yet so the description is based on the theoretical concept and is up to changes due to practical experience. Basically the second mode is a variation of the first mode with data acquisition, topic identification and community identification and their corresponding dynamic variations topic tracking and community development.

Data acquisition is more or less equal to initial data acquisition. However to discover changes, it is necessary to download the whole data set again for each period in time, as there is no reliable version flag standard in html, up to now. Thus the agent will proceed with the whole mode 1 download for several times (search in a search engine, download full text from search results and follow all extracted links so that all links with search strategy string in text are downloaded). After each download the corpus is treated in the same manner than in mode 1, with word vector creation and clustering.

Topic tracking is different to topic discovery in a way that it is necessary to now the topics that should be tracked and that for tracking additional topic attributes are used. For tracking basically four events of topic-development are of interest. Topics might get more important or less important and topics might arise or disappear. For the first two events it is necessary to define an "importance" - indicator, e.g. the number of domains or organization in the topic or the external links to topic sites. For the second two events it is necessary to calculate difference measures, based on the reference word vector from the Wikipedia description of the topic and based . If the distance measure exceeds a specific threshold it is assumed, that a new topic did come up and the topic identification algorithm will be executed.

Community development is based on the calculation for initial community structuring with our network model, with organization as nodes and directed links as edges between the nodes. In this network, some organizations have privileged positions, like hubs or authorities, as mentioned in the description of the initial community structuring. These positions might change over time and one organization might become more important than other. These changes will be analyzed in the community development.

All these dynamic measure concepts are set up to find weak signals for emerging issues. However we expect to see first the strong signals for emerging issues and only with improvements in the sensitivity of the measure concept, we expect to find more and more weak signals. In addition to these internal indicators an evaluation module with external indicators is part of the internet screening agent ISA.

Evaluation module: Signal Assessment

In addition to the internal evaluation methods of the second Mode, the evaluation module is developed to offer external indicators for evaluation. The most important question for the agent is: "Which pattern makes a signal to a weak signal for an emerging issue?". The purpose behind the concept of weakness is to detect changes as early as possible so that the detection of weak signals is not practiced as an end in itself. For signal assessment it is more important to draw the attention to the time frame and to concentrate on the detection early in time than to draw the attention on weakness. Basically emerging issues in a community can be discovered by looking on the communication behavior in the community or by looking on the knowledge search behavior in the community. We are using both strategies with the following external indicators. The agent will reference them as additional attribute for each identified topic

The agent will use editing statistics from Wikipedia as the first external relevance indicator. The idea draws upon the well known fact that some of the articles in Wikipedia are changed very often and others are not. This is often due to conflicting interests in a specific topic or a wider interest in the topic, which we think, can both be interpret as an indicator for social relevance. If an upcoming issue let expect a high impact on society it might be a weak signal for an emerging issue.

As second external relevance indicator, we use the usage pattern from Google to identify topics with increasing or declining attention. As the search statistics reflects the world wide search behavior, it can be expected that an increase in search term usage reflects an increase in overall social relevance of the topic that is referenced by the search strategy. So we use our topic title from Wikipedia as search strategy in Google Trends and the agent loads the search statistics from these topic titles. With this relevance indicator, the agent finds out, when a topic gets attention of a worldwide community. Again this is stored as an attribute for each identified topic.

As an outlook for future development direction for signal assessment, we are developing the agent in a way that user classification can be used to improve automatic signal classification in the future. With this, we expected that the agent will develop the capability to find unknown pattern for emerging issues. However we are aware of the fact, that this signal assessment with mechanical learning algorithm needs text samples that are tagged by the user, according to their

relevance. Thus this feature will only work if there is an existing user community.

5. Experiences from the first test run of the ISA software

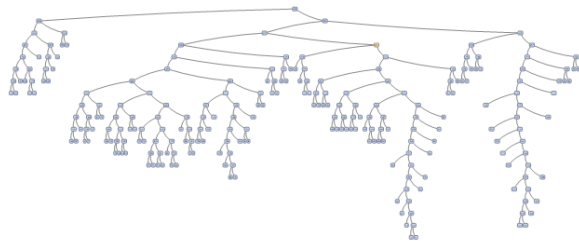
The first test run of the internet screening agent ISA has shown that the engineering concept in general is operational. However some weaknesses have come up, in most of the agent modules, which will lead to an improvement in the next version of ISA. In the following we will present some of our insight results, which are produced by the agent to build up his knowledge base.

