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Editors: Matej Mertik, Nadja Damij

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The Proceedings of the 1st International Conference on Information Society and Information Technologies ISIT 2009

Editors' Note:

The 1th International Conference on Information Society and Information Technologies ISIT 2009 is organized by the Faculty of Information Studies in Dolenjske Toplice, Slovenia. The main concern of the conference is to explore the latest findings and results about mutual influence between information society and information technologies. There are three important dimensions covered by ISIT- public administration, eBusiness & eCommerce and civil society where ISIT focuses on real world applications.

The conference featured two invited talks on the topic of information management and digital media. There is 21 submitted papers selected by the ISIT program committee. Selected papers highlight the ideas on how to improve public administration, solve business problems with IT and how the modern e-services and the world wide web, in particular new social media phenomena, influence today's society. The latter is one of the key topics of the conference.

ISIT conference is also introducing the business ICT forum, which is an important mark of the conference where opportunities for strengthening the cooperation between research and economy sector are in particular focus. At the first ISIT 09 conference the business ICT forum covers the aspect of using social media in organisation culture and business environment.

As such ISIT aims are to become one of the most important ICT international conferences held in Slovenia with ambitions of being hosted abroad.

Index

ICT in civil society

ICT in business/e-Commerce

ICT in public administration

ICT in civil society

Social networking

Web 2.0

Society 2.0 - networking human potential

Faculty of information studies

Constructing Professional Identity Online: Web 2.0 – The New Vogue

Beryl Burns[1]

ABSTRACT
This study explores and discusses the issues concerning how members of an online community – KAN (Know and Network) construct their professional identity online. The KAN network offers a knowledge portal and online social networking community to women working in Information Technology (IT) in England in the United Kingdom (UK), a declining and sometimes isolated group. Through an examination of research and practice, the author draws some conclusions about how the members of KAN utilised the network and considers the ethical issues surrounding social networking projects.

Key Words: *social networking; Web 2.0; weblog; ethics; gender; action research*

1 INTRODUCTION

Internet applications such as weblogs, wikis, podcasting, file sharing and social networking are collectively recognised as and commonly termed 'Web 2.0', a term that emerged at a conference in 2004. O'Reilly defined Web 2.0 in contrast to what had gone before (Web 1.0), with key features being user-developed content (text, videos and images on blogs and wikis), collaboration (in social bookmarking and image sharing) and social networking via the Internet (O'Reilly, 2005). The adoption of these applications enable increasing numbers of users to actively participate online and create and share their personal information and help develop a collective knowledge and intelligence within an online network (Kolbitsch and Maurer, 2006). Increasingly it seems to be that a trend has grown where people are structuring new relationships by drawing on a variety of social networks in order to construct and sustain an ever-increasing circle of social contacts. Web 2.0 applications such as Facebook, MySpace, Flickr, Twitter and LinkedIn for example, have become a fundamental necessity amongst and have given rise to such social practices and social lives. This emergence has meant that an individual builds their online persona and are then seen and known through their digital presence. Such applications rely on individuals disclosing personal information and therefore hold large amounts of personal data, which can potentially be used for various purposes. Such purposes include the rising notions of 'networked sociality' (Wittel, 2001), 'networked individualism' (Wellman, 2001) and 'networked identity' (Boyd and Heer, 2006).

The Web 2.0 services and applications are not technologies per se, but are 'user processes' constructed from the technologies and open standards underpinning the Internet and the Web. One of these services/processes is the weblog (blog), which is the

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concern here. This particular application of Web technology has been in use for some years, with new features and capabilities added frequently (Anderson, 2007). A blog is a useful form of social networking that can generate business, knowledge transfer and development. In addition, blogs are a useful source for 'getting connected' if you are feeling somewhat isolated, either personally or professionally; most people require the need to have someone with whom they can share ideas and thoughts and build 'friendships' and/or 'business connections'. Being part of this inner circle of the online community and using the online friend/business-based networking could in time, prove to be one of the most valuable business tools the Internet has yet provided. Through the use of social networks an individual's outreach is broadened and the potential for learning is enhanced, this is the aim of a project under study – the KAN (Know and Network) online community.

2 RESEARCH APPROACH

The KAN project, funded by the European Social Fund (ESF), is an action research project informed by previous research into the experience of women working in the IT industry that uncovered various barriers. Women's under-representation in IT can lead to isolation coupled with a lack of access to mentoring, business and social support, and networking (particularly outside London). The project developed a 'diversity direct' portal (an information resource) and a social networking site available to women in IT, regardless of location or company size. This site www.knowandnetwork.org offers personal and group blogs, comments, tagging of content, networking of 'friends', and other Web 2.0 features, using the elgg (http://elgg.org) Open Source Software[2], attractive for this purposes since the absence of license fees enhances opportunities for sustainability of the network beyond the end of the project. Exploring its use and development by women working in IT, participants were encouraged to make use of the social networking facilities such as tags and blogs.

As afore mentioned, the research strategy is based on Action Research (Baskerville, 1999; Oates, 2006) in that the researchers are engaged in an iterative cycle of plan-act-reflect to consider how we can act in intelligent and informed ways in a socially constructed world. The author conceptualises this action research as a form of co-operative inquiry (Heron, 1996; Oates, 2004), which removes the researcher-subject distinction, calling for research by, with and for people. The data generation methods comprise online observation, the use of online documents and online questionnaires. Co-operative inquiry recognises that there at least four forms of knowledge (Heron, 1996; Oates, 2004): *Experiential knowledge* (gained by direct encounter and almost impossible to put into words, being tacit and based on empathy, intuition and feeling), *presentational knowledge* (which emerges from experiential knowledge and gives the first expression of knowing something, through stories, drawings, sculpture, music, dance etc.), *propositional knowledge* ("about" something in the form of logically organized ideas and theories, as in most academic research) and *practical knowledge* (evident in knowing "how to" exercise a skill. As an academic researcher the author

[2] Open Source Software is usually developed by software developers who give their time freely to write code but who may make money from consultancy, training or from using the software in paid employment.

aims to gain propositional knowledge, and the primary means to gaining that knowledge is though presentational knowledge as the KAN members tell stories of themselves and their experiences. Thus, the method is Action Research (Baskerville, 1999), supplemented by ethnographic approaches that elicit women's stories to gather research data and to enrich the dialogue and resources on KAN.

3 LITERATURE REVIEW

3.1 The Project

The study's overall focus is on professional women working in the IT industry as a user group. In particular the study looks at constructing professional identity and networks online as an important consideration where a social network is rolled out to a professional group. Professional development studies suggest that the concept of a profession changes over time based on the economic, social and historical context being looked at (Freidson, 2001). The constitution of a profession, and in turn what is professional, has often been debated and the definition of professional identity continues to be a highly contested issue (Carr-Saunders and Wilson, 1933, Crompton, 1987, Freidson, 1983). Information systems have been held up as fundamental components of the 'information society' (Webster, 2003) and are becoming increasingly pervasive in our everyday lives. Moreover, it is now almost conventional wisdom that information systems can have a role to play in shaping organisational practices (Hanseth and Braa, 1998), identities (Coupland and Brown, 2004) and the occupational groups associated with them (McLaughlin and Webster, 1998). The combination of organisational practice, occupational groups and information systems that has emerged, and recently grown tremendously, is that of the social networking ensemble.

Information technology can threaten claims to professional identity and as a consequence can possibly change the basis on which professionals traditionally gain power and status (Ackroyd, 1996). Professionals, as a rule, have knowledge or skills used to manufacture a product or provide a service, done individually, for example, a doctor advising certain treatment, or in groups of professionals sometimes together with others offering skill and knowledge to an organisation (Johnson, 1995). Although it is clear that not all professional groups have equal status and that some may fare better than others where information technology is utilised (McLaughlin and Webster, 1998). The author observes a group of professional women who are members of a specialised online social network, KAN (Know and Network), and is interested in looking at the ways and means in which they construct their professional identities and networks online via this Web 2.0 service; the process(es) by which online social networks are shaped. This raises specific questions:

- How do women engage with the information available from the structured knowledge base and from the member profiles, blog posts and comments?
- How are women in IT attracted to social networks? And if so, how do they use them?
- By what process(es) are online social networks shaped and what impact has KAN had on this process?

A member's professional identity is not only recognised by qualifications but also by their indeterminate skill (Dent, 1996), determinate expertise (Boreham, 1983), ownership of areas of knowledge (Witz, 1992), vocational prestige (Saks, 1995), discretion (Johnson, 1972) and authority over activities (Witz, 1992), all of which can potentially be used as sources of power to retain, reinforce and construct their professional identity and consequently construct their online network.

3.2 Women's Networks

Moore's 1990 findings on the difference between men and women's social networks confirm Kanter's earlier contention that differences are better explained by structural differences rather than individual predispositions (Kanter, 1977; Moore, 1990). If there were more women at high levels in organisations, and women experienced better opportunities then women's personal social networks would tend to become more like men's, except that where women remained primary care-givers, they would maintain a larger number of links to kin (Moore, 1990). Homophily, the principle that similar people make more network connections than dissimilar people operates differently for gender in the workplace and voluntary organisations than outside those places. One review found that men's workplace networks, particularly those where men were significantly in the majority, were more homophilous by gender than women's (McPherson et al., 2001). Reasons for this include 'male bonding' activities that reinforce homophily, unequal division of home commitments that prevent women from engaging in after work activities, and the 'sexual politics' of the office that militate against women approaching men for mentoring or advice-giving. This argument has led to the suggestion that disadvantaged women would benefit from social networks both in getting a job and in getting on in their careers (McCarthy, 2004; McPherson et al., 2001). There is evidence that women derive satisfaction from membership of women's networks[3]. This has also been confirmed in the Information and Communications Technology Sector 'but the key justification is a recognition that what women who work within ICT need more than anything is to build networks, skills and confidence in order to overcome their felt isolation at work and to progress their careers' (Faulkner, 2004).

Even once they are recruited, women are still being excluded from core organisational activities thus being deprived of the social and material benefits that accrue from internal networks (Adam et al, 2005). Women are leaving the ICT industry in England in disproportionate numbers (DTI, 2005b; DTI, 2005a). A recent qualitative study identified some reasons why women leave: aspects related to the workplace, long hours culture and experience of exclusion; life events that triggered change or enabled a decision to change; and a sense of poor cultural fit, tending to lead to a desire to join caring professions (Griffiths et al., 2007). Interestingly, Jacobs (1989) uses a 'revolving door' metaphor when explaining the continuing occupational gender segregation suggesting that for eleven women who gained entry into male-dominated sectors, ten left. This can be read as a rejection of male-dominated workplace networks, and a yearning for women's networks, for example within caring professions.

[3] 35% of women networkers reported a gain in confidence through network membership, and 71% agreed or strongly agreed that the network met their expectations.

3.3 Women On-Line

In the 1990s, the prevailing ethic of the Internet was libertarian requiring users to tolerate irritating behaviour in the cause of freedom of expression but there is evidence of a growing acceptance of systems to restrict abuse (Herring, 2004: p 32). However women's experiences online are mixed: an online presence offers women the chance to be heard but also carries the risk of attracting unwanted attention. Kathy Sierra, whose blog 'Creating Passionate Users' is widely read, has withdrawn from blogging and from the conference circuit, since being the subject of offensive postings and even death threats earlier this year (Sierra, 2007). Robert Scoble, an influential blogger who claims to have secured his employment by Microsoft on the strength of his blog, Scobleizer, blogged this phenomenon as follows:

"It's this culture of attacking women that has especially got to stop. ....whenever I post a video of a female technologist there invariably are snide remarks about body parts and other things that simply wouldn't happen if the interviewee were a man…" (BBCNews, 2007).

It is not only women with a public presence that have suffered: on a Law School admissions discussions board on the AutoAdmit message board, anonymous users have posted hundreds of derisive statements about women, gays, blacks, Asians and Jews. One Yale Law School woman was the subject of a threat of sexual violation in a thread in which another participant assumed her identity, so it appeared she was taking part in the dialogue (Nakashima, 2007).

These are examples of what may happen when women are involved in on-line forums, the common thread being women speaking out and then being harassed. For instance, cyberstalking cases show a similar pattern (Adam, 2005). A woman speaks out in some shape or form and then is stalked on-line. This may involve her impersonation (which we could reasonably case as a form of identity theft) which incites others to stalk her.

4 DISCUSSION

The author chose to collect data from members' public interactions and activities; and on the attitudes to social networking of Know and Network members. Conducting this action research raises ethical issues for this type research and for the generative social practices of all Know and Network members. Ethical issues are both straightforward and complex. In large scale standard research practice, anonymity and confidentiality are both routinely granted to respondents and guarantees are easily maintained as the researcher probably has no interest in names or personal details of participants. This is also similar in smaller scale research, although the difference here is that a participant's identity may be obvious to potential readers of any reports or papers subsequently written and quite often this involves the researcher changing the names and other personal information, such as age and occupation that may identify them. Although these issues are well known, the solutions may not be readily obvious, this is also, and even more so the dilemma concerning social networking data, how can data remain 'private' in a 'public' online environment and how can Know and Network ensure participant's privacy? Which also begs the question: in principal, if the data is 'public', is there an ethical issue?

Ethical approval must be gained before a research project commences. In gaining approval from the university Research, Governance and Ethics Committee (RGEC), the author identified different categories of data: email exchanges, private blog postings, anonymous online questionnaires, ESF beneficiary forms (a funding requirement for the KAN project) and public blog postings. Table 1 summarises the treatment of the data collected.

Table 1: Extract from Ethical Approval

Type of Communication/ Research Data	**Consent/Withdrawal of Consent arrangements**	**How used**
Email exchanges with researchers, private blog postings.	None needed.	Treated as private, not used for research data.
Anonymous Online Questionnaires/evaluations.	Consent given when questionnaire completed; withdrawal impractical because of anonymity.	Anonymous, online, used for feedback on resources and tools.
Beneficiary Record.	Consent given when participant joins KAN, can withdraw at any time.	Data used anonymously
Public blog postings and comments.	We are not asking for your consent since this data is public. We will not use any blog postings and comments that you delete.	No direct quotes used (because of link back through search engines). Findings published on blog for comments/corrections.

This categorised data into *private* – that which participants had designated private online or email conversations with researchers and therefore beyond the gaze of the research, *anonymous* – online surveys where their identity was not revealed but the purpose of gathering information from research or development was clear, and *public* – where members are 'publishing' their ideas in the public domain. In common with other social networking sites, Know and Network allows the user to determine how public their content is (on their profiles and in blog posts) as they supply it, and the opportunity to change permissions at any time. Anonymity of research data plays out differently on the web than it does in more traditional interview and focus group settings because of the features of mediated publics as mentioned above. Anonymity is not possible with content posted to web sites that are crawled by search engines. Thus, it was decided not to use direct quotes from public data (in any of our subsequent publications) to avoid individuals being identified from 'anonymous' quotes taken from their public contribution.

4.1 Ethics in Practice

It was the intent to use questionnaires with KAN members to refine and improve resources and tools. To protect anonymity of questionnaires, the survey was conducted via an online service not connected to the Know and Network subscription service. The first page of the survey explains the purpose of the survey, the arrangements for

anonymity, and compliance with the 1998 UK Data Protection Act. Informed consent is implied by completion of the survey, with respondents being free to withdraw from the study until the point at which their data is submitted. Various themes focussed on 'personal characteristics' (gender, age, ethnicity); 'personal demographic information' (region where they live and work, are they a woman working in IT, which industry sector they work/worked in, do they work full/part time etc.); their familiarity in using weblogs, wikis and blogging and their experiences and knowledge of weblogs; 'social connections' made through weblogs (associated found/people they know/people they have personally met through weblogs); 'trust characteristics' (how do they trust and treat bloggers and weblogs); 'diversity' (anonymity/usefulness of work related issues on weblogs) and 'work' (have they ever: hired anyone based on what they have read on a weblog/received a job offer because of their weblog/been invited to attend events/advertised events). Proper handling of the data and the analysis, and complete control by researchers can virtually eliminate harm to respondents and protect their identity.

4.2 Duty of Care

Given the discussion in section 3.3 (harassment of women online) there is a 'duty of care' to those participating in KAN. The ethics approval process outlined above ensured that informed consent and ethical treatment of the data which participants supply was addressed. But in considering the ethics of the project we should also be concerned with the potential impact on participants through their mere presence on KAN and labelling as female, before they even 'say' anything; and once they write/upload something, it is possible the potential for harm increases. The KAN site has been widely advertised, and though unlikely, it is possible that male misogynists could take items from there and re-post elsewhere. Using the structure provided by the software, Terms and Conditions and a Privacy Policy is provided, setting out the responsibilities of Know and Network (as a service provider) and participants. An adaptation of the Blogher (a women's blogging site) Community guidelines encapsulated in the opening sentence "We have just two rules: We embrace the spirit of civil disagreement and we decline to publish unacceptable content" http://www.blogher.com/what-are-your-community-guidelines. The privacy policy covers the safe use of data by the Know and Network project researchers.

Once members have joined KAN they are prompted to complete their profile: filling in these details is the main way other members will learn more about them and is subsequently how they 'get noticed' and find and make 'friends' with people with common interests within the KAN community. Members can choose exactly what they want to share and with whom they would like to share their personal information by setting the 'access restriction' to either 'Private' or 'Public', to 'Logged in Users' or a specific 'Community' set up within the KAN site.

With Web 2.0 and the social networking phenomenon, people are becoming much more accustomed to posting their information online. There is less of a paper trail off-line and people are embracing posting CVs and online profiles. The world of online social networking at the 'high-end' (professionally) seems to be changing. This aside, members of the Know and Network online community have been somewhat reluctant to fill in their profiles. Only half of the members have completed their profiles and only

one tenth have added profile photographs. This outcome is somewhat surprising because of the status the professional members already hold in the 'outside world'. It can't be the technology they fear as these members are women working in IT with a high level of technical skills and ability. So what is it they fear from disclosing their personal details within a secure and professional online environment, therefore helping to create a professional 'digital' presence? In addition, how are they going to construct their professional identities and networks online if they don't feel comfortable revealing their personal data and their identity? And why, in contrast, do so many openly disclose their private lives on social networking sites such as Facebook? Would the creation and comparison of a 'Male in IT' networking site see more activity, more profiles being completed, and more profile photos added? Would restriction to an urban area (not England) have been more beneficial? Would organising face-to-face events market the site more naturally? These questions are open to further research and debate.

5 SUMMARY

The KAN project, its rationale and potential contribution to knowledge, and the ethical aspects of the project's research and practice has been explored and explained. The ethical approval process that was conducted prior to the start of the project directed attention to the network members as research subjects, in particular interactions between them and researchers. The application addressed the ethics of network members' practice and in particular their interactions with each other and the exposure of themselves online.

In summary, it is argued that the KAN project can be seen not only as a case study in women's interactions online, which highlights the ongoing issues that women face in online life but also as a case study which questions the validity of ethical approval process, given that the nature of the action involved in the project cannot be known in advance. This suggests a move towards ethical approval in the form of dialogue with participants and those who grant ethical approval rather than as a bureaucratic process may be a more fruitful way forward in achieving a duty of care toward research subjects. Additionally structuring and retaining their professional ID online remains an issue – how can this be achieved if there is reluctance to be 'seen' and 'known' in a virtual community? Maybe looking at 'backstage' and 'front stage' identity and further reflection on 'online' and 'offline' ID is necessary to fully understand the concerns of social networking members – maybe users need to find their own value of using the network for it to encourage full participation.

Who benefits from this study?: academic researchers benefit, organisations and the virtual society may benefit, individual respondents rarely do benefit but in our case they do because they have the use of a social network site and knowledge portal; associates have the opportunity to take the concept of the social network service provided by KAN and put it to practical use, and to allow members to construct and expand their network of personal and business relationships – if only they would embrace the online facility fully and with confidence.

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Using E-Business Tools to Overcome Gender Barriers for Women at Work in the UK ICT Labour Market

Beryl Burns[1], Claire Keogh[2], Helen Richardson[3] and Angela Tattersall[4]

ABSTRACT

This paper discusses the situation of women in the UK ICT labour market noting their severe underrepresentation contributed to by overt and indirect discrimination along with a chilly organisational climate. Having overcome many barriers and joined the ICT labour market we report that women enjoy the technical and other challenges faced and yet struggle to progress in their careers. We consider the role of social capital and networking in career development and the experiences of women working in the ICT sector. This paper discusses the KAN (Know and Network) project research that sought to develop e-business tools to help isolated women working as a small minority in the UK ICT labour market to collectively overcome barriers to recruitment, retention and career development.

Key Words: *social capital; social networking; ICT labour market*

1 INTRODUCTION

Women working in the UK Information and Communication technology (ICT) labour market are a rare and valuable group, often isolated and lacking knowledge and access to information about overcoming discrimination at work and without opportunities for business and social support and networking. Women are severely underrepresented in the ICT sector and are "haemorrhaging out" of the ICT labour market (Platman and Taylor, 2004). The UK ICT industry is facing a 'skills time bomb' with the main ICT recruitment pool of young white men ever-decreasing. Additionally the UK government white paper 'Opportunities for all in a world of change' (DTI/DfEE, 2001) calls for a more diverse ICT workforce and particularly the need to address the reasons why there is a serious under-representation of women in the UK ICT sector. Since 1999 the number of women has more than halved to just 53,759 which accounts for barely 12% of the total sector employment (Platman and Taylor, 2004). Also there is gendered job segregation in the ICT sector and women represent 30% of ICT operations technicians, a mere 15% of ICT managers and 11% of ICT strategy and planning professionals (EOC, 2004).

Having overcome many barriers and moved into ICT, our research reports on how women value the technical work and variety offered. Yet gender pay gaps persist even at entry level and gendered ageism and age discrimination is manifest at all life and career stages. In terms of moving up, career development in the ICT sector relies heavily on business

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networking and mentoring. Here women often face a chilly organisational climate and exclusion from networking opportunities. Women are increasingly absent from senior and Board Room levels. Our previous research has highlighted overt and indirect discrimination (Adam et al, 2004), gender pay gaps and salary secrets (Keogh et al, 2007), hostility and exclusion (Adam et al, 2006).

In this chapter we report on the KAN (Know and Network) project research that was conducted from January to December 2007 and that sought to use e-business tools to help isolated women working as a small minority in the ICT labour market to collectively overcome barriers to recruitment, retention and career development. Access to networking is a significant way that ICT professionals can develop their careers and lack of access, we found from previous research was having a detrimental effect on pay, rewards and progression for women in ICT and were acting as a push factor resulting in women prematurely leaving the ICT sector (Griffiths et al, 2007). Further the ICT sector is comprised of a large SME (Small to Medium Enterprise) grouping often lacking a structured HR function. Therefore women reported a lack of access to information about legislation, policies and good practice examples so discrimination at work could be overcome or improvements in working conditions and opportunities implemented.

Acknowledging this need for knowledge and information in an easily accessible format and location and also the need for women to network for mentoring, support and career development reasons, the KAN project research and development enabled women to network virtually and gain benefits from use of web 2.0 social networking tools. It also developed a 'one-stop-shop' information site to enable women to learn about the specificities of Equality and Diversity issues for women working in the UK ICT labour market and where to go for more help and advice should personal circumstances necessitate. In this paper we discuss the drivers to web 2.0 use and we evaluate the opportunities that using e-business tools may have in overcoming gendered barriers. The paper proceeds by exploring theoretical issues that underpin analysis of why there are so few women in the UK ICT labour market. The KAN project is informed by feminist theories of the co-construction of gender and technology. Further we take into account the role of social capital in helping or hindering career development for women. We then outline why and how the KAN project transpired and evaluate what it achieved in terms of supporting women in the UK ICT labour market.