Crawling and spider are working as expected. The results make clear, that in addition to the html format, the pdf format is very important at least for scientific communities. So it is on our agenda to include pdf parsing in the data acquisition module. We are aware of, that parsing pdf files will have an effect on network calculation results, as pdf files usually do not include hyperlinks. So we expect that it is necessary to mark them as pdf-source and exclude them from network calculation.

A small but very important detail in the spider process has come up as an important part for the scalability of the agent. The html download and parsing process is scalable because it is easy to set up a thread for each download and parsing process. However to prevent the spider from importing sites more than once, it is necessary for the spider to check in the database, whether the actual url in queue exists already in the agents database or not. This is a task that will need an increasing amount of time, when the list of urls in queue becomes large. The execution time for this single database request will grow potentially for quite a while for a typical crawling strategy, as each parsing of a new site will add more than one link to the spider queue. So up to now it is an open problem to increase the speed for this database request.

In the topic identification module the results are even better than expected. For practical reason we use two different clustering algorithm. For initial topic identification, we use an unsupervised hierarchical clustering with mixed Euclidean distance measure. The following figure 3 shows a typical result for a small corpus of our spider results for the search strategy “emerging issue”.

Figure 3: Unsupervised hierarchical clustering of the spider results “emerging issue”



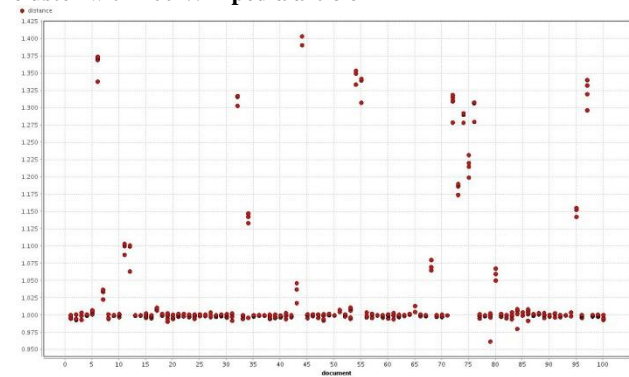
Source: AIT

The results show that the cluster algorithm is capable to identify different topics and the corpus might contain 4 different topics. In a next cluster process we use this information to identify and label these topics and to calculate the word vectors for each topic, so that we have a cluster id –word vector information in the database.

To identify and tag each cluster with a human readable title and a topic description we use an k-means distance algorithm to identify the Wikipedia article, that fits best to each cluster.

Figure 4 shows the inverse distance (larger is more similar) for one cluster with 100 Wikipedia article (for visualization purpose, we limited the results to 100).

Figure 4: K-means similarity plot of one “emerging issue” cluster with 100 Wikipedia article



Source: AIT

It is quite clear, that most of the Wikipedia articles are not similar to our cluster example (distance nearby 1). Some of the articles are more similar than the average and only a few are quite similar. So the topic identification algorithm is working as expected. The agent is looking for the article with maximized inverse distance and he stores this article as descriptor for the corresponding cluster topic and thus has a topic with title and description in his database. With a whois web service it is possible to identify all the organization with a specific domain, and with the agent database we know which domain is engaged in a specific topic. From this it is possible to start the community calculations.

The purpose of the community structuring module was to get indicators about the position of all organization in a specific topic. Up to now, the network calculation and visualization in the module for community structuring is an open task. So there are no results for now, but we do not expect too much problems in this module, as it uses well known methods.

To sum up our results from the first ISA scanning process, we got the impression, that it is not an impossible task to develop software agents that can help in scanning for emerging issues. However the key problem in scanning for emerging issues is, that computer have no semantic understanding of what is important, relevant, interesting and so on, so the computer has to rely on statistical indicators and it is inherent difficult to discover weak signals for new or emerging issues as typical statistical pattern like maximum, minimum, average and so on are not typical for weak signals. Nevertheless human scanning is very resource intensive and comes to a natural limit with very small source documents. So it seems that both, automatic agent scanning and human scanning work quite different and both have their advantages and disadvantages.

6. Conclusion and future perspectives

As already mentioned, the engineering concept seems to fulfill the expectation and we expect, that the concept for a weak signal scan has some advantages in comparison to the more often used manual scan. We already discussed the advantages and disadvantages of automatic internet scan with our intelligent agent. Even after we tried to adapt our agent to human search strategies there remained a number of fundamental differences.