2 THEORETICAL ISSUES

The 'women and IT problem' first emerged as a reported phenomenon in the late 1970s and early 1980s, as it became clear that computing was not the gender neutral working environment that some had hoped and where the under-representation of women began to be regarded as significant (Woodfield, 2000). The numbers of women working in the sector are ever-decreasing – currently around 12% (e-skills 2008) and there is acute gendered job segregation with women concentrated in lower paid areas. Panteli et al (1999) note that whilst the IT employers in their study were enthusiastic about recruiting women, the women they employed did not enjoy equal opportunities with men of career advancement.

Although aspects of women's careers may be common across a range of disciplines and industries, nevertheless we argue that the gender and technology literature suggests a strong relationship between masculinity and technology which may present particular difficulties for women working in the ICT sector (Adam et al, 2006). Women's more general exclusion from technology may be accounted for in terms of the historical and socio-cultural construction of technology as a 'masculine domain' (Wajcman, 1991, Woodfield, 2000). As so much of the rhetoric surrounding putative shortages in the ICT sector involves the concept of a shortage of skills it is important to note the strong link between the notions of skill, in particular technical skill, and the ways in which something becomes defined as a technical skill, and therefore a masculine attribute (Keogh et al, 2008).

In this paper we particularly consider the role of social capital and networking in advancing careers in the ICT sector. It has become increasingly more apparent that career mobility, higher levels of pay, positions and status are achieved through informal networking (Seibert et al, 2001) which women find difficult to penetrate due to the 'maleness' and 'sameness' of the members and the specific activities involved such as after work socializing or golfing.

Although a certain degree of knowledge and technical expertise is necessary to elevate pay, position and status we suggest that the membership of networks and the accumulation of social capital can also have a positive impact. The work of Putman (1995), Coleman (1988) and Bourdieu (1986) has provided scholars with a theoretical framework for examining the impact of people's networks on their life chances and gives credence to the term 'it's not what you know but who you know'. Korpi's (2001) study of job search in Sweden found that the size of an individuals network had a significant positive impact on their likelihood of finding work. Aguilera (2002) found that social capital (measured through friendship networks) was positively associated with participation in the labour market and therefore suggests that those who are well connected are likely to find work and are more likely to be active in the labour market. Networks not only facilitate the supply side of the labour market they also supply the demand side.

Putman (2000) takes a differentiated approach to social capital in that along with Woolcock (1998) he distinguishes between 'bridging' and 'bonding' forms of social capital. Putman asserts that 'bonding' (or exclusive) is based around close friends and family and other nearest and dearest, it is inward thinking and tends to bond people together from a similar sociological niche reinforcing exclusive identities and homogenous groups (Field, 2003). On the other hand, 'bridging' (or inclusive) social capital links people to distant acquaintances who move in different circles from their own, it can generate wider reciprocity rather than reinforcing an exclusive grouping (Field, 2003). Putman believes that 'bonding' social capital is good for getting by whereas 'bridging' social capital is vital for getting ahead. Lin (2001) refers to bonding as 'strong ties' and bridging as 'weak ties' and follows the work of Granovetter (1973) who suggests for example in his study of job searches that 'strong ties' were a good source of jobs in firms where family or friends were already working, whereas 'weak ties' were good for finding jobs in new areas (Field, 2003).

Lin (2001) theorises a model of social capital that forms a distinction between strong and weak ties, the purposes of mutual cooperation, actors' structural social positions and membership of networks that provide access to positions. 'Strong ties' bind people together that are similar to themselves, following the principle of 'homophily', 'weak ties' bring people together from different social and cultural backgrounds.

Many scholars write of the positive benefits and outcomes of social capital however Field (2003) points out that social capital is in principle as likely to promote negative outcomes including the underpinning of institutional discrimination. Although many do gain access to the benefits of network membership, groups may control or deny access to outsiders, and social capital serves to underpin struggles of status (Field, 2003). Bourdieu (2005) questions 'the logic of 'choices' of practice' and introduces the concept of fields of struggle where capital is competed for. In the ICT sector technical capital – the technical resources, procedures, aptitudes, routines and unique and coherent know-how (Bourdieu, 2005) – can have a vital role in shaping gender inequality, particularly in terms of how technical capital is valued and how this is owned and controlled. Additionally, Fukuyama (2001) suggests that social capital is far more likely to offer negative benefits than that of human and physical capital 'because group solidarity in human communities is often purchased at the price of hostility towards out-group members'. In the main, social capital can promote inequality because access to various types of networks is unequally distributed.

It is important to mention that the transition of the social capital metaphor to a concept has proved problematic. Feminist critics have noted that social capital scholars have contributed (through their work) to the issue of 'gender blindness' . Coleman and Putman for example, largely ignore the gender dimension of a clearly gendered practice. Adkins (2005) looks at social capital as a 'troubled concept' one that she suggests feminists should disengage from, advocating that the use of this concept will always trap women in the social-historical time of industrial society. So with this contested view of the role of social capital and networking in mind, we now introduce the KAN project research.

3 METHODOLOGY

The KAN (Know and Network) project evolved from the findings of a number of gender and information systems research projects (see www.iris.salford.ac.uk/GRIS) that were partly funded by the European Social Fund (ESF) with an overall aim to address the discrimination of women in employment. Previous research findings had uncovered various barriers to women working in the UK ICT sector and relevant to this paper is their severe underrepresentation often resulting in isolation and a lack of access to mentoring and networking opportunities. Accumulation of social capital and social networking are often ways that people progress in their ICT careers and this lack of opportunity for women meant obstacles to career advancement with women frequently taking their skills elsewhere. In addition our previous research had also noted that women working in SME's also lacked access to a structured Human Resources function and therefore often did not have sufficient knowledge about their rights in the labour market and information about how to seek redress if facing overt or indirect discrimination. It was clear that a 'one-stop-shop' of information on legislation, policies, good practice and where to find help could be of benefit to women in ICT and also use of e-business tools in the form of

use of web 2.0 social networking tools as a virtual and first step to providing opportunities for business and social support.

The KAN project ran from January to December 2007, the KAN networking site was developed and went live on June 26th 2007 and during that six month period signed up 137 members. All members made the most of the tools available which were used as a means of retaining and developing women in IT. During the period of the project daily screening of the usage of the KAN site and knowledge portal took place. The social networking site featured personal and group blogs in which users communicated and shared knowledge, ideas and concerns within a community of 'friends'. Additionally users were also able to advertise forthcoming events, seminars and conferences, training and consultation events and meetings and promote existing personal blogs by linking to and displaying the contents of their blog on the KAN network enabling them to create their own community within the Know and Network site.

The knowledge portal was developed as an aid for women in IT/ICT professions who wished to know more about: work related grievances such as discrimination, harassment, bullying and victimisation which may be connected to issues of gender, ethnicity, age, pay, sexual orientation, gender identity, maternity, care responsibilities, disability, religion or belief; retirement and contractual arrangements; employment procedures for making complaints; their legal rights in relation to these grievances and where to go for advice and support. Once launched, constant analysis of how the KAN networking site and knowledge portal was being used was carried out.

4 PROJECT FINDINGS

One of the aims of the KAN project was to see how this social networking site would benefit its members. Initially as members first joined the KAN network we wanted to gain insight into their lives looking at aspects concerning their employment status and if their employment/education status changed during the course and as a result of being a member of the KAN network. The findings concerning the 137 KAN members were drawn on and reported, the details of which are shown in the tables below.

Table 1: Number of women who fell into each of the following categories prior to the start of the project

Employment status	**No. of Women**
Unemployed	14
Employed (inc. Self Employed)	114
Economically inactive (in Further Education)	9
Total	**137**

Table 2: Of those shown as 'unemployed' in Table 1, this table shows how many fell into the following age groups and how long they had been unemployed prior to starting the project

Age	Length of Unemployment					
	Less than 6 months	6-11 months	12-23 months	24-35 months	36 months	Totals
	No. of women					
16 - 24	0	0	0	0	0	0
25 - 49	0	2	0	1	0	3
50 +	1	3	6	1	0	11
Totals	**1**	**5**	**6**	**2**	**0**	**14**

Table 3: Of those shown as 'employed' in Table 1, this table shows the size of the company in which they were employed

	No. of employees in the company								
	In secure employment				Threatened with redundancy				
	<10	11-49	50-249	250+	<10	11-49	50-249	250+	Totals
Age	No. of women								
16-24	4	6	2	0	0	0	0	0	**12**
25-49	8	11	24	31	4	0	0	0	**78**
50 +	18	0	3	0	0	3	0	0	**24**
Totals	**30**	**17**	**29**	**31**	**4**	**3**	**0**	**0**	**114**

Table 4: Number of women who fall into the following health related categories

	No. of women
People with a long standing health condition or disability	6
People who do not have a long standing health condition or disability	131
Total	**137**

Table 5: Number of women who received training for occupations in the following categories

Occupations trained for:-	No. of women
Managers & senior officials	16
Professional occupations	21
Associated professional and technical	27
Administrative & secretarial	11
Skilled trades	9
Personal services	4
Sales and customer services	34
Other	15
Total	**137**

Table 6: How many achieved the following outcomes?

	No. of women
No outcome	10
Positive outcome – Employment	8
Positive outcome – education or training	6
Positive outcome – voluntary work	2
Other outcome – soft outcomes	111
Total	**137**

Table 7: What happened to members once the project was completed?

	No. of women shown as unemployed in Table 1	No. of women shown as employed in Table 1	No. of women shown as economically inactive in Table 1
Full-time employment		52	2
Part-time employment		35	1
Self-employment	3	27	2
Voluntary work	2		
In further education or training	2		4
Unemployment	7		
Totals	**14**	**114**	**9**

5 DISCUSSION OF FINDINGS AND CONCLUSION

The KAN project provided mutual support for women in IT and its members used this social network to construct their professional identities and networks online. The KAN site supported their ideas and campaigns and allowed them to share their skills and expertise; where they felt isolated it helped them to feel they had an active presence in the working community giving the members a place to find out who they really are, rather than who society and the IT community wants/expects them to be. It was a place where they could 'get angry' and 'fight back' and voice their opinions.

Whilst there is always internal discussion within organisations that is not for public consumption, it is vital that women's networking should be made visible to highlight women's concerns and issues as well as create a representative picture of where and how women in IT are working together. By making women's networks known and public it not only makes a positive statement that women need and want then to exist, but it also makes it easier for other 'like minded' women with shared needs or interests to have the opportunity to make contact, get involved and get employed.

In addition KAN provided the opportunity for women's networks with common concerns to more easily link up or to come together to share ideas, campaign, to take part in consultations, or exchange policy work etc., whether for a one off response to a specific

issue or as an ongoing strategy, making them more visible. It was a place where getting feedback or opinions from a cross section of like minded women was easily accessible. This 'social networking' site, made it easy for the researchers involved in the project to collate and analyse current data and interview members to generate and write their reports, and without any apparent influence or impact, any future research contributors could be matched against the diverse range of women's networks within KAN, where a map would be made visible, which would act as a bench mark to judge how credible a report's contents are helping create a broader, truer picture of women's concerns.

From the data in Table 7 we can see that there was significant change/progress in the 14 that were unemployed at the beginning of the project and also in the 9 that were shown to be economically inactive (in full time education). 5 who were in full time education are now employed, and 3 of the unemployed had become self-employed and 2 had undertaken voluntary work, with 2 although still unemployed, having taking up further education. After interviewing these members they said that their new employment/educational status was due to connections and contact with other KAN members who had offered them jobs, convinced them to undertake voluntary work which could potentially lead to paid employment and encouraged them to undertake further education to place them in a better position to 'get back into work'. Although this is only a small part of the research that the project uncovered it shows that the KAN online network was indeed a valuable asset to some of its members with positive outcomes for those members. Additionally some members were able to promote their businesses and business websites and weblogs via the KAN network.

The barriers to women having access to valued social capital is one of the dimensions that explains why there is a gender pay gap in the UK ICT labour market and why women are concentrated in lower paid areas with comparative difficulties faced in career advancement. In this paper we have discussed the efforts of the KAN project to promote social networking opportunities and timely and useful access to information as a means of overcoming these barriers and opening up opportunities for that rare and valuable resource – women in the UK ICT labour market.

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Public Interfaces as the Result of Social Systems Structural Coupling

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ABSTRACT. Social systems are autopoietic (self-creating) systems which produce all their internal processes by them selves. When autopoietic systems interact with environmental (possibly alopoietic) systems the process of structural coupling takes place and there are possibilities that language will emerge. We analyze different public interfaces like wiki systems, forums, weblogs, social networks, tagging etc. to show how such interfaces can be seen as the result of structural coupling of social systems. We conclude that to facilitate citizen participation in on-line processes one needs to facilitate autopoiesis through various mechanisms. In the end we present the ŦAOPĪS system that we implemented which aims on solving the described issues.

Key Words. public interface, social system, structural coupling, autopoiesis

1 Introduction

Autopoietic theory is one of the contemporary complexity theories, dealing with complex, non-linear and especially living systems (Schatten, 2008). Autopoiesis a pseudo Greek word coined from *αυτό* (auto) for self and *ποίησις* (poiesis) for creation, production or forming was first coined by the Chilean biologists Humberto Maturana and Francisco Varela (1973) to label the type of phenomenon which they had identified as the definitive characteristic of living systems (Whitaker, 2001).

Using the metaphor of autopoiesis a whole theory of social systems based on communication was developed later by Niklas Luhmann (1984). He introduced the concept of autopoiesis to formal organization theory basing his reasoning on a special subset of communication: decisions that, following Luhmann, are the essence of organization (Luhmann, 2003).

Autopoietic systems produce all of their internal processes by them selves, as opposed to alopoietic systems that produce something else then them selves. Such systems create a distinction between self and environment and use different techniques to establish and maintain their boundaries. "*The organismic autopoietic system is conceived as originating (or self-originating) as a recursive enactment of material events, by which recursion, a structure is constituted which conserves itself (or fails to do so) in interaction with other such systems and with the nonliving environment. The autopoietic system has the capacity (indeed the requirement) to preserve itself, not (like a rock) by remaining the same, but by (like an organism) changing. That which changes while the autopoietic system maintains itself, is called by Maturana and Varela the system's* ***structure****, while that which the system maintains is called its* ***organization***" (Guddemi, 2000).

When an autopoietic system interacts with other systems from their environment they perform a process known as structural coupling. "*The result of structural coupling is an autonomous and strictly bounded system, that has nevertheless been shaped extensively by its*

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interactions with its environment over time, just as the environment has been shaped by its interactions with the system" (Quick, 2003).

A special case of structural coupling is that between two autopoietic systems. When two autopoietic systems interact they use their structure to influence the others structure. This mutual influence often yields semantics that we commonly call language. While such language is obvious when considering living (biological) systems, when observing social systems the definition is less evident. Such language when following Maturana is the "coordination of coordination of behavior" that allows social systems to interact with each other.

In the following we will argue that the process of structural coupling between social systems in cyberspace yields public interfaces commonly known under terms like web 2.0, social web as well as social semantic web or web 3.0. That the participation of citizens in such interfaces is a function of the degree to which autopoiesis is facilitated by information technology shall also be shown. Automated acquiring of public opinion is possible if the autopoiesis of social systems is acknowledged in such technology, which is why we present the ᴛAOPĪS system that aims on providing suitable mechanisms.

2 Public Interfaces

In the last few years we were witnesses to a great deal of new web technology that facilitates user participation. Various systems like discussion forums, wiki systems, social networks, social tagging, podcasting, content feeds, weblogs etc. were introduced and are in heavy use. Such systems are of particular interest to government and democracy since they in a way reflect the public opinion of citizens.

When taken into an autopoietic perspective the public is a social system that is autopoietic in terms of self-producing its social processes that yield culture, opinions, social expectations etc. Such autopoietic systems reproduce their components (social people) and structurally couple to their environment (physical world, cyberspace, media, other social systems etc.). In particular, when structurally coupling to modern information technology, like the previously outlined ones, social systems provide a pattern of behavior that can be measured and analyzed (Schatten, 2008).

Autopoietic theory allows us to use a strong metaphor: social systems can in a way be seen as living beings that adapt to their environment preserving their internal organization (Žugaj, 1996). This allows us to observe social systems behavior by measuring and analyzing their immediate environment in a metaphoric way comparing them for instance to animals that create their nests, leave trails and show certain behavior in special situations. The measurement of such behavioral characteristics is often referred to as biometrics or behaviometrics in the context of living beings.

It must be stated here, that the only thing that can be measured are the effects of an autopoietic system to their environment. In order to measure the internal organization of an autopoietic system, one would have to become part of it (a component in the terminology of autopoietic theory) which would inevitably influence the observers objectivity.

From this reasoning we can conclude that the "trails" or effects of social systems to modern web technology can be measured in terms of content left by components of the system and influenced by its internal processes. The content accumulated by such systems contains semantics that can be interpreted as public opinion. The possibilities of analyzing such semantics are strongly influenced by the very technology used and especially by the degree to which input mechanisms are structured. This degree, in a way, sets the rules of structural coupling.

There are two forces that have to be taken into account: (1) the degree of structure of input mechanisms and (2) the degree of ease of use. While the former introduces easier analysis, the

letter facilitates structural coupling. These two forces may seem reciprocal, but as shall be shown, they don't ought to be. In the following a few most popular modern web applications will be analyzed from this perspective.

Discussion Forums A forum is a network application that allows its users multimedia based communication (mostly through text, images, and simple animations) that is organized into subjects and subforums. A forum is hierarchically organized in a way that every user can participate in the communication process by answering previous messages. The communication process of such a system can be thought of as a general tree structure in which nodes are messages and arcs are the essential connections between message and answer. Forums are a very widespread technology with a lot of implementations like *PHPbb* and *vBuletin* to name the most popular. Lots of communities functioning almost completely through this kind of technology. Weblogs or simply blogs are very similar to this kind of technology, which is why we wont elaborate it further. Forums have in terms of our perspective a low degree of structure imposed by their input mechanisms. The only metainformation that is attached to content are the author, the subject and eventually a simple context like subforum or subject thread. On the other hand their ease of use if very high which is a major factor that influences their popularity. Methods that can be used to extract structured content (the actual result of structural coupling) are advanced and closely bound to web mining as shown in (Dringus and Ellis, 2005) and (Spangler et al., 2006). In order to enhance the degree of structure, without diminishing their ease of use, mechanisms like polls, social tagging as well as social network analysis can be introduced.

Wiki Systems The concept of a wiki system operates in the following way: every user or visitor of a wiki service on the Web can change articles and information that he encounters, add new articles and/or information and argue about the existing ones. Wikis became a widespread technology with typical implementations like *WikiMedia* to name the most prominent one, which is the engine of *Wikipedia* the free Internet encyclopedia. Wiki systems have a higher degree of structure introduced by their input mechanisms then discussion forums, but their ease of use is still high. The structure is most evident due to the relationships between articles. Still methods to extract structured content include web mining since most articles are written in natural language, but context analysis through the interconnections can be applied as well (Mehler, 2008). To enhance the degree of structure various ideas from the semantic web initiative (Berners-Lee et al., 2001) can be used like structured tags, link annotations, querying facilities, formal language support etc. It should be mentioned that such mechanisms reduce the ease of use, and should be implemented with care.

Social Networking Applications for social networking allow their users to virtually create social networks of their friends, colleagues, co-workers etc. One can browse others friend lists and profiles, play virtual games, get in touch with long lost friends etc. Some of the most famous social applications like *Facebook* or *MySpace* allows one to engage a lot of different activities with her friends like games, projects, petitions, causes, exchange images, videos, journals etc. Social networking applications have a high degree of structure in terms of connections between people, but a low degree in terms of content. Their ease of use is high due to millions of users world wide. To extract content of interest one could use social network analysis for information regarding the social structure, but for content again advanced web mining techniques have to be used. To provide more structured input mechanisms that wouldn't decrease the ease of use various technologies could be used like social tagging, group management, network management etc.

Social Bookmarking Social bookmarking and social tagging technologies allow their users to organize content they encounter on the web or on site through tags and/or bookmarks. One of the most prominent social bookmarking and web search engine application *del.icio.us* allows users to tag any page on the World Wide Web with custom defined keywords. The search results are impressive having the simplicity of the algorithm that constitutes the application in mind as opposed to complex algorithms used by traditional search engines. Such applications have a high degree of structure regarding their input mechanisms since they allow users to directly input keywords for chosen content. One could see the provided metainformation as user-preprocessed content. Ease of use is dependent on implementation medium to high. The extraction of structured content is allmost direct in such systems, but limited to simple keywords. To enhance the degree of structure one could use built-in ontologies or simple taxonomies, as well as additional autocompletion mechanisms.

Podcasting Podcasting services are another interesting web technology that allows its users to broadcast their own video, audio, image and presentation materials. Services like *YouTube*, *Slideshare* and others became extremely popular and are often compatible with other technologies mentioned previously. Such systems have a low degree of structure since input is multimedia, whilst ease of use is high. The extraction of structured content is extremely hard to conduct introducing methods like pattern recognition, advanced audio/video processing algorithms, neural networks etc. To facilitate the input of structured content (and likewise its extraction) social tagging can be used, and especially image tagging (allready provided by few such services).

3 Discussion

The previous analysis showed that most modern web technologies are easy to use, but are limited in terms of possibilities for extracting structured content. From an autopoietic theory perspective we could state that such systems facilitate autopoiesis due to the fact that communication and interaction are a major factor for the maintaining of social system's autopoiesis. The actual content gathered during the systems normal functioning can be viewed as the result of the social systems, which surrounds such applications, structural coupling. The social system coordinates its behavior according to the given possibilities of the environmental system (in this case a web application). Thus, the only way for the social system to leave effects on web applications are the provided input mechanisms. The greater the ease of use of such input mechanisms, the greater the effects the social system will achieve on the environmental system.

This observation gives us a valuable insight that we can take advantage of when designing input mechanisms to web application. If input mechanisms are structured in a way that the effects of structural coupling can be processed by the web application in order to yield structured content then we would be able to measure, track and analyze the social systems behavior. This implies mechanisms for acquiring instant public opinion, facilitating public participation as well as fostering e-democracy. On the other hand one has to bear in mind that such mechanisms need to remain easy to use in order to acquire valuable effects of structural coupling. This is why we propose to hide advanced technology (like semantic techniques, formal languages, ontologies, web mining, pattern recognition etc.) inside a web application system and provide intuitive input mechanisms.

Having such a reasoning in mind we developed the ᴛAOPĪS system that aims on providing a platform for self-organizing communities. For such communities suitable tools like semantic wiki systems, forums, blogs, ranking mechanisms, content filtering, tagging, social network analysis etc. are provided. The advanced technologies are hidden in the background of the

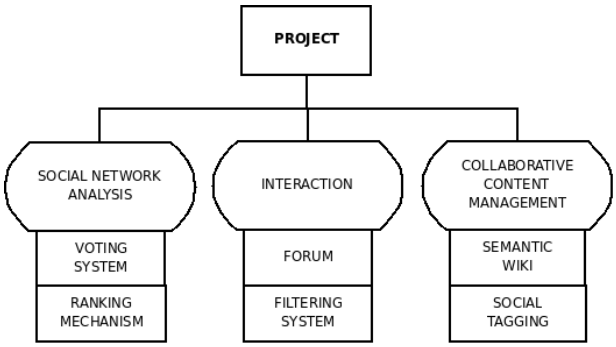

Figure 1: ΤΑΟΡΙS System's Architecture (Maleković and Schatten, 2008)

system in order to remain the initial ease of use, while various input mechanisms are provided that allow an emergent generation of structured content through the coupling social system.