Human scanning for weak signals for emerging issues is based on a specific understanding of political issues and thus is based on semantic understanding of the issue and human intuition. Usually humans tend to search like a snow ball system, from one to the next document in the WWW. They might skip a full new cluster if the content of the first few documents of the cluster are not appropriate.

In this article was shown, that automatic scanning is possible, but is based on statistical methods of machine learning and text mining. This is by far not an equal replacement for the human scanning but it might be a supporting method to overcome the drawbacks from human scanning.

ISA was developed as scanner for policy issue and due to the specific sources it is optimized for this subject. However in the future, we expect that ISA can be helpful for scientific issue scanning although. Especially community identification and structuring is applicable to epistemic communities where the same question arise, like who is referenced by whom, what are the most important subjects and which subjects are getting more important in this community. The next more user friendly version will show whether ISA will be accepted in the foresight community or in other scientific communities.

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Crime Forecasting System (An exploratory web-based approach)

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ABSTRACT

With the continuous rise in crimes in some big cities of the world like Karachi and the increasing complexity of these crimes, the difficulties the law enforcing agencies are facing in tracking down and taking out culprits have increased manifold. To help cut back the crime rate, a Crime Forecasting System (CFS) can be used which uses historical information maintained by the local Police to help them predict crime patterns with the support of a huge and self-updating database. This system operates to prevent crime, helps in apprehending criminals, and to reduce disorder. This system is also vital in helping the law enforcers in forming a proactive approach by helping them in identifying early warning signs, take timely and necessary actions, and eventually help stop crime before it actually happens. It will also be beneficial in maintaining an up to date database of criminal suspects includes information on arrest records, communication with police department, associations with other known suspects, and membership in gangs/activist groups. After exploratory analysis of the online data acquired from the victims of these crimes, a broad picture of the scenario can be analyzed. The degree of vulnerability of an area at some particular moment can be highlighted by different colors aided by Google Maps. Some statistical diagrams have also been incorporated. The future of CFS can be seen as an information engine for the analysis, study and prediction of crimes.

Keywords: crime, exploratory analysis, graphs.

1. INTRODUCTION

The aim of this paper is to propose the development of a Crime Forecasting System to support the police operations in Karachi. The proposed system will be able to collect and store crime incidents and analyze it using different tools to process crimes' data. This would help the *Law Enforcement Agencies* in forecasting crime and preventing it before it actually occurs. Thus, leads to a reduction in the crime rate. The system would also benefit *the general public* by providing the victims an unconventional and advanced medium to report the criminal incidents they are subjected to.

The features of the system if highlighted, takes the form as follows. It;

- Comes out as a decision support system that assists the law enforcement agencies in optimal utilization of resources
- Is able to predict crime patterns by analyzing the graphs based on real time data sets.
- Shows the results in multiple views using *Google Maps* with various perspectives.
- Provides ease in use with user friendly interfaces due to which no special training would be required.
- Improves the quality of results/output with grown data sets over the passage of time.
- Highlights Gang based criminal activities located within different parts of the city thus expose criminal social networks.
- Provides information regarding criminal Characteristics such as their facial appearance, dressing style, nature of weapons used for crime.

- Clearly depicts the comprehensive picture of criminal activities in a city

With these features the most valuable prospective outcomes of the system are considerable reduction in the crime rate, maintenance of a standardized and centralized crime database and satisfactory response time by the law enforcement agencies.

2. BACKGROUND

Keeping the focus bounded to a crime prone mega city like Karachi, the study through field survey and the analysis of the current conventional approach/practice for handling and managing crimes reveal a series of flaws. Some of which are stated below.

• Lack of data sharing

Problem-solving clearly depends on the availability of robust data (Read and Tilly, 2000, p. 28) but the manual system currently in use makes the communication channel and information flow very static and rigid.

• Inefficient Resource Allocation

According to Boba (2001) Crime Analysts can assist in effective allocation of resources by determining the times and areas i.e. when and where the offenses are likely to occur. The system under study shows that due to the absence of appropriate data processing mechanism the practice of efficient resource allocation is not in place.

• Inconsistent standards of data storage

The data storage standards are not consistent as different departments use customized formats, schema and parameters.