Figure 1 shows an outline of the ΤΑΟΡΙS system's architecture. The system basically allows any user to create an arbitrary number of projects which in turn other users can join or register a project of their own. Any project consists of three interconnected parts, namely a social network analysis part, an interaction part, as well as a collaborative content management part. The part concerning social network analysis comprises of a voting system that allows project members to vote for each other as well as a ranking mechanism that analizes the voting data and maps each project member to her/his respective rank. In particular a modified PageRank algorithm is used to analize the voting data as well as to calculate member's ranks. The member with the highest rank is pronounced project leader which is a dynamic role that can change depending on voting data. Thus a dynamic hierarchy is constructed on every project resambling a dynamic fishnet structure (Schatten and Žugaj, 2007). The interactive part is represented through an multimedial discussion forum as well as an self organizing filtering system. The discussion forum suports threaded discussion, binding to mailing lists as well as inclusion of multimedia files like images, animations and video files. The filtering system basically allows any user to be a forum moderator by filtering messages and other content she/he encounters. Other users can use a moderation of another user or be the moderator for their selves. A list of most used moderators is also provided in order to yield the most popular moderators on any project. The collaborative content management part consists of a semantic wiki system based on a well established formalism called frame logic (Kifer et al., 1995) as well as of a social tagging system. Users by organizing their own content through attribute-value tags provide the reasoning engine with metadata which in turn allows other users to query the dynamically created knowledge base.

4 Conclusion

Public interfaces can be seen as as the result of social systems' structural coupling to information technology. Such public interfaces contain valuable information that can provide us with public opinion, social decisions and trends. In order to extract such structured content one needs to acknowledge the autopoiesis of social systems as well as the limitations of research methods. To facilitate autopoiesis, which in social systems is a matter of communication, public interfaces need to remain easy to use. On the other hand, such interfaces have to be provided with additional mechanisms that will facilitate the creation of structured content. The design of such input mechanisms is subject to our future research.

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The Mo.Di project - digital divide in the remote communities

Blaž Rodič[1]

ABSTRACT

The inhabitants of mountain settlements live far from administrative centres and public services are not easily accessible for them by conventional transport. Also, inadequate knowledge of information technology makes the use of online public services difficult for some of them. In the first phase of the project we have conducted a field survey on information technology skills and the accessibility and the need for online public services. Next we used information technology courses and publicly accessible internet points with assistance to improve the skills of population and facilitate their access to online public services. The information gathered was used to develop a web portal that facilitates access to online public services. The final result of the project is a good practice model that facilitates the implementation of the EU's Lisbon Strategy in the remote mountain areas to reduce the digital divide and isolation of mountain communities.

Key Words: regional development, digital divide, Lisbon strategy, information society, e-inclusion

1. INTRODUCTION

Deep divides exist between those who possess the resources, education, and skills to reap the benefits of the information society, and those who do not (Warren, 2007). Digital divide is not a social phenomenon present only in developing countries, it is a common even in the most industrialized countries. It keeps several groups of people from reaping the benefits of ICT development, ranging from well paid jobs online public services such as e-government. But according to Warschauer (2004), the digital divide is a symptom of a much larger and more complex problem – the problem of persistent poverty and inequality.

A large part of the population which is affected by the exclusion dynamics of the digital divide is represented by the people living in isolated geographical areas, such as the mountain communities participating in the Mo.Di project. However, e-inclusion needs a comprehensive and coherent approach addressing any social and economic exclusion factor with the help of ICT (Timmers, 2008). Experiences from USA show (Warschauer, 2004 and James, 2008), that access to just technology is not enough to affect the digital divide. What is needed is physical access to IT, access to training, access to relevant local content in the language of the users, and a way to influence the availability of content and online services.

The Mo.Di project consortium included the six partners from different EU states (Italy, Poland, Slovenia, and Spain). Each partner selected three areas affected by the exclusion dynamics within its territory. The activities on the project began in April 2004, while the pilot project ended in September 2006. The project is currently in the phase of dissemination and promotion of results and the insertion of new links to public services in the citizen's portal.

2. PROJECT IMPLEMENTATION

All project activities were divided among the partners in a way to promote cooperation and teamwork. Also, a different leading partner was defined for each group of actions.

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2.1 Study Activity

This part of the project was aimed at defining the conditions necessary to carry out the pilot project, it was one of the initial phases of the project. In order to meet the real needs of the mountain areas, each partner had to carry out a survey within its territory. The survey affected the local population, and was supported by a specific questionnaire devised to collect specific data. The field survey was carried out in July 2005 in eighteen mountain communities with an average of 420 inhabitants each. The total number of surveys gathered is 1584, which represents over 20% of the total population of communities participating in the project. Using data from the survey, Figure 1 shows that the largest group of people hasn't used a computer before, and only about four percent of the people view themselves as computer "experts". The average subjectively assessed level of computer skill varied between 1,5 (Poland) and 1,68 (Slovenia), which could be interpreted that there are stronger similarities between the communities than one may conclude by comparing the countries in terms of economic development or broadband availability.

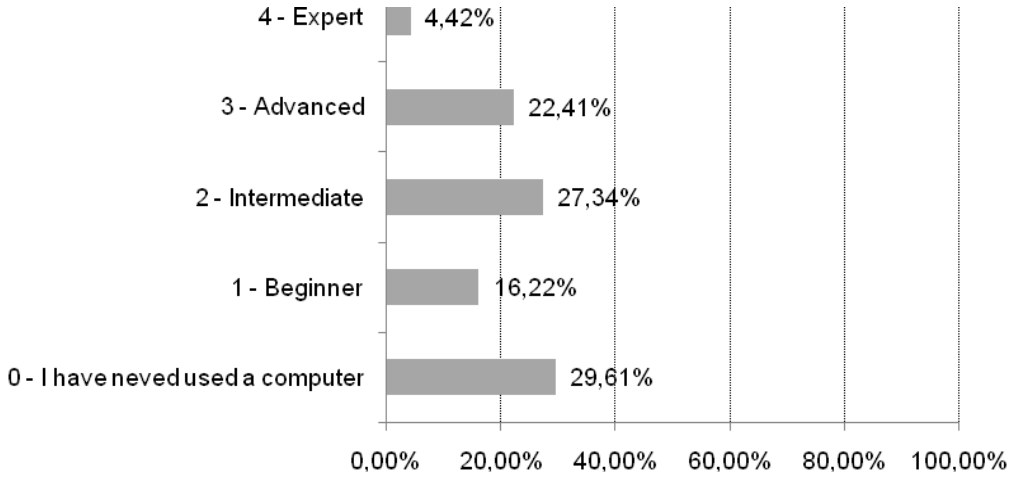

Figure 1: Level of PC skills (subjective assessment) in all of the communities in 2005

The survey also focused on the usage of internet in the communities. We tried to establish how often the people use the internet and what they do online. The data shown in Figure 2 indicated that a large part of the population (over 40%) never uses the internet, which is a lot, especially regarding the relatively low average age of population in the survey (38,97 years). On the other hand, about 45% of the population use the internet at least several times a month. They use the internet mostly to surf websites relevant to their hobbies or work and read the news (about 40%), about 20% use the internet mostly to look at music, sports and games pages (presumably these are the young people), while about 10% of the population use job hunting sites and public administration sites. The number for public administration sites (12,81%) was especially low and proved that there is much room for improvement in offering online public services to remote areas.

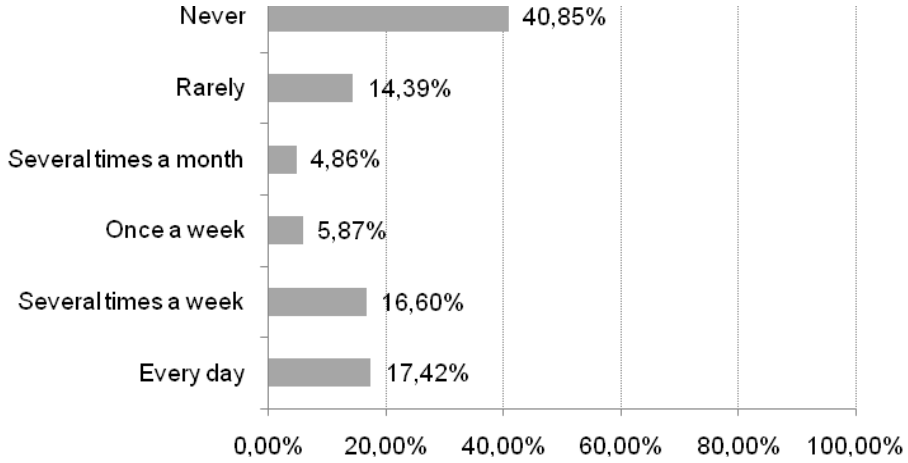

Figure 2: Frequency of internet use in the communities

A very important issue in remote areas is the accessibility of public services. We found that while the participants in Italy in Spain mostly answered that the public services are near or easy to reach, while all of the participants in Slovenia answered that the services are hard to reach due to poor public transport, and about a third of Polish participants replied the services are either too far or the public transport is poor.

2.2 The Pilot Project

The Pilot Project was aimed at assessing the actual usefulness of the services defined by Component 2 for the population of the mountain areas chosen for the pilot project. The pilot project comprised: training of the operators, installing of the internet points at selected locations and supplying of material and services, collection and elaboration of the information, creation of an interregional protocol for the computerization of the services and the creation of a network of the mountain communities and survey of Mo.Di portal users

In the online survey conducted on the Mo.Di portal we have measured the effects of the Mo.Di project and compared them with the results of the field survey in July 2005. While the field survey targeted the entire population and included 1584 participants, the online portal survey targeted only the portal users, and a total of 223 responses were gathered. A second field survey was unfortunately financially unfeasible. The two sets of data obviously do not belong to a homogeneous sample, and cannot be statistically compared. Still, the data indicated the results of the Mo.Di project. The average age of participants was 32,87 years, giving a 6 year younger population than the population in the field survey.

The final question we would like to present within this paper is perhaps the most relevant to public administrations planning the development of their online services. As Figure 3 shows, more than half of the participants believe that the distance between them and the public administration can be reduced by online services, however over a quarter of participants found that the services they want are not provided online, and they still have to go to the nearest public administration office to get the service they need. This indicates that some services that are important to the residents of remote areas should be implemented online, or perhaps provided by field teams from public administration, where an online service is not possible or not practical.

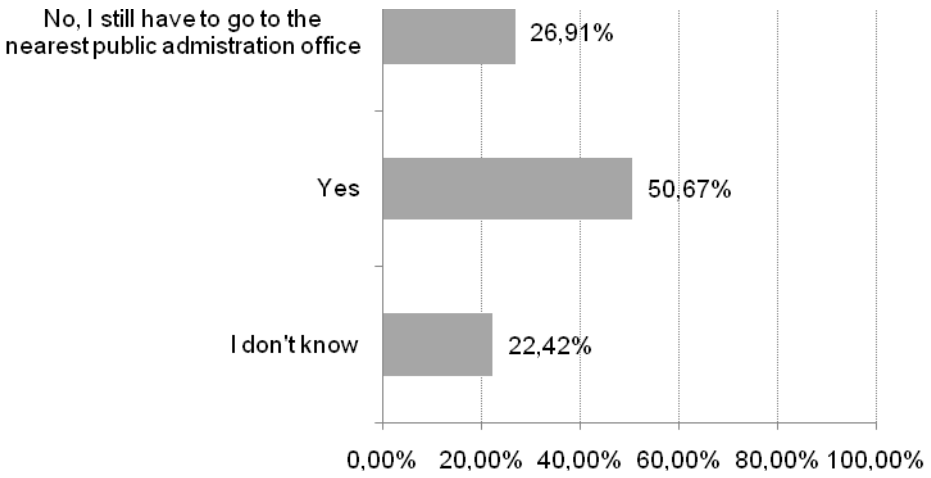

Figure 3: User satisfaction with public administration services in remote areas

3. ACHIEVED RESULTS

Mo.Di was an innovative project setting a best practice at the European level. The project has allowed an active cooperation amongst various countries of the European Union. This has allowed the implementation of a common methodology for:

- The sharing of common objectives and information,
- The analysis of the on-line services issued by public administrations and of the technologies used,
- The analysis of needs of public services by the Mountain populations that participate to the project,
- The Implementation of a common methodology of services issued via a common multilingual platform, and
- Digital literacy of Mountain population via the installation of public, assisted internet points Stimulation of the mutual understanding and communication of the local population through meetings and sharing of common experiences.

The various steps of the project, such as the analysis of the initial needs of the residents, the exchange of experiences, through the final phase of definition and use of the internet points (which have all been provided according to common standards in all participant countries) have actually been defined by the citizens themselves, assisted by tutors and by local facilitators. This has allowed the creation of a common platform of knowledge and objectives. All participants have come into contact with European issues, and that has further enhanced the sense of belonging to a wider European community, despite their physical distance.

The partners of the project have undertaken a significant activity of information at local level, by organising workshops and involving the local media. This has removed the local citizens from their insulated daily routines and has provided new and exciting stimulation. It has further enhanced the international debate on innovation of administrative processes and on the specific needs of the local areas. The pilot project has enabled different populations to reach common objectives while retaining their individual characteristics.

During the start-up phase every partner of the project selected those citizens who could represent in a homogeneous way different social groups (different ages and conditions) to set up “local communities”. In order to gain benefits from the agreed transnational cooperation, the project also provided for the interaction among different European communities; they could interact both in a virtual and in a real way. Thanks to the added value offered by transnational cooperation and debate on the innovation of the administrative services and on the need of public services in marginal areas, the local communities have become a sort of “virtual communities” - “workrooms” animated by the facilitators of the project. Every local community has experimented and used the ICT and has interacted, in a virtual way, with the other geographically distant partners.

Moreover, the different members have been given the opportunity to share their own experiences and opinions and to organize the so called “physical” exchange of experiences. In fact, every facilitator has selected some “key actors” among citizens in the local communities, who had the real opportunity to stay a few days and visit some of the communities of partner countries in order to see different cultural traditions and above all to have a careful look at different instruments and realities as regards the relationship between citizens and local public Administrations, and consequently to bring back new proposals and ideas for their own communities.

Throughout the project, the Mo.Di portal was being perfected according to the needs of citizens, and new links to interesting services were being added. In this way, the portal became a model, that can be used by the public administration throughout Europe to simplify the citizens access to their public services.

Finally, the most tangible and immediate result for the local communities participating in the project, in each of the eighteen communities, over 60 locals were trained to use ICT and the available online public services, and their community has gained a publicly accessible internet point with a computer, broadband internet, printer and scanner, that is operated by tutors trained to help the users.

4. LESSONS LEARNED

One of the key points of value generation of the project is the actual involvement of the local population in the definition of the project itself, as an active participant to it, rather than a passive subject of an experiment as often is the case. The various steps of the project, such as the analysis of the initial needs of the residents, the exchange of experiences, through the final phase of definition and use of the internet points have actually been defined by the citizens themselves, assisted by tutors and by local facilitators. This has allowed the creation of a common platform of knowledge and objectives.

The innovative element in the Mo.Di project is the will to overcome the “digital divide” by relying more on the diffusion of the culture of accessibility than on specific training measures. The diffusion of such culture can be carried out through a progressive increase in the number of citizens involved in the new dynamics of the Information Society and in the actual use of interactive instruments. The deep involvement of the local populations in the confrontation and exchange of experiences among the partners can contribute to the reduction of the isolation conditions of the marginal territories, thus eliminating the obstacles to their economical development.

While the reach of broadband interent may well define also the geographical range of the digital divide (Preston et al, 2007), our experiences confirm the opinions of researchers (Gil-Garcia et. al, 2006 and James, 2008), that mere internet access is not enough to have an effect on the divide. Particularly providing IT training is a very important step in the promotion of e-inclusion and reduction of the digital divide.

The effect of the Mo.Di project should not end with its completion, but should be kept alive by the relevant public administrations and the populations themselves. The value of the project is also linked to the understanding of the importance of the results achieved and making them last. The experience gained through the pilot could also represent a base for further, more ambitious projects on wider scale that could be presented in the context of the INTERREG IV C during the years 2007-2013.

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Multi-scale topography

Matija Vidiček[1], Aleš Vidiček[2]

ABSTRACT
The automation of map generalization could speed up map production and standardize the results. The goal of this study was to answer if it is possible for municipalities to buy only map of great detail and from it derive a less detailed map. Quality of data set derived by using automated generalization is also discussed. An experimental approach was used that required a lot of testing in the first phase, that was performed step-by-step by hand. In the second phase scripts for automation process were written and used. Automation process was studied on two test data sets, the 1:1000 data set and 1:10,000 data set. The latter one was necessary to evaluate the end result. A case study revealed that completely automated generalization is not possible yet, because some steps still need to be done interactively by human. Furthermore, generalization is very influenced by geographical patterns that are not easily recognizable even for experienced cartographer. Finally, guidelines and techniques that could lead to solid implementation of automated generalization have not been clearly defined yet.

Key words: *GIS, map generalization, automation, data quality*

1 INTRODUCTION

Nowadays, every engineer at field work needs detailed geographic information, displayed on large-scale maps (1:1000), for example cadastral registration, road maintenance, building permits, registration of underground cables and pipelines, and other cases where location and shape of objects has to be as accurate as possible. The amount of detail on these maps is high.

Topographic maps are normally (since centuries) produced in larger scale than the scale of the final scale eventually is. Until now National Mapping Agencies (NMA's) produced separate geographic data sets for the different scales (1:1.000, 1:10.000, 1:50.000 etc.). However, NMA's could derive maps of smaller scale by generalizing maps of higher scale. The generalization can be done by applying different approaches. In the ladder approach the (updates of) smaller scales are derived from a large scale data set in steps (scale by scale). The alternative is the star approach in which every small scale data set is generalized from the same base data set. In the mixed approach large to middle-scale data sets are derived from the base data set while smaller scales are derived from one middle-scale data set (Stoter et al., 2004).

The data sets used for testing were two Dutch maps of different scale. Dutch example of detailed map is IMGeo, i.e. a new version of large scale topographical base map (GBKN). However, this level of detail is not necessary for some tasks and is sometimes even a hindrance; maps become unreadable if they contain all the details of the 1:1000 maps. In the Netherlands such kind of map is TOP10NL that has scale 1:10,000.

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These two data sets were chosen, because Dutch municipalities require topographic information at these two scales, i.e. 1:1000 and 1:10,000. Municipality has to buy both products (including 3-monthly updates for the 1:1000 data set and 6-monthly updates for the 1:10,000 data set). Apart from the cost of buying two products instead of one, there is also another disadvantage, i.e. often there appear inconsistencies between the two topographic data sets, and for the municipal geo-information department this means that they have to spend extra time to decide which of the two data sets is more adequate representation of the real world. Sometimes the 1:10,000 is better, sometimes the 1:1000.

Aim of our case study was to answer following questions:

1. Is it in principle possible to only buy the 1:1000 data set and then every 3 months derive somehow the 1:10,000 data set from the 1:1000 data set?
2. Will the derived 1:10,000 data set be of adequate quality?
3. What are the advantages and disadvantages of deriving the 1:10,000 from the 1:1000?
4. How can the derivation of the 1:10,000 data set be done in practice? By which tools?
5. What are the current bottlenecks associated with automated generalization? Can GIS software companies or the National Mapping Agency do something about these bottlenecks?

2 GENERALIZATION APPROACH

Generalization is, as cited by Hofman (2004), the selection and simplified representation of detail appropriate to the scale and/or purpose of the map. A lot of research is carried out by geo-scientists and research institutes about the possibilities of "automated generalization" (Aslan et al., 2004; Lee, 1996; Regnauld, 2007; Stoter et al., 2004), i.e. to derive a less detailed (= generalized) data set from a more detailed source data set (the base data set = master-data set) by specifying generalization rules that can be turned into algorithms that can then be executed by software. Of course, the end results of these computations should be of high quality; otherwise the derived data set will not meet the quality requirements expected by customers. Furthermore, as Lee (1996) defines it, the process of generalization extracts and reduces information from reality or source maps and portrays it to represent a specific theme and/or at a smaller scale, while meeting cartographic specifications and maintaining the representative integrity of the mapped area.

Generalization is one of the most important issues of cartography. The automation of it could speed up the map production workflow and standardize the result (derived) products (Aslan et al., 2004). On the other hand, Stoter et al. (2004) and Regnauld (2007) state that despite more than 20 years of research of automated generalization, current practice is that generalization still has to be performed partly interactively and therefore can not be performed on the fly. This is a probably because generalization in traditional mapping simply relies on a cartographer's analysis and decisions as Lee (2004) cited: "Due to scale restrictions, the cartographer makes a selection, classifies, standardizes; he undertakes intellectual and graphical simplifications and combinations; he emphasizes, enlarges, subdues or suppresses visual phenomena according to their significance to the map. … he reorganizes the many elements which interfere with one another, lie in opposition and overlap, thus coordinating the content to clarify the geographical patterns of the region."

The generalization operators that describe the nature of automatic generalization were defined. They consist of spatial transformation: simplification, smoothing, aggregation, amalgamation, merging, collapse, selection/refinement/typification, exaggeration,

enhancement and displacement; and attribute transformation: classification and symbolization (Kilpelainen, 1999). Operators are used to break down the generalization process into smaller sub-processes that are easier to solve.

3 DATA SETS AND PROCEDURE

The 1:1000 data set (GBKN or the new IMGeo shown in Figure 1) of a small area, and the 1:10,000 data set (TOP10NL) for that same area are shown in Figure 2. The second data set is necessary for two reasons: for the exploration of differences between 1:1000 and 1:10,000 maps, and for evaluation of the end result of the automated generalization that takes the 1:1000 as basis: the derived map is supposed to 'look' like the existing 1:10,000 map. Only then the conclusion can be that the automated generalization algorithms will lead to good quality results.