• Slow Response Time

The delay, due to the absence of a rapid reporting mechanism, non preemptive approach and the fulfillment of departmental protocols at law enforcement agencies produces a mandatory flaw of a slow response.

With the above mentioned flaws of the system the crime rate is likely to increase naturally. Despite several governmental efforts and restructuring of the law enforcement agencies/departments, the history asserts this trend too.

In order to address these problems the need of a crime forecasting system arises. The initial research was based on the consideration of multiple factors specially the Crime Index. This approach employed the use of statistical methods namely Regression, Time Series Analysis, Double Exponential Smoothing. Crime Index, which is the rate of crime over population, was the main input parameter provided to these statistical methods, on the basis of which it forecasted results.

The forecasting process comprised of three steps:

1. Evaluation of Crime Index.
2. Gathering data.
3. Application of the techniques on the gathered data.

However the drawback associated with this approach was that it did not cater for all the effecting factors, thus less effective and the intended scope was not fully covered. For instance, if one considers the murder crime, it can be seen as only murder while it may be a result of an initial crime. i.e. the reasons and causes behind may

possibly be categorized as crimes too, thus affecting the results of forecasting.

The literature survey that was conducted in order to understand and identify the features that we need to incorporate into the system, as well as to learn the various approaches that others have taken to improve this system. The following table- 2.1 contains summary features that depicts how have the different systems been implemented in terms of the features they provide (*details of these systems can be obtained from the first author*).

Features	CrimeView ^[3]	ATAC ^[4]	WebCAT ^[1]	CADmine ^[5]	Data Detective ^[2]
Statistical Model	✓	✓	✓	✓	✗
Spatial Analysis	✗	✓	✓	✓	✗
Data Entry	✗	✓	✗	✗	✗
Features	CrimeView ^[3]	ATAC ^[4]	WebCAT ^[1]	CADmine ^[5]	Data Detective ^[2]
Calendaring	✗	✓	✗	✗	✗
Reporting	✓	✓	✓	✓	✓
Data Mining	✓	✓	✓	✓	✓
Artificial Neural Networks	✗	✗	✗	✗	✓
Environmental Mapping	✓	✓	✓	✓	✓
Alerts	✓	✓	✗	✓	✗

Table 2.1 (Benchmark)

3. METHODS and MATERIALS

3.1 The Techniques

Exploratory Data Analysis lies at the core of **Crime Forecasting System**. *Exploratory data analysis (EDA)* used to analyze data for the purpose of formulating hypotheses worth testing. It was so named by *John Tukey, Weiss (2002)*. The objectives of EDA are to:

- Suggest hypotheses about the causes of observed phenomena
- Assess assumptions on which statistical inference will be based
- Support the selection of appropriate statistical tools and techniques
- Provide a basis for further data collection through surveys or experiments.

The approach under consideration employs a variety of techniques (mostly graphical) to,

1. Maximize insight into a data set.
2. Uncover underlying structure.

3. Extract important variables.
4. Detect outliers and anomalies.
5. Test underlying assumptions.
6. Develop parsimonious models.
7. Determine optimal factor settings.

The disadvantages of using this technique were,

- It does not provide definitive decisions always.
- Requires a high degree of judgment

Since the system relies heavily on crime data, one of the vital tasks was to collect it. Initially the law enforcement agencies were contacted for this purpose but the effort was not productive. Therefore the data was acquired through **Interviews, Questionnaire, Observations and Research**. These techniques ensure first hand real data with magnified volume and minimum error. Generally most of the cases are not reported due to the problems people have to face in reporting them to the law enforcement agencies. This Web based approach works as a remedy to this problem.

3.2 Architecture

The underlying database design which serves data storage and retrieval. Its design is fully optimized and synchronized with the questionnaire and has the flexibility for future enhancements and adjustments. New factors may be added according to the dynamic crime patterns in order to improve the effectiveness of the system.