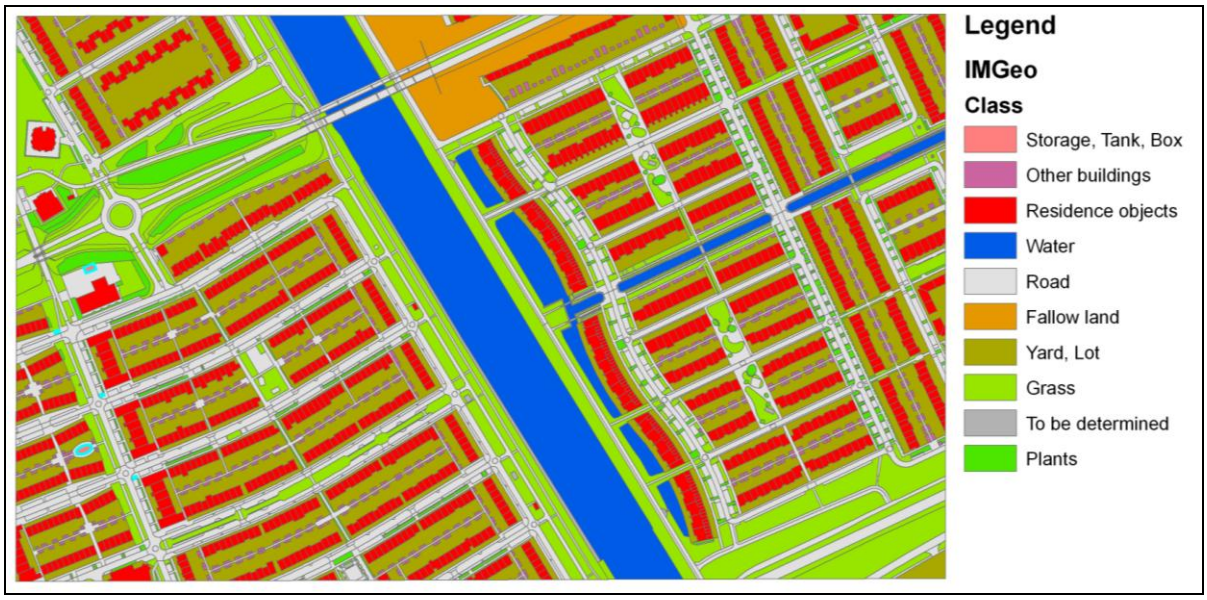

Figure 1: IMGeo data set visualization

From Figure 1 following elements can be distinguished: residence buildings, other buildings, storages (tanks and boxes), roads, water, fallow land, yards, plans and some areas which are not determined yet. On the other hand, Figure 2 depicts TOP10NL data set with following attributes: buildings, roads, water, forest, grass land and other. It could be noticed that class "Other" is very common between buildings.

Figure 2: TOP10NL data set visualization

Figure 3 depicts schematic generalization approach used in this research. All determined rules and criteria (census) were applied with actions (steps) in selected software environment, first step-by-step (‘by hand’). In the second stage, scripts for process automatization were written and used.

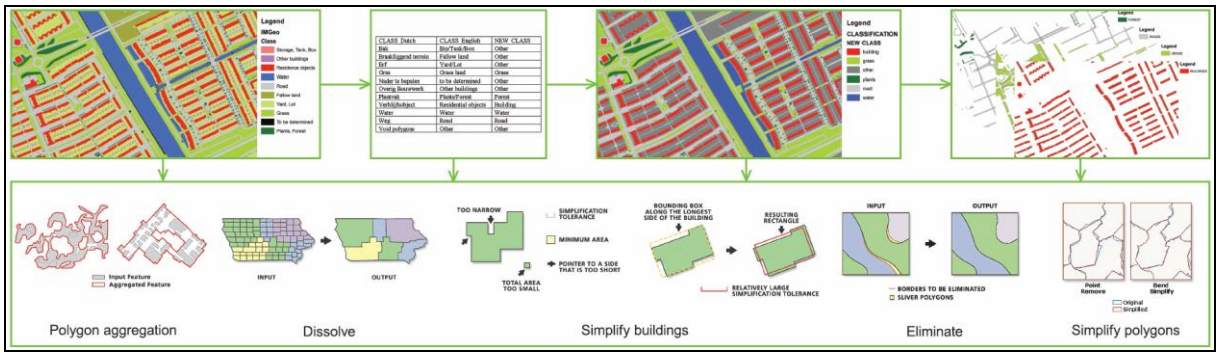

Figure 3: Generalization approach

By comparing two available data one can not fail to observe that land use with class “Yard”, “Other buildings” and “Storage” could be immediately reclassified into land use “Other” in order to gain TOP10NL results. Therefore, classification is the first step in automated generalization procedure. After classification process the next further logical step was dissolving by the new classification attribute field over the whole study area. Dissolve results were exported into six new different data layers (buildings, water, roads, forest, grass and other). Each data layer was involved in further process development separately based on following generalization tools: polygon aggregation, dissolve, eliminate, simplify polygons and simplify buildings tool which was performed only on buildings data layer.

Therefore, generalization tools were used in different sequences in order to achieve best generalization results. For example, roads data layer was firstly aggregated with 6 m aggregation distance and than simplified with 10 m simplification distance. The grass data

layer was the most challenging for generalization. The grass data layer example shows that an empirical research method was the most appropriate to use for the data layer described and following steps were executed as shown on Figure 4:

- Dissolving grass data layer (Figure 4 – A)
- Aggregating polygons with 2 m aggregation distance (Figure 4 – B)
- Calculating Area field (Figure 4 – C)
- Selecting polygons where area is smaller than 250 m^2 (Figure 4 – C)
- Deleting selected polygons (Figure 4 – C)
- Aggregating polygons with 3 m aggregation distance (Figure 4 – C)
- Aggregating polygons with 4.5 m aggregation distance (Figure 4 – C)
- Calculating Area field (Figure 4 – C)
- Selecting all polygons where area is smaller than 1000 m^2 (Figure 4 – C)
- Deleting selected polygons (Figure 4 – C)
- Selecting all polygons where area is between 2000 and 4000 m^2 (Figure 4 – C)
- Deleting selected polygons (Figure 4 – C)
- Selecting last redundant polygon with statement where area is smaller than 1300 m^2 (Figure 4 – C)
- Deleting selected polygons (Figure 4 – C)
- Simplifying polygons with 100 m simplification distance (Figure 4 – D).

Figure 4: Grass data layer generalization

Final stage of the generalization process was merging all created data layers (buildings, water, roads, etc.) into one data layer and elimination of all possible gaps between different classes based on area criteria. After few iterations correct area selection was found. In this case area limit was 200 m^2. If area limit was larger results were not acceptable. Even with condition used, smaller areas were lost, i.e. smaller buildings were deleted if elimination process was

executed. Evaluation of the generalization results was based on the comparison between the derived data set with the existing 1:10,000 TOP10NL data set.

4 EVALUATION OF THE RESULTS AND OPEN ISSUES

Upper map of Figure 5 depicts final result of IMGeo generalization and lower map of Figure 4 shows TOP10NL. The main objective was to achieve as best as possible resemblance of the final result to TOP10NL map. At this stage only visual quality assessment was performed to evaluate the final result. As can be noticed, there are some differences:

a) Blue circle: After generalization there is grass, instead of "other" landuse type.
b) Cyan circle: Algorithm is problematic on the boundary of the study area. A building is strangely cut off.
c) White circle: Landuse is not the same and also the area should be bigger.
d) Magenta circle: With generalization a bridge was "constructed".
e) Yellow circle: In this area roads prevailed.

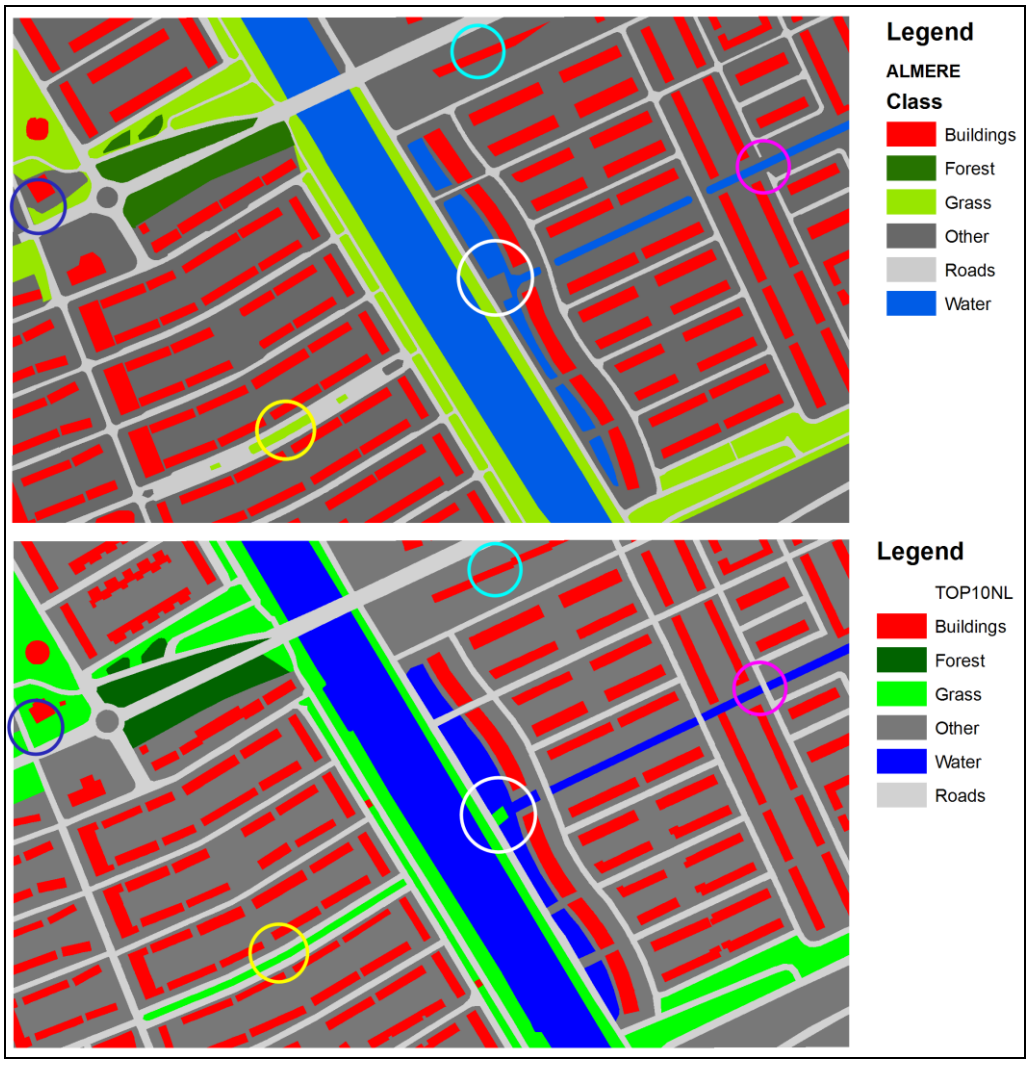

Figure 5: Final result IMGeo (upper map) and TOP10NL (lower map)

As the goal was not production of perfectly generalized map, the final result can be enhanced in real situations. In the following paragraphs, research questions set in the introduction will be answered.

As described in previous section an experimental approach was used that required a lot of testing. Based on this experimental research, it can be asserted that completely automated generalization is not possible yet. The main reason for this is not in lack of appropriate tools, but in guidelines and techniques how to write an algorithm that would perceive geographical patterns (that are not easily recognizable) automatically.

Nevertheless, it is in principle possible that a municipality buys only 1:1000 data set and uses half-automated generalization to derive 1:10,000 data set. The main advantage are lower costs on the long run, because it can be quite time consuming when the first generalization is performed, but updating would not take much time (of course, depends on the extent of updates). Furthermore, because the generalization would be done half-automatically the quality would be adequate.

In this research only combination of three ESRI tools were used for generalization, therefore it can not be judged if other existing tools are appropriate. The combination used appeared to be sufficient.

5 CONCLUSION

As shown in previous sections, it is possible to get close to TOP10NL look by using automated generalization – writing the algorithm with testing. There are few things that need to be noted:

1. Completely automated generalization is not possible, because some steps still need to be done interactively by human.
2. The algorithm was written for this specific case in the manner of trying to get as close as possible to the TOP10NL. Algorithm would change as soon as the area of generalization would get bigger or if the area would be different. As Lee (2004) states, this is due to geographical patterns of the region that are not easily recognizable even for human cartographer. It is not straightforward to write such algorithm that would perceive geographical patterns automatically. Guidelines and techniques that could lead to solid implementation have not been clearly defined yet.
3. The test area is part of Almere municipality that was artificially created; at the time of establishment spatial planning was already well developed. One can expect that regular geographical patterns could be found.
4. Algorithm is problematic on the boundary of the test area.
5. Algorithm will always have to be adjusted to concrete situation; it could not be used ever again.
6. Knowing the region would be an advantage and would improve the results.
7. The quality of the generalized map is adequate because the result is almost the same as real TOP10NL data set. Quantitative assessment of the quality should also be done.

Nevertheless, generalizing the IMGeo data set “half-automatically” and not buying TOP10NL data set would still be the better choice for the municipality, because benefits are higher than costs. Only IMGeo data set should be bought, then in order to get 1:10,000 map generalization of IMGeo data set should be performed. Although IMGeo is updated every 3 months, it does not have to be generalized completely again, but only updates can be considered. Probably there is not much updates, therefore this would be cheaper than buying also TOP10NL (including 6 monthly updates).

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Data on the web: fresh, fancy and free

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ABSTRACT:

Web users have been spoiled with perpetual "fresh, fancy and free" content, making it hard to earn honest money on the web. With the "Web 2.0" development facing its climax at intruding the desktop scene, the academia hopes to avoid bursting the bubble by building the 3rd generation – the semantic web. While W3C's semantics engine has trouble making the wheel turn, the community is developing on its own, ignoring the lessons from the "browser wars" where chaos was king.

Key Words: *Web 3.0, Web 2.0, mash-up, RIA, outsourcing, data on the web, semantic web, Microformats, RDFa*

1 THE CONFLUENCE OF WEB, WEBS AND DESKTOP

Long gone are the times when any single functionality of our applications (be it web- or OS-based ones) had to be coded individually. Though reusing code is a method of efficient programming known since the first days, it first gained great popularity and true structure trough object-oriented paradigms, which provided coders with libraries and APIs – the later enabling communication between heterogeneous applications.

Applications being built to target the web have become most demanding and fully comparable in both functionality and complexity with »traditional« desktop-applications. So called »RIA« (Rich Internet Applications) have revolutionized the reuse and coding-paradigm, as they allow using web-focused programming scenarios on the desktop. RIA introduce an additional layer (in essence an invisible "browser") on top of which applications are designed using web-technologies and paradigms. The importance of RIA has been fully realized by the industry, most noticeable with the quasi-monopolist Google entering the OS-market with its platform Android.

The advent of RIA paradigms and the evolution towards a melting of web- and desktop-programming is favoring the discussion of managing the growing amount of heterogeneously stored data that is published – and thus is consumable – on the web. The emerging of various social & community platforms has contributed to huge amounts of person- and behavior-oriented data being available to practically anybody interested in harvesting it – data, which may be of important value for different kinds of businesses.

In this article we present the evolution of the web from an interdisciplinary perspective with focus on current status of development. We emphasize the rapid development of the web community and the constant pressure of providing fresh,

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fancy and free content to its users – consumers, as well as developers – which creates a new "bubble" within the IT sector, which will burst sooner or later.

2 STARING AT THE "WEB 2.0" - A WEB OF DATA

As long as the WWW was known just as »the web«, an invention of any new marketing-terms was unnecessary, simply ignoring the fact that web-technologies, programming paradigms and the user-experience were evolving. It took a huge evolution for »the web« to grow from a networked, interactive and community-driven desktop application with a dedicated network protocol, used primarily by technical enthusiasts and scientists, into a virtual environment focusing on infotainment, pornography, scientific content and sharing of pirated material, as we mostly use the web for[2]. The shift from a simple application into an environment involved a huge development both from the perspective of the developer and designer, as well as the user and included the development of main concepts, as are namely RIA, style-sheets, client/server-side scripting etc.

The 2nd generation of the WWW started its existence from the paradigm of the web as an environment, a space within which further development is possible. The popular term "web 2.0" itself is said to be coined by Tim O'Reilly in context of the *Web 2.0 conference 2004*, which took place in Athens, while at that time the term had no deeper meaning (Graham, 2005). Tim B. Lee in 2006 even said, that "web 2.0" is just a piece of jargon and nobody even knows what it means (Laningham, 2006), hence disqualifying the marketing-term as being nonsense.

In technical terms, the 2nd generation is closely linked with programming paradigms such as AJAX (see below for explanation) and/or RIA. Both paradigms have been present and popular already prior to the 2nd generation web and have no direct impact on the development of the WWW as a virtual environment. RIA is technologically a concept, where the computing needs of web applications are shifting towards the consumer, while from the users perspective offering a more responsive, "flicker-free" experience. RIA do not determine any programming language, nor environment and can be created using W3Cs open web standards (XML[3], (X)HTML, SVG[4],…), as well as proprietary technologies such as Flash/Flex, Silverlight, JavaFX, etc. AJAX on the other hand is the description of using client-side-scripting (mostly ECMAScript or JavaScript, while other languages are used as well) to pull structured data or information from the hosting server for consumption within the RIA application. It is a common misconception that AJAX is equal to RIA, or that AJAX is determining a specific use of programming languages or technologies (though it is true that the acronym stands for "*asynchronous JavaScript and XML*", programmers referring to this term do not necessary use either language, nor is their approach always asynchronous).

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[2] *We may cite the famous Swiss mathematician, Eduard Stiefel, the founder of the Institute of Applied Mathematics on the ETH, who used to emphasize to his students, that 95% of the activities computers are used for, are completely wasted.*

[3] *eXtensible Markup Language*

[4] *Scalable Vector Graphics is a standard for defining vector drawings and (ev. interactive) animations. The standard is a dialect of XML and may be used seamlessly with other dialects of the family (e.g. XHTML).*

From the sociological perspective, the 2nd generation web is linked to collaborative, participatory[5] forms of content, which frequently rely on crowd sourcing for content-requisition. The charisma of a well-done application is derived from the platform-oriented approach, which creates a new virtual space within the global web space of the WWW, within which users are invited and motivated to create their own content and interact with other users of this new virtual space. Typical platforms of this kind, which create new spaces, are social-communities like FaceBook, SecondLife, Habbos, as well platforms like Google Maps/Earth. The requirement to qualify as a virtual space is the ability of the user to develop its own content within the application, a condition not fulfilled by other most popular services like Flickr, Issuu or Twitter.

Even design matters when determining the 2nd generation. It is the art of giving the user-experience an added value, which draws new demands towards designers and web-artists. While 1st generation web sites where author-centered and primarily static, sites of the 2nd generation focus on the user and his needs, providing customization and possibility for redesign and reconfiguration. The challenge of the designer is now how to provide an intuitive environment, which unobtrusively exposes the rich functionality of our platform. The enhanced focus on design has developed a new paradigm, where the "des-dev" of the 1st generation has been replaced by a team of equally professional developers and designers, each working on its own part, collaborating in environments where design, data and business logic are strictly separated.

While "Web 2.0" in the beginning was nothing more than a well-placed, meaningless buzz-word coined to attract fresh venture capital towards the ruins left by the burst dot-com bubble, it has developed into a broadly accepted marketing term, collectively describing modern feature-rich, collaborative, user-centered web services and environments, which form a bubble, which has not burst yet.

The web we are staring at today is a web of webs, a virtual space that provides the infrastructure for a perpetual creation of new spaces. Its applications and services are melting the borders between desktop apps, making the later step-by-step obsolete and unattractive. Media convergence has become state-of-the-art, spoiling the users with high-quality audiovisual content on demand. A major problem, which will sooner or later trigger the bursting of the 2nd generation bubble, is the business case of modern web services, as the web is generally perceived as a free, no-cost space where everything is allowed.

3 STORING THE SEMANTICS

The vision of the semantic web as an intelligent network that knows our wishes and makes our lives "easier" will most likely remain a vision, as the web is far too

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[5] *The participatory aspect is often referred to as "democratic", which is an opinion we cannot share. Democracy is a form of hegemony for governing the civil society, where its rulers base their legitimacy on the freely expressed will of their basis, while the web is simply a network-infrastructure that has nothing in common with hegemony. Neither can the term "democratic" be linked with absolute freedom of expression, as censorship and repression are present and step in place as soon as the information becomes visible. You are as free to post whatever you want on the web, as you are free to go into the wood and post your messages on the trees: as long as nobody sees it and identifies you, you can do whatever you want.*

complex to evolve itself naturally along a foreseen path. Applications and services, i.e. web sites, which form the 2nd generation of the web, have developed themselves by mere rules of the market, without any guidance from godfathers or prophets. The same rules have power over the next steps of the web's evolution, speaking frankly: it is the content-providers, which will decide, whether a semantic web is needed or not.

A killer application relying on semantic structuring is yet to be born, until then established development practices will remain in use.

Lately many polished, fancy 2nd generation (in terms of visual style and user-experience) sites are popping out, offering collections of data and information with the "semantic" added value. Sites such as Microsoft's new search engine *Bing*, *Yahoo*, or *Sindice*, already use the services of semantic or quasi-semantic listings like *Freebase*, *Geonames* or *UniProt*, to enhance their results and user-experience by the added value the underlying semantics provide. Search engines do also extensively use semantic enhancements like Microformats (μFs), eRDF or RDFa, which designers and developers use to semantically annotate their existing structures.

A revolutionary, yet equally hazardous step towards the evolution of the 3rd generation was performed by WolframAlpha, a platform offering answers mostly to mathematically definable questions of statistical and scientific nature. Although WolframAlpha is a brave step, many critics doubt whether the step is done in the right direction, labeling the application even as "boring" (Gibbs, 2009).

4 HARVESTING AND OUTSOURCING

Semantic annotation (using formats like μFs and RDFa) does not miraculously make our applications intelligent or self-thinking, it does, though, make them more open and interchangeable. Storing person-related data within *hCard* or *hResume*[6] can save our time, while making the information reusable. Interlinking people trough the popular FOAF[7]-ontology may be used to store the internal business hierarchy, thus, for example, making notifying of groups or management-levels more convenient. For sales relevant applications, μFs such as *hReview*, *hProduct* and *hListing* are used, which describe the product itself, the price, delivery options and availability, or user-contributed reviews.

Though parasitizing would be more describing, we choose the term outsourcing when referring to the technique of using the functionality of foreign web services to satisfy the needs of our own applications. Any foreign source, which allows us to use its open web API can be utilized for outsourcing and may spare us valuable development time, as well as server space and computing power.

Simple, but common tasks, such as storing and retrieving images may be easily outsourced to Flickr, which professionally handles this task, while providing an unobtrusive and easy to use front-end. Managing image collections trough Flickr is done by tagging them with custom keywords, trough which we can retrieve a sort-able and pre-paged list of images, including thumbnails and additional information.

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[6] *hResume is the way μFs describe CVs.*

[7] *The friend-of-a-friend ontology is a descriptive vocabulary stored in OWL, providing a standard to describe personal relationships.*

For several years now this technique is promoted at concerts and other mass-meetings, where the hosts for promotion create mash-ups.

Geographical needs, such as for displaying maps, calculating distances and routing, are satisfied trough Googles Maps, Yahoos Placemaker, MapQuest, OpenStreetMap and others.

Office-related tasks, like document management, charting, or spreadsheet-calculations are handled trough services as Scribd, EditGrid, Googles Documents List, with new services being developed and old ones updated steadily.

The availability of several hundred published APIs (more than 1.400 published on the listing http://www.programmableweb.org) provides many possibilities for speeding-up development of our applications by outsourcing common or specific tasks. Through using open web APIs and a RIA approach, added value is created by mashing-up different services from different providers.

5 CONCLUSION: *FRESH, FANCY AND FREE*

With fostering the use of 3rd generation / semantic approaches when publishing information online, the web is evolving towards an open database, to which everyone can contribute and which everyone can consume. Unlike dealing with closed and controlled data stores, retrieving information from the web is more complex and requires new skills. Direct data sources have first to be located, eventually interconnected and harvested. They might even disappear or change without prior notice and their consumption demands powerful processing capacities as well as fast connection speeds.

As mashing-up crucially relies upon foreign servers and the provider's good will, it is by its nature a hazardous undertaking. While the web as we know it today is still prospering and established services are running stable, using this approach is FFF - "*fresh, fancy and free*", thus fully in accordance with the web community's expectations.

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Use of Enterprise 2.0 in Organisations

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ABSTRACT

Now that it has already been widely recognised and proven that using tools of the Web 2.0 technology, such as blogs, wikis and public nets, beneficially affects business successfulness of ***large organisation****, we shall make an attempt to assess what is their impact on business successfulness of* ***small organisations****.*

The tools of the Web 2.0 technology are of a recent date. Their implementation, though being simple, is much time consuming. The fact is that the speed at which they are generated is too fast for the business world to keep pace with them. In our study, our focus will be on implementation of Enterprise 2.0 which is one of the most power tools of the Web 2.0 technology foreseen for the use in the business environment. Our aim is to assess the impact of the tool both on the employees and on successfulness and trend of innovative ideas of the enterprises using it. Results of various researches have shown that benefits of enterprises from adopting tools of the Web 2.0 technology are improved development of innovations in parallel with a faster and more successful business operations. In our study we shall rely on results having been made available for the enterprises already implementing Enterprise 2.0.

KEY WORDS: Web 2.0, Enterprise 2.0, Blog, Wiki, Intranet, Business

1. GENERAL ABOUT THE WEB 2.0 TECHNOLOGY

Enterprise 2.0 was for the first time mentioned in 2004 by Tim O'Reilly and Dale Dougherty. Though the technology of Web 2.0 is not a novelty - but just a new way of using web by integrating various web technologies, innovations and its background – it represents a business revolution by enabling the use of the internet as a most valuable platform towards assurance of business successfulness. The main advantage of the Web 2.0 technology is offering its users to participate in complementing the existing and setting up of new contents. To allow individual users to contribute to the content, the Web 2.0 provides information and data of any possible subject and area of interest. The system offers categorisation and presentation of the content with the connected architecture. The information and data are made available in the form and location as (re)given by the user in an arbitrary context connected with other information and data (Kalejd 2005 *http://www.kalidej.net/*).

The Web 2.0 contents are poorly controlled by the web owners and are closer to the idea of Tim Berners-Lee- who wanted the web to be a democratic, personal and Do-It-Yourself communication medium permitting a shift from the static web sites and use of browsers towards a dynamic and interactive world wide web. Let us mention just some of the services of the Web 2.0 technology: EBAY.com is a well known shop and sale by auction on the internet, Google maps provide satellite photos of the Earth, iGoogle is a web site arrangeable by the users themselves, Amazon.com is the largest web bookshop, Huffingtonpost.com is a service offering news from different media, etc.

The Web 2.0 technology permits an individual production and user-implemented content using mass-generated knowledge, its data are generated in huge amounts, its architecture

enables collaboration, and it makes use of the net effect and constitutes an open system. Legal, political and cultural rules have also been laid down regulating access to digital contents. Further, the Web 2.0 technology supports openness, working with open standards, use of open-code programme tools and freely-accessible contents, reuse of the content and operation of open innovations. The Web 2.0 technology emphasizes the importance of using information and data from its large database filled-up by various services. There are discussions held among the academic and publishing organisations regarding the issue of open-accessing of scientific and humanitarian research activities (Frey, 2006). At the 2006 Open Business Forum, Tim O'Reilly expressed his conclusion that »the power is not in availability of data but in ability of controlling them. The reason which makes the Google data more accessible to their users is not that Google disposes of more data than the web but in its equipping data with "brain«!

For a traditional service - such as the DoubleClick dealing with advertising on the web, which is based on creating and not on co-creating of sites - it is necessary to conclude a formal web selling contract limited to maximally 1000 of large scale sites.

Google and Yahoo! have evolved from a graph of a long tail used in economy. The long tail is also a strategy of the Amazon.com which sells enormous quantities of one-off products, such as books, in small quantities and represents an aggregate power of small sites thus creating the major part of the internet content and sale. Google and Yahoo! also enable advertising of any site whatsoever with no involvement of any agency or pop-up windows. They both allow for user-friendly advertising on the side of the computer screen contextually connected with the topic being read on the web.

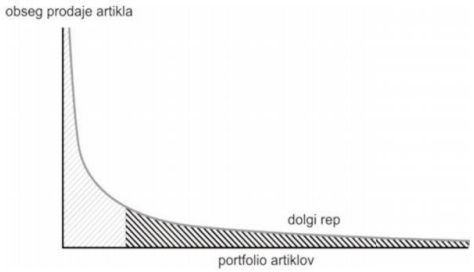

Figure 2: Demand graph (Management e-business 2008)

2. ENTERPRISE 2.0

Enterprise 2.0 relies on the use of the public software of an organisation, integrates its public and net changes and programme platforms used for communication, designates business practices and public web tools, such as wiki, web communities, blogs, micro-blogs and similar, with the target of improving the efficiency of its working processes and capturing the collective intelligence of its employees, business partners and customers. Enterprise 2.0 has been defined Andrew McAfee at the Harward Business School as the use of »**emerging public «** programme platforms inside an organisation so as to allow for acquiring, connecting, and collaboration of users by using computer-mediated communication and for forming a web community. Digital platforms present contributions and interactions seen and existing all over the web. The software that is being developed means that shapes and structures are at its adoption not yet seen; they develop later on. The shapes which are at the beginning non-formal can become inherent in community interactions. The use of the software is not obligatory, the work procedure is not determined in advance, it is unprejudiced and non-

discrimination in towards organisational identities, it has no in-advance determined rights and is capable of accepting various kinds of data. The Enterprise 2.0 technology employs tagging, folksonomy and tools such as the Technorati.com browser, free Flickr.com photo album, Digg.com for adding connections to news and the Delicious.com web site foreseen for making web notes.

The traditional access disposes of an autocratic system. The information is stored beyond the reach of people that are potential collaborators. Such an example is the ERP - Enterprise Resource Planning. For the reason of its rigid structure, it requires certain knowledges and an unambiguous course of business. Some of the traditional tools are intended for the entire organisation. For instance ECM (Enterprise Content Management) is a system for management, acquisition, storage and retention of ERP-related information and documents. It allows for management of non-structural information irrespective of where it can be found. The system is successful if any of the persons employed is able to use it. In most cases, its failure is due to the employees' lack of knowledge of how to use it. It is already at the time of their adoption that the standard platforms, i.e. management systems, information portals, intranets and »workflow« applications, require a high level of the structure.

The approach with the »**evolving** « platforms is a work starting from the bottom to the top. It enables the system to expand horizontally, it has fewer limitations and is a tool of »workers of knowledge « mastering high-technology professions and being specialised managers and technicians. Consequently, Enterprise 2.0 does not enforce perceptions of how to proceed with work and of how a certain production should be categorised and structured. It is horizontally flexible with a user-oriented technology, has open limitations, global teams and its market accessibility is simple and direct.

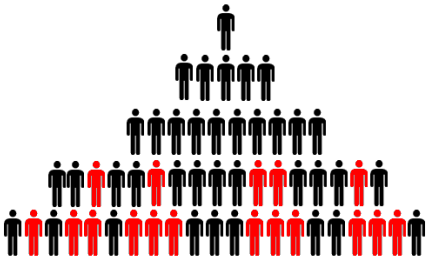

Figure 6: Evolving structure of integration into Enterprise 2.0 (Infovark.com, 2007)

Components of Enterprise 2.0 are: searching tools, connections – links, authorships, tags, additions and notes. Activities of Enterprise 2.0 take the following course. The author creates the content which is then connected by connections and tags. The browser, additions, tags and notes make these evolving structures and patterns visible and assure that they are constantly updated. Enterprise 2.0 uses different tools, such as blogs or weblogs, which periodically display texts, figures and other elements as added by different authors. It is characteristic that the use of blogs is simple and that they can be co-created even by user equipped with modest computer knowledge. In a blog, the author or a group of authors open a discussion which is then commented by visitors of the blog.

A blog used for business purposes can either be of the internet type, e.g. for internal communication in an organisation, or of an external type, e.g. for marketing. Wiki is a collection of web sites enabling accessing, editing, changing and adding the content with a simplified html and is used for releasing documents for the web site and for initiation of web sites of a certain community. A known Wiki service is Wikipedia which is a web

encyclopaedia laid down through collaboration. Wikis are used in activities assuring the intranet and systems for knowledge management. Ward Cunningham, the author of WikiWikiWeb, has described the Wiki as »a most simple database on the net that truly operates«.

The first to use the Enterprise 2.0 technology was the Dresdner Kleinwort Wasserstein bank dealing with investment banking. The structure and composition of Wikis differs from one organisation to the other.

3. IMPACT OF CONNECTIONS TO ENTERPRISE 2.0.

There are several types of connections with which an employed worker of knowledge working in a geographically distributed organisation can be connected with other workers:

- Strong connections – a worker establishes connection with a small group of people who are her/his close co-workers.
- Weak connections – a worker establishes connections with people she/he knows poorly.
- The worker has no connection with a large group. Had such connection been established, it would have been useful.
- The last type are zero connections. Even if established, they would have been of no use at all. By using the Enterprise 2.0 technology, these connections might become very useful in the business sense.

In the **strong connections,** any of the following tools can be used in Enterprise 2.0: Wiki, Google Documents and similar. Wiki and Google Documents offer a higher level of productivity, greater flexibility of the service rendered and an improved responsiveness. An example of the successful use of the Wiki service is the VistaPrint Company. In eighteen months following its adoption, there were 280 users registered on the internal Wiki with 12 000 sites and 77 000 instances of site editing.

For the nets or **weak connection**, Facebook, Twitter or a net specially made for Enterprise 2.0 can be used. Their advantages are non-redundant information and connections to other nets. They provide information that would have never been obtained otherwise. Messages in Twitter cover maximally 140 words and enable connections to other nets. Participants exchange their re-tweets[1] with which they form a new net. Public nets, Twitter and Facebook give answers to questions put in the net. The number of thus obtained answers can be considerable.

Example: D Street in the Deloitte LLP Company. The company's management proposed to their employees to form a Facebook account. They adapted the Facebook Wednesday. On this day, the employees were asked to come to work dressed in their leisure-time garments. Each employee was taken a photo of which was then published on the Facebook profile. Results of this non-obligatory idea were:

- 90 % of the employees set up their own Facebook profile,
- 50 % of the employees became active users of the service several times a week, and

[1] Re-tweet is a re-published message on the twitter service. It is published by a user wanting to send to her/his users a message written by somebody else and believing that it would be interesting or useful also for her/his customers.

- 25 % of the employees turned into very active users of the service using it several times.

The company improved the level of connectivity among their employees and with the external world as well as their reputation and respect. Research findings prove that there is a strong interdependence between the rate of the company successfulness and their internal connectivity.

Successfulness of remodelling **potential connections into actual connections** considerably depends on the active internal blog-sphere of an organisation. By establishing a blog-sphere and by using an efficient browsing tool, a tool is obtained providing information about interest of certain individuals into specific topics. The result of the use of the blog-sphere and twitter are innovations, useful arbitrary discoveries and connections to other webs. As an example, let us mention the Intrawest Company *(http://www.socialtext.net, 2009)* enabling their employees to blog.

Zero connections are among employees not knowing each other and having nothing to talk about. At such a stage, using Prediction Markets that make use of the knowledge of masses can be very efficient. The method of benefiting from the knowledge of masses is named Prediction Markets.

4. PREDICTION MARKETS

Prediction Markets are speculative and fictitious. They are formed with the target of implementing predictions by means of which an attempt is made to make a marketing assessment of something currently not yet available on the market. The final value of the means to be used for this purpose depends on a specific event or parameter.

The figure on the left illustrates the case of the external Prediction Market of the Intrade Company. The upper figure predicts the bankruptcy possibility of the USA car-manufacture giants until 2009, and the bottom one the probability rate of deposing or resigning of Tim Geithnerja from his function of the USA minister of economy by June 30, 2009. The graph in the right figure assesses the possibility of election of Barack Obama, the blue line, and John Mccain, the red line, for the USA President over a certain period of time. The graph shows that it is characteristic for the markets that when new information is made available, values change for the reason of prices being dynamic. As shown from examples, Prediction Markets are at least as precise as predictions released by institutions predicting the same events covering a similar scope of participants.

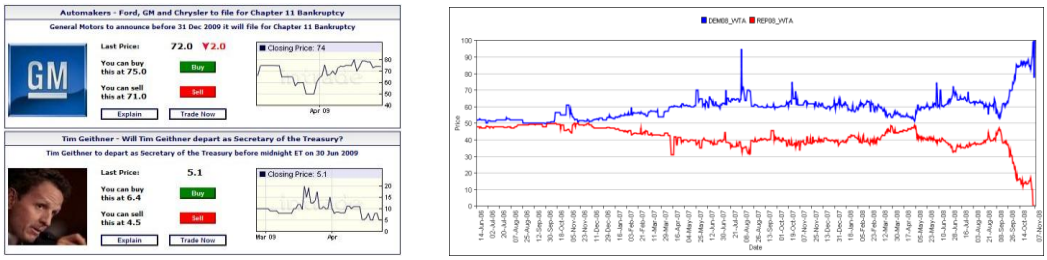

*Figure 9: Left, an example of the Intrade Prediction Market (http://intrade.com, 2009,) and right, a prediction graph for the 2008 USA presidency elections made with the Iowa Electronic Markets (*http://iemweb.biz.uiowa.edu/graphs/Pres08_WTA.png *, 2008).*

As far as we are concerned, we are above all interested in the Prediction Market inside the organisation. A transparent example is the case of the Rite-Solutions Company developing software for the USA Navy Forces. It is the right of any of the persons employed with the Company to propose for the internal market to purchase a novel technology, contract a new business or improve efficiency. Such a proposal becomes a share with which the Company's employees trade. The prices of these shares vary thus reflecting perceptions and positions of engineers, computer mastering personnel, project managers, salesmen, accountants and even receptors. It is characteristic that in companies dealing with the technology of the kind the most brilliant ideas are those of the non-managerial personnel. In this way, the market of successfulness evolving from a common knowledge is created. The possibility for innovations is assured in the direction from the top to the bottom stimulating any of the persons employed to think about new ideas. The Rite-Solutions architecture captures collaboration, business and entertainment. On their internal market they have fifty-five shares, which they call "common entertainment". The initial price of such a share is 10 $. Further, the company offers to their employees 10.000 $ of the »opinion money« to be spent for investment purposes, this being at the same time some sort of a voluntary work on a project. If thus obtained share becomes an actual product or if it ensures a certain saving, the investors partition among themselves the revenues in the form of real money. The Prediction Market, which has been used from 2005 onwards, has brought around considerable profits. Such an example is the share of VIEW permitting a three-dimensional visualisation technology as an aid to sailors and for teaching the occupational-safety personnel in their decision-making processes under emergency states. This policy has generated the Rite-View product representing 30% of the total company's sale. Another advantage of the Prediction Market is the possibility of getting a good idea from hardly probable sources. The Company's secretary with no technical education proposed to use this technology for education purposes with an entertainment environment for teaching mathematics and history. In this way she launched the WPL (Win/Play/Learn) share. The final result was the VuGo multimedia system presented at the end of 2005. If there had been no availability of the Prediction Market, this innovation would never have been accomplished.

New services of Enterprise 2.0 connect the overall organisation that had formerly been partitioned into several parts on the intranet. The worker of knowledge operates with two categories of the information technology being used in organisations. The first are **channels for mutual communication,** such as e-mail, messenger, and the second are the **platforms**, such as the intranet, web sites of the organisation and information portals. Unlike is the case with the channels, the platforms are visible to anybody working in the organisation.

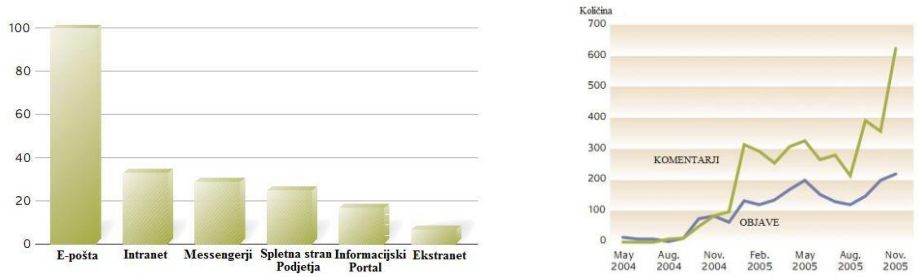

Figure 22: On the left, presentation of the current use of various categories of the workers of knowledge (T. Davenport, Thinking for a living, 2005) and on the right, the increase in the level of blogging in the DrKW Company (The dawn of emergent collaboration, 2006)

New technologies allow for capturing practices and effects. Figure 22 depicts the current use of various media or technologies. Findings of the Davenport's research give evidence that the

questioned workers of knowledge use e-mail, whereas the use of any other technology, such as intranets, various messengers and other portals very much lags behind, this being despite the fact that the Enterprise 2.0 tools are more efficient than e-mail and constitute a permanent collection of generic data.

The research made at the NASA and the Sabre Airline Solutions Company has brought to light data from which it is seen that most of the questions, precisely 93 % , raised by the NASA staff on internal public nets were answered by employees not working in the sector asking the question. In the Sabre Company they came to the conclusion that as much as 60 % of the raised questions were answered within an hour and that each of them was answered by nine people on average.

5. PREDICTIONS

Abroad in general and especially in the USA, the speed at which the use of the Enterprise 2.0 technology has been increasing is tremendous. According to results of the Forrester research, by 2013 Enterprise 2.0 will be a 4.6 milliard $ industry. In 2008, all the companies with minimally 1000 employees devoted 764 million $ for the Enterprise 2.0 technology and tools. The annual rate of the increased investments into this technology in the next five years is assessed at unbelievable 43%. The major part of these investments will be reserved for the public nets. In 2008, organisations invested into these tools 258 million $. The next to follow are RSS, blogs, wikis and mashups.

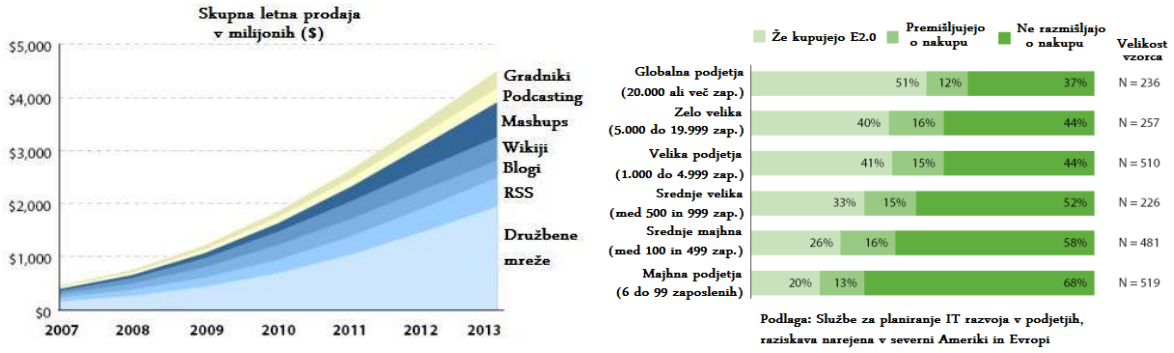

Figure 25: On the left, forecast of the growth in the use of the Enterprise 2.0 technology, and on the right, research in implementation of the Enterprise 2.0 technology by organisations (as assessed by the »Forrester Research«)

The greatest challenge imposed on investing into novel technologies will be redirecting 70% of the total planned investing foreseen for maintaining the old technologies. The conclusion drawn on the basis of a research conducted by the Forrester Research is that the greatest interest into the Enterprise 2.0 is in large companies. This is mostly due to dispersion of their organisations around the world. There is less interest in them in small companies for the reason of their budgets.

The risk to be copped with in adopting Enterprise 2.0 is safety of data. For an open system, this is quite a considerable challenge. After an organisation allows downloading of contents on the intranet, it is hard to prevent evil-minded databases to access the system network.

Andrew McAfee believes that the most frequent concern of managers is the risk of disclosing confidential data. Nevertheless, this is a risk that is hard to be controlled since information or

data may travel out of an organisation also through other means, such as e-mail, usb drives, copying machines and similar. A company can provide a restricted access over various sectors as has been the case with the US IC. Andrew McAffee knows no other company that would have introduced greater safety measures than the US IC where they came to an important conclusion that advantages of data sharing with other agencies outweigh safety issues. In the end, one should be fully aware that it is the very feature of accessibility of data and information that constitutes the extraordinary advantage of this technology.

There are always some of the participants in Enterprise 2.0 who are not sufficiently competent to use it adequately. To control, or avoid, the release of contents created by the company's employees expressing their views and opinions which are non-productive, it is necessary to allow for a-priory discussions and argumentations so that only useful contents are given the green light for release.

Enterprise 2.0 cannot be efficient if the employees do not use it and do not adapt to it their working habits and manners. The companies who have adopted Enterprise 2.0 have encountered no difficulties. To prevent the employees from releasing in their blog texts a hostile speech, pornography or if they use them for molesting their colleagues, the company should adopt a corresponding regulatory by means of which this issue can be quite easily controlled.

Another issue to be solved is the risk of the organisation to loose control over information streaming. The company's management no longer controls information streaming in the organisation since these are the employees themselves that create information on the intranet, unlike is the case with the old model. This is not bad due to the already available practice of high-level non-structured internal communications.

In case of an excessive release of videos on web sites, there is a risk of slowing down the internal and external net and of incurring some extra costs. If such be the case, there should be restrictions imposed on the release capacity for each sector and for each individual separately.

6. CONCLUSION

A good intranet is a heart of a successful organisation. Organisations with workers of knowledge must provide themselves with adequately capable and user-friendly internal software. If this is not the case, their applications might be useless and in certain cases even harmful.

In our study we mostly followed published results of various researches and study cases addressing the use of Enterprise 2.0. Our definite conclusion is that it is important for small companies, too, to use this powerful technology in their aspirations to be successful.

We agree with those who claim that the still used outdated internal software cannot compete with Web 2.0 assuring an incomparable data traffic and that it obstructs the company's progress. There are many cases in which persisting to use the old technology has resulted in disastrous consequences.

In the enterprise environment, Web 2.0 has freed itself from rigidity characteristic for old technologies. It simplifies browsing, reading, writing and stimulates creative thinking inside

the organisation. Moreover, besides their ease of use, the Web 2.0 tools do not predetermine the structure since they know no directors, managers and other employees. These tools regard employees of any ranking as being equally important thus facilitating discussions and argumentations on various levels and stimulates those who in absence of these advanced technologies would not have had the opportunity to comment ideas of other employees, express their own ones, or, in the worst case, they would not have had any idea as they would not have known what the issue to be solved is.

The favourable impact of the Web 2.0 technology is by all means stronger on large and geographically widely distributed companies since it enables their employees to get connected among themselves and the working teams to work remotely. Despite the fact that the impact of this technology is less beneficial on small companies compared to the large ones, its numerous advantages definitely speak in favour of having it implemented in them, too.

Benefits from using the Enterprise 2.0 are already assessed as being considerable despite the fact that they are not yet entirely known since this technology is still in the early stages of its evolvement. Not before long, using it will be indispensable. Though it did not take much time for the first users of this technology to enjoy its beneficial effects, its absolute value will be discovered after concentrating the vast knowledge of large masses, from which this technology has evolved, on the intranet. The greater is the downloaded content the more powerful are the Enterprise 2.0 tools.

The trend at which the new technologies evolve is clearly visible and extremely steep. There are more than a half of the global companies that have already equipped themselves with the Enterprise 2.0 tools.

There have been no reasons given against adoption of the Enterprise 2.0 tools. Two of the major concerns remain to be safety and confidentiality of data and contents released on the intranet.