The context diagram serves to focus attention on the system boundary and helps in clarifying the precise scope of the system. Figure 3.1

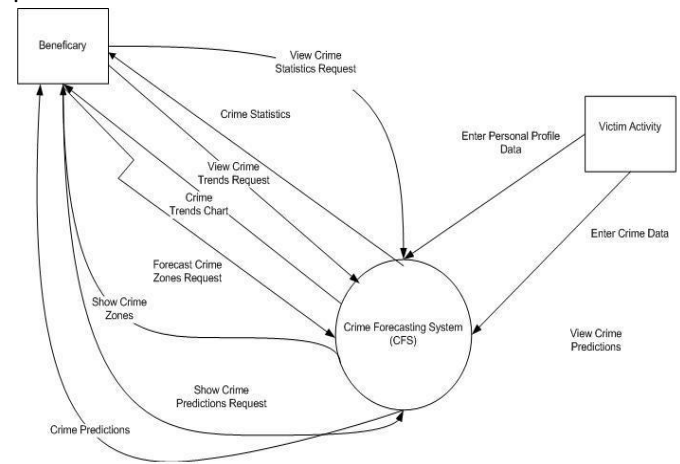


Figure 3.1- the context diagram

3.3 Environmental Mapping

The geographical data assists in mapping with the help of Google APIs which act as a bridge between our system and Google Maps. The process is explained in Figure 3.2

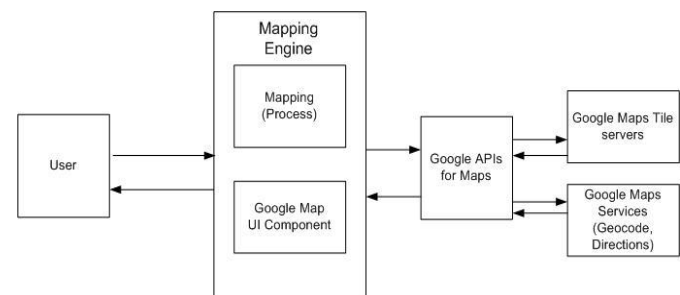


Figure 3.2 – The Mapping Process

3.4 The dependency contours

Figure 3.3 shows the dependencies of different qualitative entities which ensures the relationship among them. This vital result authenticates the effectiveness, productivity and the workability of the system. The contours and the color intensities confirm the relationship between areas and crimes.

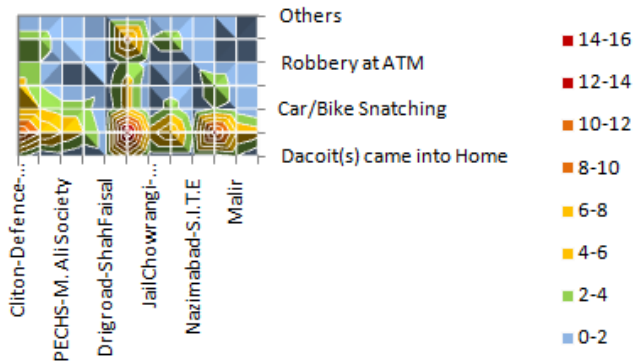


Figure 3.3 - Contours

3.5 Statistics

Figure 3.4 verifies the hypothesis made against the authenticity of data collected through this system as most of the crimes remain unreported due to the procedural hindrances. The analysis conducted on the involvement of number of criminals assists in prediction of the nature of crime expected as per gang based activities.

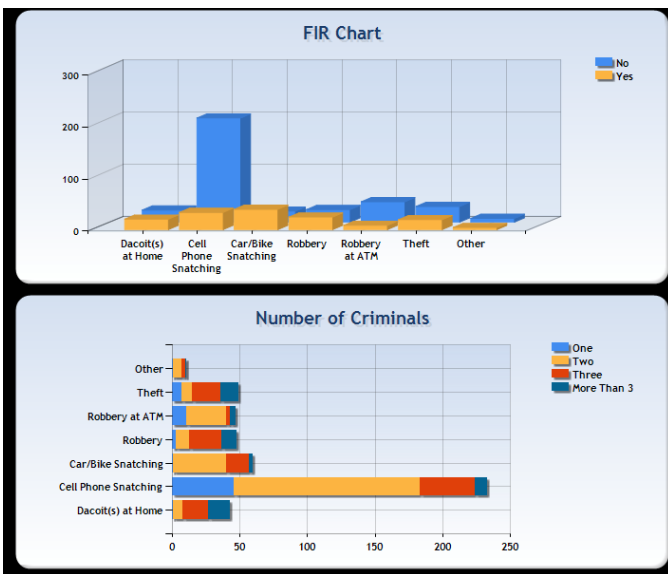


Figure 3.4

4. THE INTERFACES

4.1 Data Representation

The following snapshot in figure shows the overall picture of criminal activities per area. Moreover different colors represent different intensities of crimes. At a glance delivery of information increases the visual value of the system. The interface reflects the changes in real time as per updated data. Thus the most current picture of crimes per area appears with shifts and trends. The interface is a result of high profile integration of the data and Google Maps which enhances the effectiveness and value of the system manifold.