To sum up, there is absolutely no doubt that by having the Web 2.0 technologies appropriately implemented, business operations of companies will be improved and will be more successful compared to those used in the time of rigid technologies based on scarce content and user-unfriendly environment.

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ICT in bussiness / e-commerce

Social networking

Web 2.0

Society 2.0 - networking human potential

Faculty of information studies

Improving customer configuration update process for enterprise application software products based on meta-data

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ABSTRACT

Installation, configuration, updates, and continuous support of enterprise application software for large customer base become extremely complex because information about the customer specific configuration details and customizations are maintained separately using different formats from the enterprise database. It can be greatly simplified by maintaining customer specific configuration details and customizations in the proposed meta-data formats that not only drives the enterprise application but are also used by the configuration/update tools. Meta data that drives an enterprise application can also be used to greatly simplify installation, configuration, updates, and continuous support of enterprise application software for a large customer base when used to communicate with the configuration/migration tool. This paper presents a detail overview of meta-data base application and Customer Configuration Update process.

1. INTRODUCTION

Customer configuration update process and continuous support for enterprise application software is a complex task for software vendors having large customer base. Customer specific customization increases this complexity even more because information about customer specific configuration detail and customization is maintained separately using different formats from the enterprise database.

It is impractical to develop a perfect software system that neither needs correction nor changes. Useful application software has to undergo changes continuously on timely bases.

Maintenance of legacy software is often performed in-house or by the vendor having few customers. Enterprise application software is complex because of its scope, architecture and functionality. The complexity of application software framework makes it difficult to keep different versions or variants for multiple customers. Installation, configuration, updates and continuous support for enterprise software applications become extremely complex because of customized requirement of users. It is also difficult to maintain the tool which can handle different configurations at a time.

This research attempts to solve the problems of both the vendor and the customer by providing a single framework consisting of metadata for enterprise applications. The combined metadata would solve the existing problems originating due to the information of the customer specific configuration details and customizations being maintained separately from the enterprise database using different formats. Process of Installation, configuration, updates, and continuous support of enterprise application software for

large customer base can be greatly simplified by maintaining customer specific configuration details and customizations in the proposed meta-data format.

Our proposed metadata framework consists of storing application information and the customer specific solution in units of metadata that we call *Attrs* (for attributes). This metadata consisting of *Attrs* drives the application as well as the customer configuration process. Convenient availability of this metadata for running and rendering the enterprise application is also used to customize the rendering according to customer specific installation and configuration. The problem of propagating updates and supporting them reduces to maintaining the integrity and consistency of the metadata.

2. ISSUES AND PROBLEMS

Maintenance of enterprise application software product is a research area of common interest for both the vendors and the customers. We found following problems and issues related to research, and divided these into four categories.

- Complexity of Deployment, maintenance, updating and continuous support of enterprise software applications at large number of customer base.
- Complexity of release, delivery, and deployment to large customer base.
- Lack of tools/techniques to fulfill all requirements of software configuration update process.
- Ad-hoc solutions for dynamic deployment and reconfiguration and non availability of online Non-stop software update.

Customer specific customization makes the process of enterprise application maintenance, update and continuous support more complex because information about customer specific configuration detail and customization is maintained separately using formats and databases different from the enterprise database. Development of customer configuration tool also becomes difficult because it has to maintain customer specific configuration detail and customization information separately from the application related information. There is no commercial tool available which can fulfill all of these requirements. Because of the above mentioned problems several processes of CCU are still performed manually, which not only makes the process of release, delivery and deployment more complex but also costly.

Increasingly web applications specially related to e-commerce are moving towards non-stop updates. There are online financial transactions involved in e-commerce. Downtime of these services or servers means financial loss or maybe business loss. To avoid these losses there is need for frameworks/approaches which can support online updates of these e-commerce applications, services involved, and operating system of servers running these services without terminating or shutting down while maintaining customer specific customizations.

3. EXISTING APPROACHES AND METHODOLOGIES

Existing approaches can be divided into four categories related to development of tools, theoretical frameworks, models, and prototypes.

Deployments, maintenance, update and continuous support for enterprise application software having large customer base is a complex because of its architecture and integration. This complexity can be resolved by creating a Software knowledge information system. A useful knowledge base can be created by integrating the CRM (customer relation management), PDM (product data management) and SCM (software configuration management) having exhaustive information about all software artifacts and their constraints [1, 4]. This solution may resolve the complexity of software distribution, activation and update but may not cater to customer specific customization for large customer base. Our proposed solu-

tion, however, performs distribution, activation, and update but also handles customer specific customization for large customer base. Metadata based knowledge system is a built-in feature of our solution.

Managing evolution of released and deployed product, process of release, delivery, and deployment are complex and vendors do not put-in enough efforts which leads to high overhead per customer, which impedes growth in customer numbers [4], [5], [6]. A survey and evaluation has been conducted for existing different type of tools for software product update (generic and proprietary) and key practices of product software vendors, several weaknesses have been found, among those few are related to efforts, some are due to lack of process descriptions and some are due to CCU tools. To remove these weaknesses, organizational and architectural changes are proposed to increase quality of service and product quality. Main cause of this complexity is lack of linkage with the framework used to develop application software. By using meta-data based development approach these complex tasks can be performed in a simplified manner.

Due to availability of increased internet bandwidth un-interruptible online deployment and update process is required [7], [8], [9]. To support uninterruptable update process for e-commerce applications, services and servers running these services following solutions are presented. A software dock system framework is based on loosely coupled, cooperating, distributed components. This system provides release dock that acts as a repository of software system release. The heart of release dock is a standard semantic schema for describing the deployment requirements of software systems and the field dock component of the software dock supports the consumers by providing an interface to the customer's resources, configuration and deployed software systems.

Difficulties persist in maintenance of ERP due to insufficiency of existing software maintenance standards [3, 10]. These approaches present a preliminary ERP maintenance model in the light of deficiencies of IEEE/EIC standards.

3.1 Related Work

Large part of CCU processes is still performed manually, such as quick fix distribution and deployment, license file creation and error feedback. It is possible to reduce this complexity by developing a knowledge system which can have complete information of all artifacts and constraints of software, and web based delivery, deployment, upgrade and replacement of software components is also recommended. The ISKB (Information system knowledge base) that contain all facts about all artifacts together with their attributes, relations and constraints is developed by integrating the knowledge with PDM, CRM and SCM systems, optimizes the process of maintenance, delivery, and enables vendor to serve large customer base. It is possible to simplify this process even more by adopting proposed framework for development of enterprise application software. By using meta-data base application development framework knowledge base can be created and implemented cost effectively [2], [11].

After choosing framework for application, there is a need for CCU tool to communicate between vendor knowledge base and customer repository. Choices available with vendors are to buy general product updating tool or build proprietary tools, unfortunately both approaches have significant problems, on the one hand general product updating tools cannot provide all the required functionality and on other hand efforts and risk of building product update tools in house often underestimated. Most popular software updating tools/techniques are evaluated according to their process model and typology. Process description of CCU are presented using model and eight descriptive studies are performed. Release, delivery and deployment processes can be performed and CCU tool can be easily developed for applications developed in proposed framework. This tool is not only easy to develop but can be helpful to perform these processes cost effectively even automate these processes [1], [5].

4. PROPOSED FRAMEWORK

An application typically has forms, database and reports. Our metadata framework stores information related to each field or control (checkbox, textbox, combo, button etc.) or business rule(s) of a form or report as an *Attr* (attribute). Currently, all *Attrs* of all forms are stored in the same table. These *Attrs* have all the information required for building the form and creating, populating and setting up control and interaction with database for adding, updating, deleting of transaction information. We want to reduce the problem of managing the configuration of two versions of an application to a problem of managing the consistency of the meta-data related to these versions.

Following diagram shows the development technique of meta-data base application.

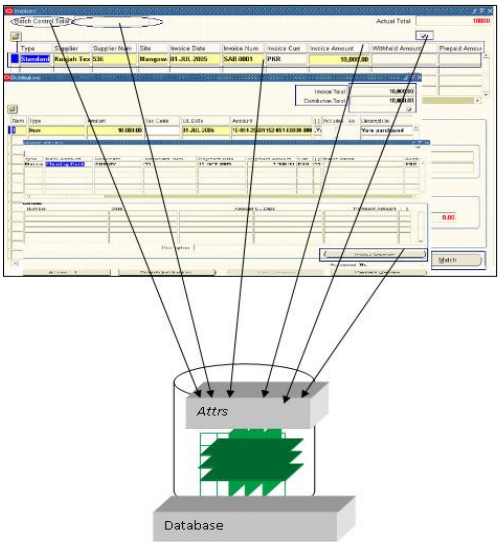

Figure 1: Meta-data base application

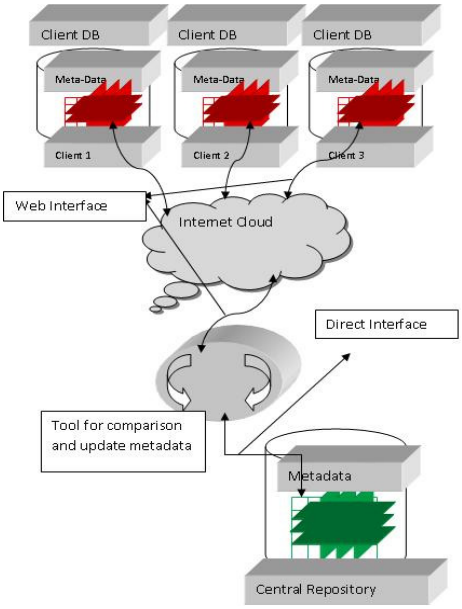

Figure 2: customer configuration update process.

This is possible only if we assume that the metadata table of the application has all the necessary information required for rendering the forms, their controls, and their binding with backend database. We propose that just as all information stored in a database must be represented and stored in the form of tables (relation), similarly we insist that all the application forms and interactions must follow a modified version of Peter Coad transaction patterns and their information be stored in the form of *Attrs*.

Information maintained by each *Attr* of a form consists of fields or properties such as the following:

Unique ID	Control Type	Column Width
Name	Client Lable	Client Column Width
Define ID	Mandatory	Column KeyID
Designe ID	Client Visible	Agg Sum From
Type ID	Enterable	Client Derived
Group	Is Saved	Rounding Type
Sub-group	Is Derived	Rounding Factor
Lable	Default Val	Client Rounding Factor
Visible	Client Default	Value Range
Editable	Column No	Is save mode
Operator	Is Optional	Client Mandatory
Operand	Is Locked	Binding with Table
Type	Is Orderable	Client Editable

Table 1: Information maintained by each *Attr*

Assumption is that such properties and their allied data should be sufficient for rendering the forms and operations related to them. All forms, their controls (captions, text box, checkbox, buttons etc), and business rules used for business transactions are *Attrs*. All of these *Attrs* are incorporated in a table with all of their properties required for building the form and creating the control, populating the controls, and setting up the interactions at run time with the database for adding, updating, deleting of transaction information. By doing this we create a metadata for application in the database. All changes required in application are controlled through this metadata. *Attrs* are also reusable, for example customer name column used on invoice form can also be used on order form or any other form within or outside the module.

According to figure 2 shows the working of customer configuration update process for application developed base on meta-data. The metadata table of central repository (source) will always be updated metadata. In the metadata of client repository (target) there can be two types of *Attrs*, (1) Common *Attrs* (standard application) (2) Client *Attrs* (customer specific customization). The customer configuration update tool has two options available (1) compare source and target database and generate script for update which will be used for review and update can be made at both end through this process. (2) Target database directly updated from source database, in this case utility will update target database from source database with mismatch founds in target database from source. In detail we have four main objects of database namely tables, views, store procedures and *Attrs*. Utility starts with comparing of tables at database level, 1st counts the number of tables and compare them with source repository, if mismatch found, we assume that source repository is updated repository and target repository needed to be updated. There can be a different type of mismatch i.e. client has less number of tables, client has greater number of tables or may be number of tables are equal at both end but there are other changes. After database comparison, utility starts comparing at tables level. Utility compares number of columns, names, size of column and other properties with source and update these as required. At this level we have decided that we will not drop any column from source. In this scenario we are updating database by updating its attributes instead of replacing it with updated database. Due to this activity client data remain intact and there is no need to make backups. We can divide tables used in system in following three categories. (i) System tables, client is not allowed to make changes in these tables. (ii) Data tables, fully for clients and (iii) setup tables partially allowed to clients for making changes, i.e. Currency table, in this table we have already updated currency for some countries but user is also allowed to update it further more. Now during updates system tables are updated directly from updated source, for client tables we need to update their properties and same process is applied for partially allowed tables to client. Same methodology is applied for rest of the objects. As all *Attrs* are in a table so, it becomes possible to update structure as well as application by using this utility.

5. FUTURE WORK AND OPEN ISSUES

Customer configuration update process and continuous support for enterprise application software is a complex task for software vendors having large customer base. Improved customer configuration update process for enterprise applications is the research area that needs to be the focus point of product software vendors for enterprise application software. This paper proposed a framework for software application development to simplify the process of customer configuration update. The utility based on the proposed framework uses the meta-data information for upgrading the client database to the stat of vendor's canonical database. This improvement helps the software vendors for increasing their customer base and achieving financial goals.

The future plan for this work is to implement the prototype of this tool with other related supported requirements. Meta-data based developed applications will be used to verify the effectiveness of this tool.

6. Conclusions

This research identified that there is no single solution available to fulfill all the requirements of customer configuration update process for enterprise application software. Solution presented are component level solutions, however we proposed a solution with respect to customer configuration update process by describing the concept of *Attrs*, and working of CCU process for applications developed based on meta-data. Proposed framework helps in reducing the upgrade efforts for a large number of clients. Customer configuration can be queried and updated using simple database queries. Meta-data repositories would help in the delivery of software as service (SAS) concept. It will also be helpful for software vendors to increase customer base and strengthen relations with their customers.

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“Pro-Check Hazard” Software Tool for Hazards/Harms Identification for Risks Assessments at the Workplace and in the Work Environment

Matija Sokola[1], Dušan Gavanski[1], Zvonimir Bukta[1]

ABSTRACT

The recent Serbian regulations prescribe the procedures for conducting identification of hazards and harms for the creation of the Act of Risks Assessment at the workplace and in the work environment. Risks assessments require systematic identification of all potential hazard sources at all workplaces. Such inclusive approach enables the recommendation of effective corrective and preventive risk management measures.

The diversity of work processes and work activities that risk assessors are encountering in different companies can result in omission of some hazards, which has a negative impact on the validity of the risk assessment. This paper presents a software tool which serves to risk assessors both as a notepad to collect various data and as a checklist to help in comprehensive identification of hazards and harms. The first version of the developed software tool is aimed at woodworking workshops of different sizes.

Key Words: *occupational safety, software tool, Microsoft Access.*

1 INTRODUCTION

The new Law on Occupational Safety and Health (OSH) defines the obligation of every employer to conduct the assessment of risks at the workplace and in the work environment (Law, 2005). The process is defined in (Regulation, 2006), hence every Act on risk assessment must have the prescribed elements. The Regulation also gives a list of 39 possible types of hazards and harms. However, there is freedom to apply any recognized methodology for either qualitative or quantitative assessment of risk at the workplace.

In order to start the process of risk assessment, it is necessary to collect various data on company, work processes, machinery and employees. For every organisation, it is necessary to systematically gather information on the following (OSHA, 2006):

- where the workplace and/or the jobs performed are located;
- who works there (regular workers, pregnant women, young workers, workers with disabilities, part-time workers, subcontractors, visitors and those who work off – site);
- what work equipment, materials, and processes are used;
- what tasks are performed (e. g., in what way and for how long they are performed);
- what hazards have already been identified, and what their sources are;
- what the potential consequences of existing hazards are;
- what protective measures are used;
- what accidents, occupational diseases and other occurrences of ill-health have been reported.

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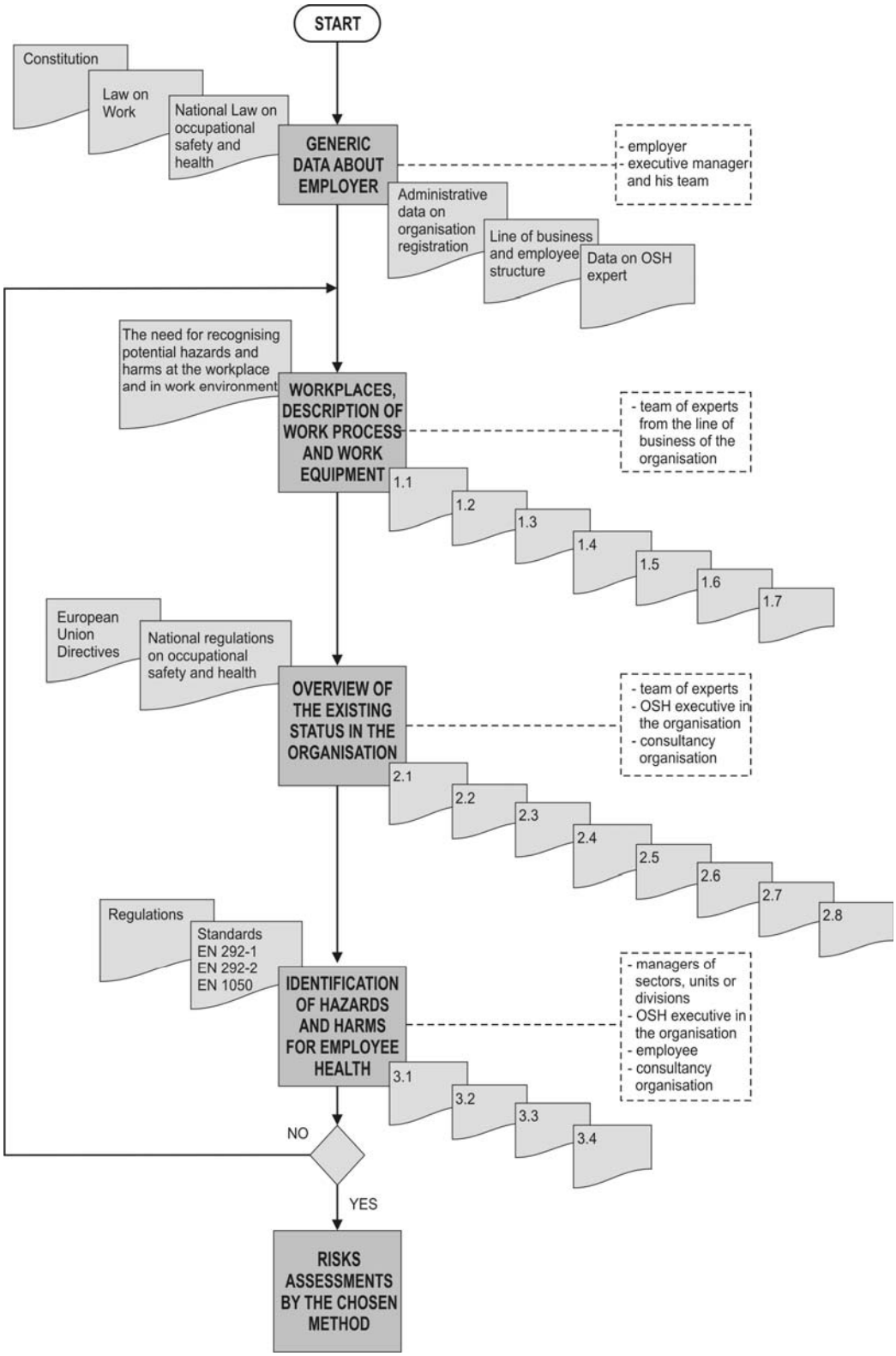

Figure 1: Regulation – prescribed procedure for hazard identification and risk assessment.

Figure 1 gives an overview of the procedure for collecting data (generic and workplace-related), recording the existing safety status, identification of hazards and harms and risk assessment. If

complex work processes are coupled with a large number of employees, amount and diversity of data to be collected and analyzed grow rapidly. Hence there is a danger of omissions and oversights, which can compromise the overall validity of the risk assessment. This paper presents the basic ideas of a software tool named “Pro-check Hazard”, aimed to help the risk assessors to collect all the necessary data and identify all potential hazards and harms.

2 THE DESCRIPTION OF THE DEVELOPED SOFTWARE TOOL

The software tool “Pro-check Hazard” is a portable multiplatform solution. Risk assessment is a team effort, with the pronounced need to share and exchange data between OSH experts, technology experts, managers and employees. Therefore, the software tool was developed in Microsoft Access and easy for use for advanced users and novices alike. It is designed in a simple way, with the main menu, four further menus and many sub-menus. Often it is possible to reach a specific sub-menu through two or three different menu paths.

In essence, this software tool combines the following:
- it is a development platform for initiating suitable OSH-related databases,
- it follows the prescribed procedures for collecting a wide range of data,
- it helps the risk assessors to organize and classify the gathered data,
- it reminds the risk assessors to consider all possible hazards and harms,
- it gives the possibility to use existing or to create new checklists to identify hazards and harms,
- it gives possibilities to select existing or add new risk reduction measures for every workplace,
- it offers different ways and formats for documenting the hazard identification process.

As it can be seen above, the underlying crucial feature is the flexibility for the users to adapt the whole tool to the specific needs of every risk assessment process for every workplace within the analyzed company. This makes it equally efficient for small enterprises and very large companies. For example, for every workplace, the user can select the hazard checklists from the existing set (and add detailed description or comments), adapt the existing checklist or even define a completely new checklist. In this way the user is given a freedom to tailor the software tool to every work position, to every production line, to every workroom and/or every building.

2.1 The main menu

In accordance with (Regulations, 2006), the first step is to gather a wide range of data about the company – legal registration, work processes, personal protective equipment, history of injuries at work and known hazards/harms. Therefore the main menu, shown fig. 2, is organized in two possible layers: the four main menus are located in the middle, while the direct links to sub–menus for entering the detailed data are available on the left hand side. The underlying idea for this is that user enter the generic company data and compile a list of workplaces during the first usage session, while in later sessions they can jump directly to retrieve, amend or add detailed descriptions of already-entered workplaces.

2.2 The description menu

For each workplace, it is necessary to enter data on work process, work equipment and personal protective equipment. The corresponding menu is shown in Fig.3. First the software tool retrieves one of the already-entered workplaces and then allows the user to open the sub-menus for entering

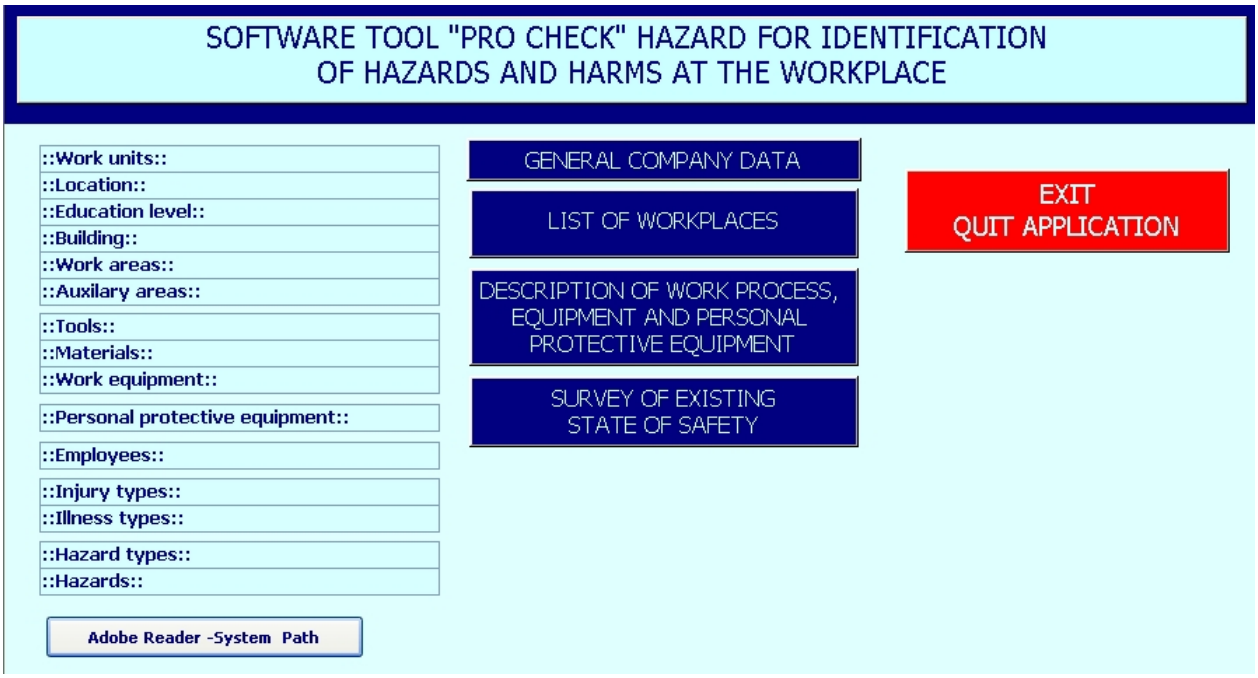

Figure 2: Screen capture of the main menu

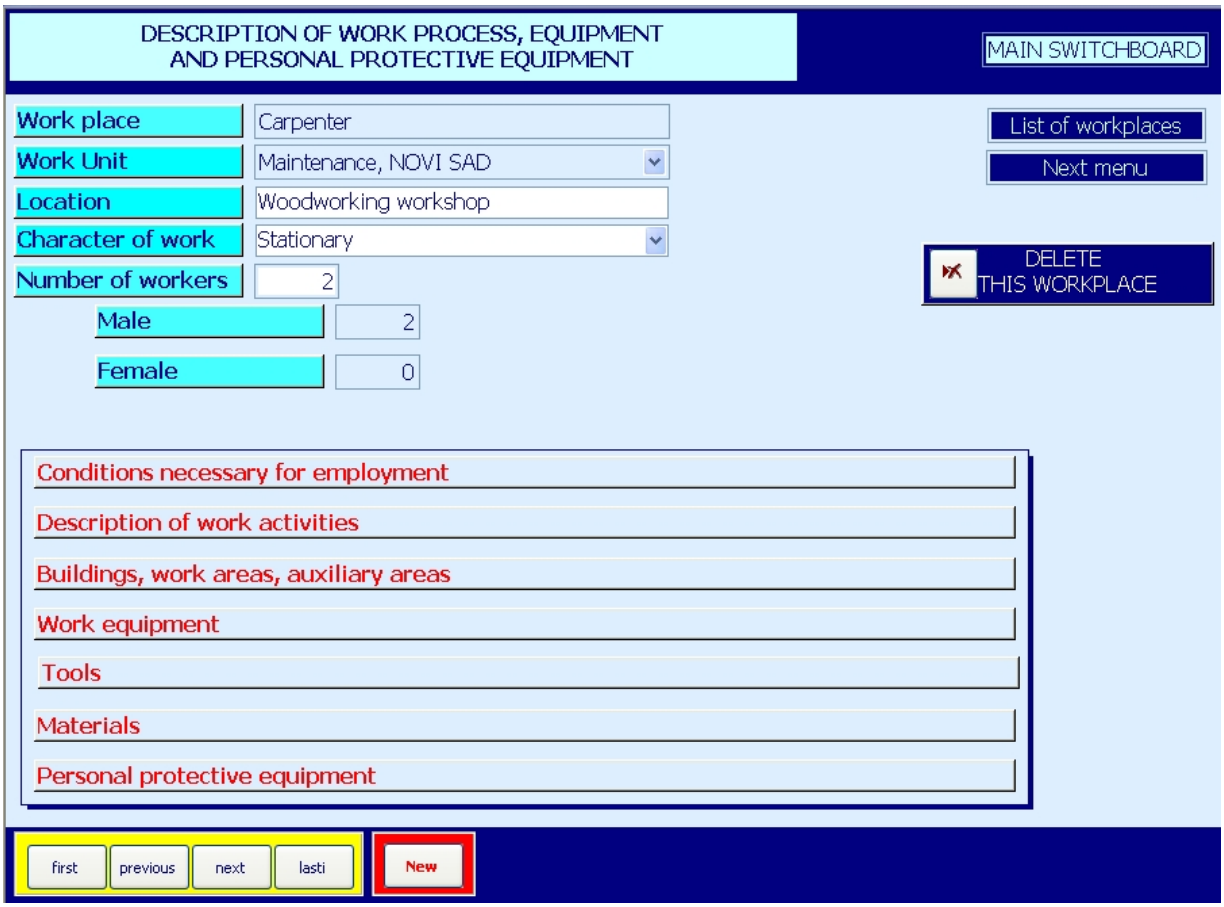

Figure 3: Screen capture of the process, equipment and PPE description menu

the particulars linked to that workplace. Some information (work unit, for example) is entered via drop-down menus, whose fields are already defined in the previous step while some is entered by typing text as the assessors phrase it (description of work activities). Sub-menu “work equipment” has the possibility to import pictures and/or .pdf files of equipment documentation. Additionally, in the left bottom corner there are buttons (first, previous, next, last) to navigate through every workplace entered, so the information for all the workplaces are systematically entered and none can be skipped or accidentally omitted.

2.3 The survey menu and hazard sub-menu

Once the detailed description is completed for one, some or all workplaces, the next step is to undertake a survey of the existing state of safety, by collecting data or entering information and observations in 13 sub-menus, as shown in Fig.4. Again, one of the already-entered workplaces is retrieved and the sub-menus are listed, ready to be activated. The sub-menu on identification of hazards and harms (the penultimate in Fig.4), is shown in Fig. 5. It contains the full list of 39 hazards and harms as prescribed by (Regulation, 2006) and the assessors is just deciding whether each hazard /harm is applicable to the chosen workplace, by checking Yes/No boxes. In order to help the assessor decide whether each listed hazard/harm is applicable, there are specific checklists with targeted questions, that can be retrieved by clicking on the button on the right hand side. In the last sub-menu, only those hazards selected by “Yes” will be listed and further particulars can be added to describe how the chosen hazard affects that workplace.

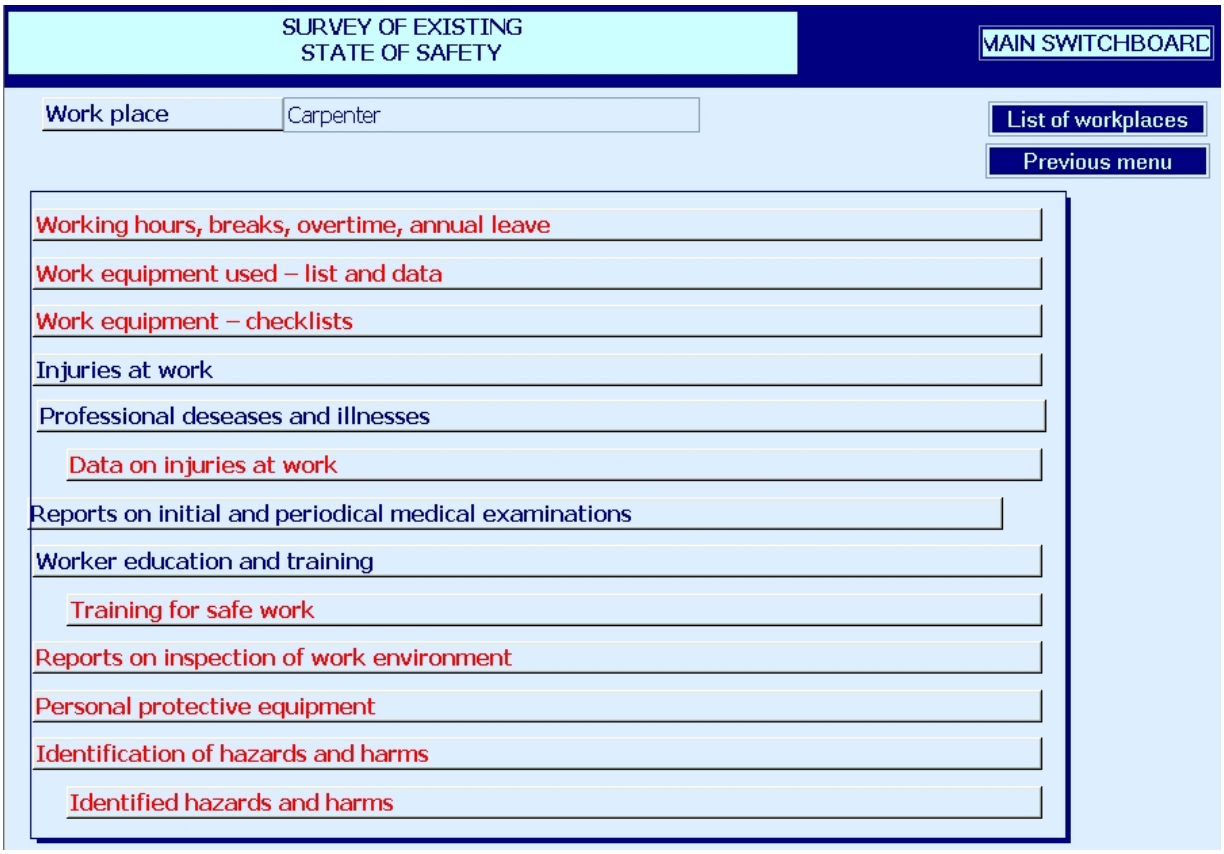

Figure 4: Screen capture of survey of existing state of safety menu

Figure 5: Screen capture of identification of hazards and harms sub-menu

3 CONCLUSION

The paper presents the software tool that helps the risk assessors to identify and note hazards and harms at the workplace, as the part of the occupational risk assessment process. It is shown that the amount, the width, the diversity, the depth and the format of data to be collected can vary significantly. The developed software tool reminds the user not to omit something but also, where appropriate, gives the user a flexibility to define both depth and format of the entered data.

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A method for analysis of corporate information security awareness

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ABSTRACT
Development and implementation guidelines of today's common information security systems in business environments is supported and accelerated with established steps described in well known international standards and guidelines. Investigating that processes in some organizations, we noticed the problem of great significance reflected in low information security awareness of all employees, in spite of existence of security policies and other security guidelines in organizations. We assume such state derives from weak or even non existing education in security issues. In this paper we present our intended research and its complete methodology including survey method that we plan to take on managers, technical personnel and common users of business information systems in Croatia.

Key Words*: information security awareness, examining information security awareness, information security education and training*

1 INTRODUCTION

According to our previous research and experience, we assume that information security awareness gained through adequate and quality education and training is a prerequisite for development of successful business environment of an organization. That statement summarizes our work presented in this paper and hence explains the intention of our intended research that we hope will contribute to better understanding of the growing need for information security awareness that will come out of properly organized education and training in information security.

The vast majority of all information security education and training efforts have been aimed at computer specialists, while other groups such as professional users from other disciplines who are not direct users of information technology have been overlooked (Yngström and Björck, 2008) and therefore unaware of security issues. From that reason, we tried to include all participants in business environment of an organization in our research, managers, executives, technical and other non-technical personnel.

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2 BACKGROUND

There are several possible explanations for low management concern about information security (Rezgui and Marks, 2008): (a) managers may make a deliberate decision to invest little in IS security because they think the risk of information security abuses are low, (b) managers may be sceptical about information security effectiveness due to the difficulty in evaluating the benefits, and (c) managers may lack knowledge about the range of controls available to reduce information security abuses. To activate managers in information security and therefore all other participants in organization, it is important to convince them about the benefits of information security efforts and introduce them effective security measures for their particular circumstances.

Furthermore, perceived problem of deficient information security awareness is recognized by many researchers. On the other hand, studies concerning IS (information security) awareness in-depth are rare. Current IS security approaches can be classified into two categories. Studies which consider IS security awareness to mean attracting users' attention to IS security issues (Hansche, 2001) or studies which consider IS security awareness to mean users' understanding of information security and, optimally, committing to it.

Siponen (2000) distinguishes two categories of security awareness: framework and content where the former concerns standardization, certification and measurement activities, while the latter implies the human and socio-cultural aspects of information security awareness.

The fact that a single case of abuse can cause more costs than the establishment of a security system (Whitman, 2003) implies great importance of enforcing security awareness through education and training. It is essential to ensure that all users are aware of information security threats and concerns, and are equipped to support organizational security policy in the course of their normal work (BS 7799, 1999).

The second edition of the ISO/IEC standard 17799:2005 recommends that all employees in an organization, existing and newcomers, receive job relevant awareness education and training in and regular updates on organizational information security policies and security guidelines. In addition, the study emphasizes the commitment of management as an important factor impacting on users' information security awareness.

In conclusion, many authors warn on lack of adequate awareness not security tools, policies or guidelines. They point out the need for information security education and training, not only for computer specialists but also for individuals in other positions. The problem is also in lack of communication between experts and practitioners, lack of meaningful computer security practices, separation of the information protection domain into subareas and incomplete definitions (Yngström and Björck, 2008).

3 SURVEY METHODOLOGY

Survey comprises large fund of questions, primarily multiple choice shaped or with open ended questions, and divided into thematic groups:

1. General questions: gender, age, geographical location, current workplace and position, professional education and training, industry certificates, practice and experience with information technology, usage of operating systems, general perception about security awareness, etc.
2. (Information) security education: previous/current participation, offline/online form of education, internal/external trainers, self-contained education, and users satisfaction with the education
3. Use of Internet: frequency of use, connection types with their respective security controls, Internet services usage for business, private matters and entertainment based on location of usage (work, home, other)
4. Security incidents: incident type, frequency of appearance, cost estimate and existence of regulations
5. Controls/protective measures: control type, quality, control intervals software validation and manufacturers
6. Password usage: password composition, number of different passwords, password protection, security protocols, remote access usage and security authorization tokens used
7. Threats and risk perception: threat type and assigned risk by each threat

Whole set of questions is available in online form, at the address http://security.foi.hr/?q=node/25.

Our distribution model was based on a hybrid approach, instead of only distributing the survey in paper form, we also sent it out to interested parties with in electronic form, that way if a company CISO wanted to assist our research effort he could forward the URL of the query to his employees or friends. With the help of this method we found that we got a good response which resulted in a very good geographical, professional and educational spectrum spread. Another good feature of online queries is that the data can be easily automatically analyzed with the help of statistical tools, that's why we filled in the paper surveys in the online system.

The paper surveys were also good because they were faster in providing response. People that got the online surveys filled them out immediately, after a few days or never. Almost all of the paper surveys we handed out were filled out in a valid fashion. Nevertheless, we would recommend using a paper/online approach because we think that the extra online effort yielded better dispersion of the persons surveyed.

Our first step after obtaining a filled batch of surveys is pruning the filled surveys for invalid entries. For example, if an employee would fill a query with illegal answers for example if all questions are with "a" or if the query was returned blank for example. Those invalid surveys are discarded and are not included in the analysis.

Information security awareness in our hand would constitute that the user:

- Is aware that he is handling and is responsible for confidentiality, availability and integrity of the data he handles and has access to

- Uses authentication tokens (passwords, biometics, tokens) in a secure fashion, with proper procedures and best practices (password strength, token handling)
- If needed keeps his operating system and all of his software updated, either by vendor updates or automatic update packs that the information support teams hand out.
- Correctly uses and doesn't disable security mechanisms like antivirus and firewall products
- Is aware of data significance so he can resist social engineering attacks and reduce unauthorized data leakage
- Has general awareness regarding use of open or unsecure wireless networks or hotspots to prevent corporate data leakage.

We established some correlations, where here we will present only the ones that we think are most significant to our future research:

1. Academic and scholarly education with general information security awareness
2. Operating system usage with general information security awareness
3. Personal perception of data significance with general information security awareness
4. Usage of corporate computers for entertainment during working hours with data breaches in which the user participated
5. Usage of hotspots and unsecured wireless networks (piggybacking) with data breaches or information leakage in which the user participated
6. Malware correlation with software and vendor use
7. Physical and technical security measures on reduction of data breaches or information leakage
8. Breaches by thematic: what was the entry point for the attackers? Users, services, vendors and similar
9. Usage of cryptographic controls to migrate the risk of unauthorized data access
10. Awareness about the threats and attacks that the user is exposed to
11. Other procedures and behavior with sensitive data

After the survey is concluded we will try to extract the correlations above with other correlations, and create an information security awareness training that would cover the field in a trough and user acceptable manner.

4 CONCLUSION

The human factor is obviously one of the most significant determinants of the overall success of information security efforts and therefore employees' information security awareness is perceived as the most important means to overcome the security problems.

Early mentioned statements in paper about information security awareness imply that today's education programs and training efforts might be missing or deficient. And certainly, high quality programs or courses will attract individuals eager to participate in learning information security. From the viewpoint of an organization, quality education promises not only to assist safeguarding information assets at a given cost but, more importantly, provides the organization with a competitive advantage through lower costs and new business opportunities (Yngström and Björck, 2008).

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Implementation of Microsoft Dynamics NAV in a multinational group of companies

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ABSTRACT

Implementation of an ERP solution is a challenging task for any company. The challenges and risks are even greater when a new ERP solution is to be implemented in a group of companies. However, when an ERP solution is to be implemented in an international groupation including 9 companies spanning 8 countries behaving as a single company under common group management towards their suppliers and as independent companies towards their customers, the task challenges can hardly be bigger.

This article describes an implementation of ERP solution Microsoft Dynamics NAV into Teknoxgroup, an exclusive dealer of Caterpillar in the area of Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Macedonia, Kosovo and their headquarters in Switzerland. Over a period of 3 years first detailed design study had been conducted which was later followed with several successful implementations of the system operating in several countries on a single installation with a common database.

Key Words*: ERP implementation, international company, Microsoft Dynamics NAV, multisite installation*

1 INTRODUCTION

There is ample evidence that implementation of an ERP solution is a challenging task both for customers and vendors (Panorama Consulting Group, 2008; Sternad and Bobek, 2008; Čop, 2006; Verville, Bernadas and Halingten, 2005). There are some differences as to what various authors consider as the critical success factors, but among them we can find the following (Sternad and Bobek, 2008):

Table 1: Critical success factors (source: Sternad and Bobek, 2008)

	Critical success factor
1	Clear goals, strategy and scope of implementation
2	Top management involvement and support
3	Project team organization and its competences
4	User involvement
5	Communication between project team members and other employees
6	Communication within project team
7	End user training
8	Business process reengineering
9	Involvement of outsourced consultants
10	Active involvement of project sponsor

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11	Data migration from legacy/old systems to new ERP system
12	As little customization of ERP solution as possible
13	Use of general principles of project management
14	Change management
15	Choice of technological architecture of the ERP solution

The complexity of management of these risks is such that in the recent study 68% of ERP implementations took much longer time than planned and 65% of ERP implementations go over budget with 27% going at least 15% over budget and nearly one out of five (16%) going over 50% or more over budget (Panorama Consulting Group, 2008).

Implementation of new ERP system in a single company is obviously a serious challenge. But how does than an implementation of an ERP system in a multinational company sound? Extremely challenging. In the remainder of this article implementation of ERP system Microsoft Dynamics NAV implementation as a single instance in Teknoxgroup, a multinational group of 9 companies in 8 countries is presented.

2 TEKNOXGROUP

Teknoxgroup is the Caterpillar Dealer in the area of Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Macedonia and Kosovo. Its head office is located in Switzerland. The organizational chart is presented in Figure 1.

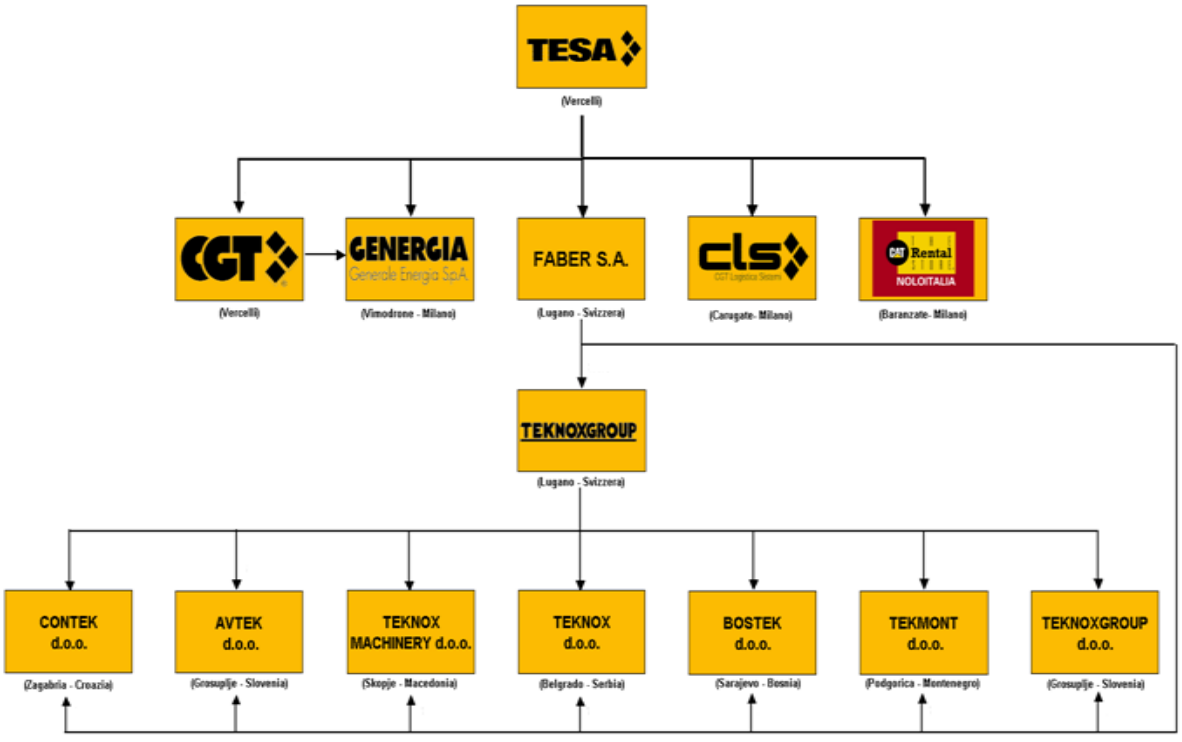

Figure 1: Teknoxgroup organizational chart (source Teknoxgroup, 2006)

With partners such as Teknoxgroup Caterpillar has grown to be the world's largest maker of construction and mining equipment, diesel and natural gas engines, and industrial gas turbines.

At the beginning of the project Teknoxgroup had approximately 250 employees working in 9 companies (Faber S.A. was also considered as a part of Teknoxgroup), located in 8 countries with 6 different major languages (Italian, English, Slovenian, Croatian, Serbian, Macedonian, Albanian). To add the complexity, some countries are strongly multiethnic which means that from the cultural perspective there are more than 10 cultures involved. Furthermore, within each companies age variation of employees varied considerably.