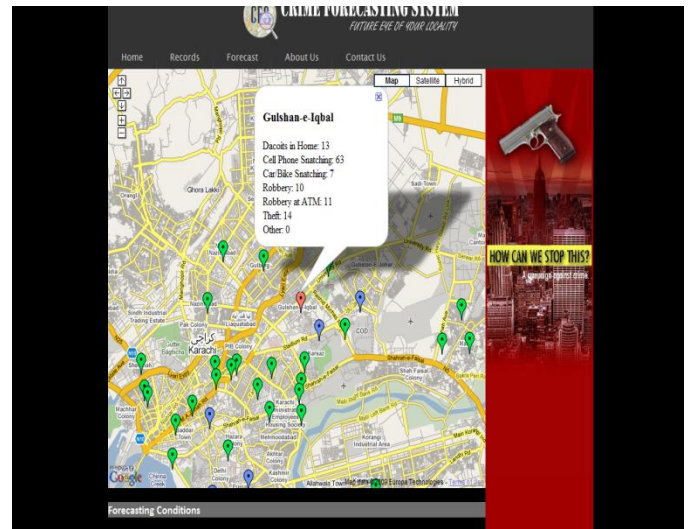
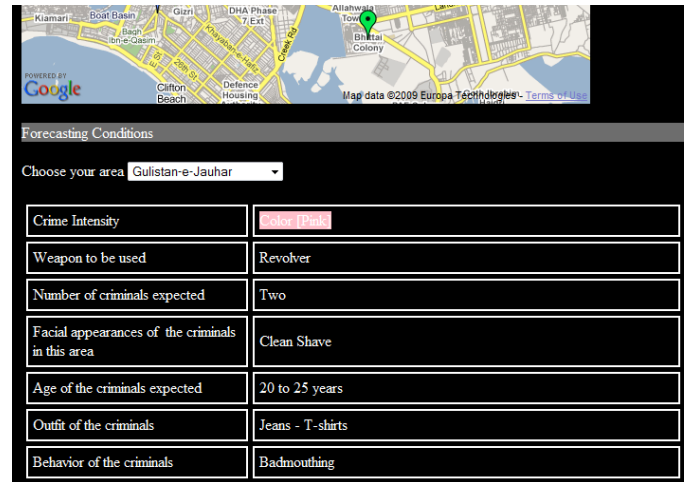


Figure 4.1

4.2 The Forecasting

Once the data is seen there comes the awaited output of the system i.e. forecasting. The forecast can be seen as per area with different factors and aspects. This provides a closely conclusive and demographic picture to the local law enforcement agencies. For instance the parameters of behavior and age tell about what social category of people is to be focused to address the increase in crime in the respective area.



4. CONCLUSION

A thorough study revealed that there are certain areas of criminology which are needed to be addressed using computational capabilities and techniques. Inferential engine and prediction on the basis of the implementation of statistical and AI techniques through computers have been found very beneficial if exploited for the purpose. Following are the results after the implementation of our efforts

- Standardization of input in form of a questionnaire and designing of a centralized database
- Analytical Engines
- Inferential Engines
- Map based visualization of crime affected areas

5. FUTURE WORK

To increase the usefulness of Crime Forecasting system, one of the enhancements that can be made is to develop the system as a mobile application. This would allow the user to report the crime remotely as soon as he observes one and eliminate the need for a desktop system to report a crime. To increase the effectiveness of the Crime

Forecasting System, more techniques could be used for forecasting crime. Techniques belonging to the Data Mining and Artificial Intelligence field may be incorporated into the system to make the forecasting process even more effective and efficient.

6. ACKNOWLEDGEMENTS

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ATAC | Automated Tactical Analysis of Crime

<http://www.bairssoftware.com/atac.html>

CADmine

<http://www.coronasolutions.com/products/cadmine.shtml>

CrimeView®

http://www.theomegagroup.com/police/crime_mapping_solutions.html

DataDetective

<http://www.sentient.nl/?dden>

WebCAT™ Crime Analysis System

<http://www.daprosystems.com/DSPProducts/crimeanalysis.aspx>



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