Teknoxgroup performs 4 primary activities: machine sales, parts sales, service and machine renting. Like any other company, there have several back office departments including accounting, customs office, IT, marketing etc. They are matrix structured, which means that they have various functional lines of commands within each individual company but also horizontal responsibilities with respect to group managers of each of their main operations. Towards their suppliers they operate as a unified company. Towards their customers they operate as individual companies within each territory but following the unified standards and procedures.

From the IT perspective, their business was supported by non-integrated systems, which varied from country to country. The main account software was SAGE in bigger territories and local legacy systems in others. The supply chain processes were supported by a Caterpillar sourced dealer management system DCES with addition of some customized solutions within Lotus Notes environment. Several other applications were used, some of them provided by Caterpillar, some of them supplied from local vendors (e.g. payroll, customs application etc.). One of most challenging tasks was a number of auxiliary formats of data provided by Caterpillar such as parts catalogues, price lists, service letters etc. Most of them were not documented.

3 IMPLEMENTATION

The project started in 2006. As summarized in Figure 2 it was split into several steps. Despite the fact that an analysis of business processes had been conducted by an outside contractor prior to product and vendor selection, a detailed analysis and design study was initiated upon implementation contract signature. Once the first draft of the design study was prepared, new hardware was purchased and a pilot implementation in the headquarters in Lugano was done. This involved some customizations required by the whole group and by Teknoxgroup S.A. specifically. Slovenian version of standard Microsoft Dynamics NAV4.0 SP3 was used as a basis, because the standard localization contained most required functionalities for the whole group. Besides that it should be pointed out that the whole IT department and most of the group managers operate from one of their Slovenian companies. The actual implementation, i.e. customization, data migration, testing, training and database initiation was done in 28 days despite this been the first implementation of the project team in Switzerland. Prior to the implementation one of the local NAV implementation partners had been contacted and asked to provide assistance if required, but they have never been deployed from either project parties.

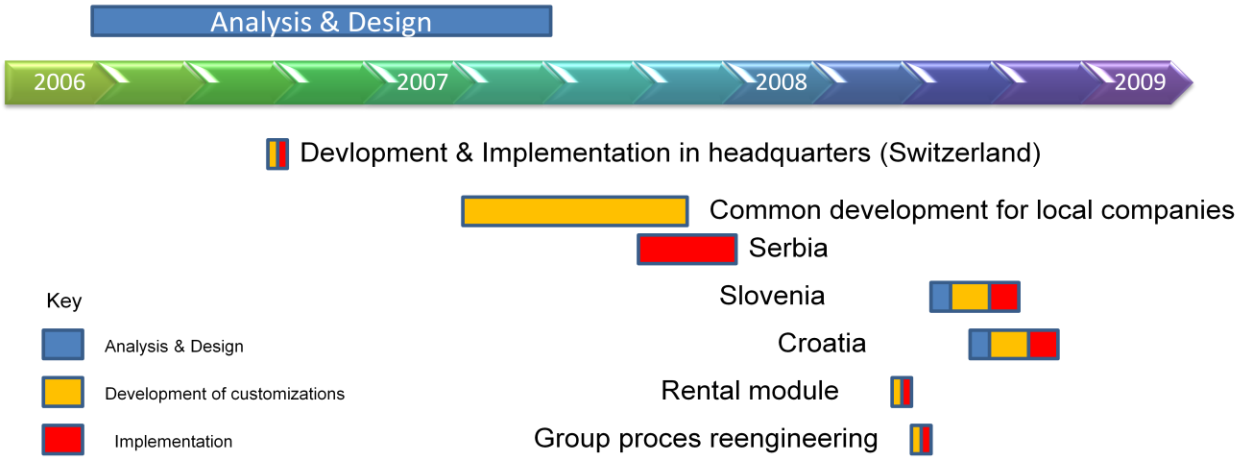

Figure 2: Project timeline

The successful implementation has proven that Microsoft Dynamics NAV has been the right solution. Similarly, the implementation team confirmed their capabilities. Furthermore, the proposed technical architecture has been confirmed as the right one. Despite the fact that all of the internal IT staff seats in Slovenia, the hardware is in running in the outsourced facility. All the users use Microsoft Terminal Services to access the application.

Having successfully completed the first implementation within time and budget, the project continued with design study. The emphasis has been shifted to the needs of local companies. To this end several review meetings have been organized to approve the design both vertically along the various business areas and horizontally across all the countries. The design of the system was based on the needs of Teknoxgroup Serbia, which was selected by the customer as the best compromise in terms of employees, business needs and some other internal factors.

Once the design phase entered into its approval stages, the development of customizations began. Altogether more than 130 customization items were listed, of which vast majority was concluded in time for the implementation of the system in the first company with full range of required functionalities. Namely, the head office in Lugano operates mainly as a back office and financial center for the whole group activities. The team of Teknoxgroup Serbia was involved in the design from the early stages. This proved to be advantages also for the implementation, since the key users there had thus been already familiarized with the new solution. The implementation of the system took approximately 4 months. The go-live was again successful and right on time and within budget which was finalized towards the end of the design phase.

The second implementation proved again the architecture was right, the system was suitable for all required functionalities and the team was successful. Furthermore, the foundation was laid for intercompany operations within the group. After two months of stabilization not a single day has been lost due to system stoppage.

In March 2008 the activities were initiated to start with the implementation of the system to Bosnia and Herzegovina. A brief cross-check analysis of the local accounting needs has been performed and the roll-out procedures prepared. However, for internal customer reasons the implementation was postponed until further notice. The sudden vacancies have led the project teams on both sides to reschedule further implementations. To this end the implementation of the system in Teknoxgroup Slovenia, originally scheduled for go-live at the beginning of 2009 to October 1st 2008. At this stage, the cross-check analysis revealed certain anomalies and deficiencies of the business processes going on in Serbia. To this end some of the customization requirements have been reassessed and modified. A number of new requests emerged, however as until that point not yet all originally planned customizations have been developed, the overall budget did not significantly differ from the original one. Both parties confirmed and agreed on the change of scope and budget and the work continued without further delay.

Within the scope of the scope adjustment, the localization requirements for the following implementation in Croatia were also taken care off. In parallel with the implementation of the system in Slovenia, an additional deployment team was engaged in Croatia on the implementator's side. As all other phases, both implementations were again completed on time and within the agreed budget and scope. Teknoxgroup Slovenia started in production on October 1st 2008 and Teknoxgroup Croatia on January 1st 2009.

In parallel to the new implementations, all running on the single server on the original hardware, two significant modifications have been incorporated for the whole group. First, an add-on module for rental management has been incorporated in the system. Second, a change in one of the most important intercompany processes has been reengineered and activated in Microsoft Dynamics NAV.

Looking back at the project, within less than three years all the important companies have been put on a single installation of Microsoft Dynamics NAV within scope, within time and within the agreed budget after the design study has been approved despite a fair deal of changes due to actual circumstances. The implementation of the solution has been put on hold for internal reasons on the customer side. This must also be considered in the view of the global and local economic crisis that fundamentally changed the overall business circumstances.

Benefits for the customer are numerous. In the 3 years of operation, the system down time was 0, something that was far beyond the capabilities of the old system. All the data for all the companies using NAV are accessible in real time. In the past, the business reports could be obtained only on a per month basis with a lot of manual work. According to the Teknoxgroup IT manager, direct costs of bulk maintenance costs decreased by as much as 50%. Business processes have been streamlined and optimized and standardized across the group; despite the original claims, it has been established during the project, that not all the procedures in the past had been followed as they should have been. There are further advantages, such as minimized exposure to absences (e.g. in case of absence of a certain user in a certain local company, a

colleague on a similar position from another company can take over). Roll out procedures have been optimized so that they can be carried out almost without the help of the implementator. Last but not least, a internal steering committee has been formed towards the end of 2008 taking the collective roll of Chief Operational Officer consisting of 3 members on the group level; no further modifications or changes are allowed within the group without the prior consent of this steering committee.

Despite the risks and poor ERP implementation statistics exposed in the introduction it has been shown that with the right methodology, mutual goal oriented work of project teams and flexibility of both partners it is possible to overcome all the risks and implement ERP system Microsoft Dynamics NAV in very complex and risky environments.

4 CONCLUSION

In this article a multinational implementation of ERP system Microsoft Dynamics NAV has been presented. Over a period of three years the system has been implemented in 4 major companies of Teknoxgroup and prepared to be implemented on demand in all their other companies. Despite many risks, the system has been customized and deployed within time, scope and budget to the numerous benefits of the customer.

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The Application of Modern Methodologies and ICT in the Management of Projects in Croatian Companies

Robert Fabac[1], Igor Pihir[2], Danijel Radošević[3]

ABSTRACT

Modern business is characterized by the implementation of numerous projects which help companies to achieve some important objectives that can not be successfully fulfilled through their usual operations and processes. Therefore the area of project management (PM) has become a topic of interest for company managers as well as theorists. Successful project management has impact on companies' competitiveness. Owing to this fact, numerous methodologies for successful project management were developed, such as PRINCE2, PMI Methodology, RUP and Critical Chain Project Management. Information technology and software for supporting project management (MS Project, Primavera, etc.) are of particular significance for project success as they support a systematic and thorough approach to project management yielding better performance. Our survey, conducted on a sample of prominent Croatian companies, examines the practice and consistency of application of the principles of PM methodologies. The research described in this paper focuses on relations between certain important characteristics of projects (including project size, duration and costs) and the issues of the used PM methodology and ICT, wherein certain regularities are established.

Key Words*: project management, methodology, software, ICT support, Croatian companies, correlations.*

1 INTRODUCTION

The project management approach is considered as a modern business concept, or business practice. Some forty years ago, the project management was predominantly used in the U.S. Department of Defense and in the building enterprises engaged in big projects. Today the concepts of project management are used in a variety of industries and organizations..." (Kerzner, 2006). There are various accepted definitions of project, provided by various authors; what is relevant for this particular research is that some thirty years ago the theoreticians originating from this part of the world (Hauc et al., 1975) defined that „...as a rule, by 'project' we understand a onetime integrality of interconnected activities that and arranged in a logical sequence, whose purpose is common and duration limited. However, a project can also be defined as an aggregate of measures required to achieve certain pre-programmed goal, or completion of certain assignment."

Many people see the solution to the project management (PM) primarily in the use of information and communication technology. It includes specialized program packages whose main purpose is to assist the managers in the planning and management of projects. The software for project management is, to put it simply, a tool that provides us with an insight into the current and updated state of affairs, i.e. provides details on duration, costs, and

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implementation of all activities relating to the project; at that it is essential that all participants in the project regularly enter data on their activities and their execution. Various methodologies of the project management are so designed to ensure successful management in the relevant fields.

Our research aims at offering a multi-dimensional insight, and even benefits. In addition to the practical experiences in the management of projects, this research is focused on the concept of competitiveness and competitive advantages, which is of extreme importance for the Croatian companies as well. Specifically, according to the well-known RBV theory, the competitive advantage has its causes in the particular assets that were being created under specific conditions and over a long period of time; but, a special place must be reserved here also for the so-called knowledge-based assets. The extents and incidence of today's projects force us to perceive knowledge in PM (methodology, team knowledge and learning, etc.) as a meta-resource that has an important role in terms of competitiveness (Judgev, 2005).

2 PROJECT MANAGEMENT

Undoubtedly, the important trait of a project is in that it is aimed at achieving certain unique short-term goals of a company. The well-known author Kerzner points out that "Term 'project' can be attributed to every stream of activities and assignments that have a determined goal to be achieved within the scope of certain specification, that have defined dates of the beginning and of the end, and have financial limitations (if applicable), that use human and material resources, and are multifunctional." (Kerzner, 2006). Generally, projects are conducted at different organizational, sometimes even transorganizational levels. The duration of projects is usually variable; they are usually launched when a company wants to make certain organizational changes, for example, develop a new product or service, make changes in the organizational structure, rearrange work posts, introduce or develop a new information system, expand business activities or build a new facility or plant, introduce a new organizational culture, enhance business processes, or restructure a business technology.

Project management uses a system approach to management in the way that it allocates functional resources (vertical hierarchy) to a specific project (horizontal hierarchy)." (Kerzner, 2006). According to the definition of the Project Management Institute – PMI: "Project management implies application of knowledge, skills, tools and techniques to project activities that are aimed at meeting requirements of a certain project. Project management is fully achieved through implementation and integration of the process of project management: Planning, Executing, Controlling and Monitoring, and Closing." (PMBOK, 2004)

3 METHODS AND METHODOLOGY OF THE PROJECTS MANAGEMENT

Simply stated, each project is divided into two major stages: planning of the project and monitoring of the plan execution. According to Kerzner (2006), each of those two stages includes the following activities: planning of the project includes: defining requirements of the work, defining quality and quantity of the work, defining necessary resources. The plan execution is very important and it includes: the monitoring process, comparison of actual and planned results, analysis of influences, and adjustments.

The system approach and the common practice in terms of the project development implies establishment of the project management office tasked with the management of projects. That office coordinates the processes and the methodology of the project management, and it is staffed by project managers. A *project manager* is a person responsible for the completion of project goals. Project management includes: identification of request, determination of clear and realizable goals, balancing of contradictory requirements for quality, scope, time period and costs, and adjustment of specifications, plans and approaches to different problems and expectations of different interest groups." (PMBoK, 2004)

According to the guide to the project management, published by the largest world association of project managers - Project Management Institute "Guide to the Project Management Body of Knowledge" (PMBoK Guide, 2004), each project consists of nine knowledge areas that need to be studied in order to implement successful project management. These are the following management elements: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, and Project Procurement Management.

We would like to point at another well-known methodology of project management, the so-called PRINCE2 (Projects IN Controlled Environments). It originates from the Great Britain, and it owes some of its success and promotion to CCTA (Central Computer and Telecommunications Agency), and also to OGC (Office of Government Commerce). This methodology covers all relevant concepts and procedures relative to organization of people and activities on the project during the main stages of planning, executing and monitoring of the project. It is worthwhile noting that PRINCE2 methodology is adjusted to ISO 9001 standard.

The PRINCE2 methodology is designed for implementation on generally all types of projects, big and small alike, and in all environments; however, the fashion in which PRINCE2 is applied to a certain project – varies from project to project; therefore, adjustment of this method to the environment of the project in question is very important. PRINCE2 is characterized by (Hedeman, Heemst, 2004): final and defined life cycle, clearly defined final products, appropriate stream of activities for the delivery of these products, a defined quantity of resources, an organizational structure with defined responsibilities. A majority of the recognized methodologies of project management have the same structure and dynamic elements, so that in some segments they differ almost solely in their names. That is why our research was based on the concept of certain universal elements of the PM methodology: to what extent they are present, and whether managers make a distinction between the methodologies and between these elements. We decided to establish and compare the presence of certain characteristic elements of PRINCE2 methodology, the so-called components, and the presence of certain standard knowledge areas according to the PMBoK methodology.

4 ICT AS A SUPPORT TO PROJECT MANAGEMENT

Modern technologies and accelerated development of communication technology, as well as reduced costs of the Internet access, have made way to the creation of a software that would provide support to the management of projects; a software that safeguards all notes and data in one place, warns us of deadlines, keeps all statistical records, allows drafting of all possible types of reports, and provides support for everyone – from ordinary employees to strategy management, so that everybody can follow their own tasks and the project as a whole. That software should ensure combining of the employees with specific skills and with tasks that correspond to those skills, and also monitoring of the projects from the smallest tasks to the overall progress.

Every project manager needs adequate software that will meet the requirements of each specific project. Although software project management packages are designed as universal tools for the management of projects of all sorts, not all of them have the same performances. The offer of project management software available on the market is huge. Some of the well-known commercial tools on the market are: Microsoft Project 2007, Intellisys Project, OpenMind, Project KickStart, RationalPlan Multi Project, FastTrack Schedule, Service Desktop Pro, Milestones, MinuteMan, FusionDesk Professional, @task, Daptiv PPM,

Clarizen, Project Insight, Celoxis, Projecturf, Central Desktop, eStudio, Copper, Smooth Projects.

5 POLL RESEARCH

For the needs of this paper we took a web-poll with 14 questions, and distributed it to a sample of 900 most prominent Croatian enterprises. We received responses from 52 companies and their analysis was aimed at investigating our major theses.

The presence of standards and project management in the Republic of Croatia was analyzed in several papers (such as the one by H. Sukić, 2007), which assume that there are two predominant standards that determine in details the processes of project management, defined by two project management associations: PMI (Project Management Institute, www.pmi.org) and IPMA (International Project Management Association, http://www.ipma.ch). Following these idea we agreed to investigate the presence of the processes of some standard knowledge areas pertaining to the PMBoK methodology, but also to establish presence of certain elements characteristic of the PRINCE2 methodology, the so-called components.

We chose the following elements from the PMBoK methodology: Project Time Management, Project Cost Management and Project Risk Management. From the PRINCE 2 methodology we analyzed the following components: key roles in PRINCE2 methodology, project plan, management of product delivery. The PM methodology provides us with standardization, flexibility, management of complexity, quality, etc. For illustration and better understanding of the research, let us mention that, according to John P. Murray (Tinnirello, 2001) some of the crucial factors that decide on the success or failure of IT projects include: adequate project funding, development of a comprehensive project plan that incorporates sufficient time and flexibility to anticipate and deal with difficulties, a critical assessment of the risks inherent in the project and the ability of the project team to manage those risks. It is important to also investigate into the practice of project management in terms of existence of a board, project managers, definition of the property in the processes. The sense of property is linked with the feeling of self-determination and with the moment a manager becomes motivated (Martin Tate, 2001).

6 RESULTS OF RESEARCH

Below are results that we consider relevant in view of the goals of the research. The query on the number of projects a year had the outcome as shown in Fig. 1.

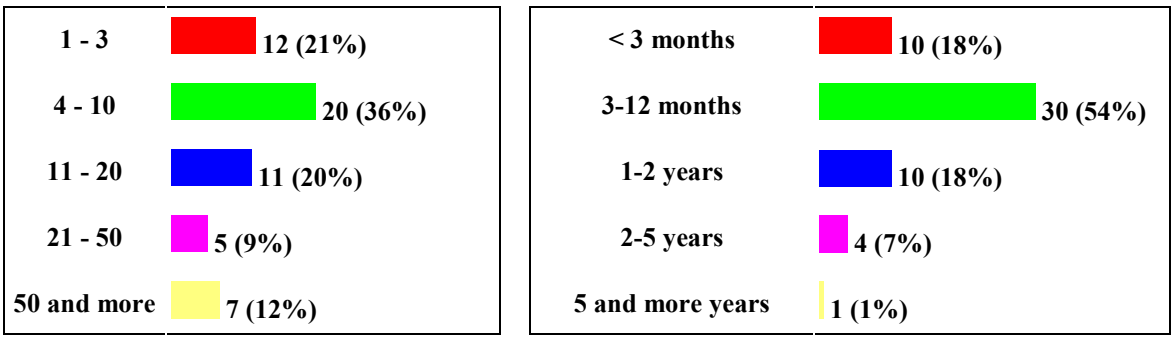


Figure 1: a) Number of projects in Croatian enterprises; b) Average duration of project

It is interesting to notice that over 40% of organizations stated that they launch more than 10 projects a year. It calls for a systematic approach to the project management, i.e. use of advanced technologies. As for the average duration of projects, the highest intensity was found for the interval (duration 3 months – 12 months; Fig. 2), which tells a lot about the

projects, i.e. that they are not too extensive. This is also corroborated by the fact that the total value of 57% of projects is less than 1 million Croatian kunas.

As for the use of specialized software tools (MS Project, Primavera, etc), 37% of companies that took part in our poll responded that they use specialized tools. Compared to these authors' previous researches, this number has been reduced over the years, from 59 in 2000 (Baljkas) to 56% in 2007 (Brodar). We assume that the percentage of companies that use specialized tools has dropped because of the growing use of modern ERP systems that integrate the project management support.

As regards the methodology, or project management standards it was found that 16% of companies use PMBoK or PMI standard. A significant number of companies state that they do not use any methodology in particular, so it is assumed that they have developed their own methods that they use in the management of projects. The research of our economy (Sukić, 2007) also gives preference to the PMI standard (28% of respondents), whereas other methodologies are present in a much lesser percentage.

Table 1: Project risk management

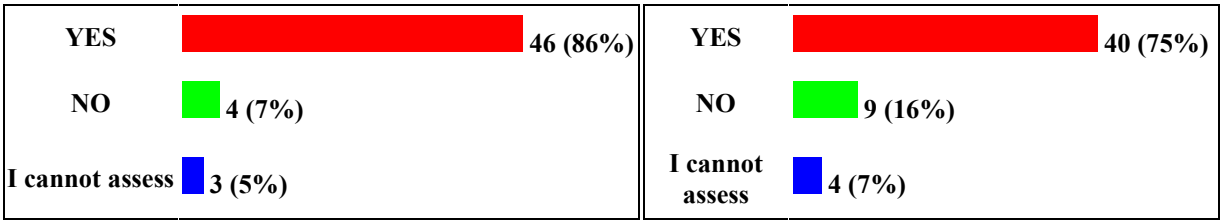
We manage risks by …	**Yes**
a) Planning risk management	64%
b) Identifying and recognizing risks	77%
c) Analyzing risks in terms of quality	67%
d) Analyzing risks in terms of quantity	56%
e) Controlling and monitoring of risks	60%

It is worth noting that despite the fact that enterprises claim they do not use any methodology in particular, the management standards, such as 'cost management' are applied in 80% of cases. The situation is similar with the question of 'time management' – its presence exceeds 80% in all processes consisting of a stream of activities. As much as risk management and its components is a significant area within the PMBoK methodology, we received less positive answers of the respondents (approximated 60%).

As regards the roles and responsibilities pertaining to the project management in practice, we can say that the roles of the project board and project manager were present in 49% and 81% of cases, respectively. Other important roles (in keeping with the PRINCE2 methodology) are present in a great amount, except for the responsibility of 'project insurer' (26%). It is interesting to compare that with the fact that the research showed (Sukić, 2007) that the position of 'project manager' exists in 80% of responding organizations. Planning and its elaboration per stages is also a point that indicates certain maturity of companies, although they do not state that they use project management methodology standards on a large scale.

The analysis of the PRINCE 2 components in the poll showed, and we had assumed so, that certain internal, not widely accepted methodologies conducted by the Croatian enterprises encompass to a great extent very important issues relating to the management of projects that are integral part of several well-known methodologies, such as RUP, Critical Chain Project, PRINCE 2, Microsoft Solution Framework, etc.

Figure 2: In our project we work out plans on the following levels
a) Project plan and b) Plan of stages with detailed description of each stage



Our analysis of the research results included also the analysis of certain interrelations. We used statistical tool JMP version 8.0 for the purpose of Multivariate analysis of correlations and we used Pair wise method. Since some of the relations are hard to recognize, unless advanced statistical procedures are used, even these relations appear as an interesting result. We have singled out several of them:

- The companies that stated that they do not use any specific methodology or standards in managing their projects, with the correlation R = 0.67, they also do not use any known software tools to support the project management.
- The correlation between projects' budget and their duration is R = 0.65.
- Project cost management, including assessment and planning of the budget, is in positive correlation R = 0.68 with the development of scheduling the activities within the time management domain.
- Defining of project activities (within the time management domain) is in correlation R = 0.45 with existence of the post and role of the executive director. Undertaking of corrective actions (quality control) is also in correlation with existence of the role of the executive director, with R = 0.41, and with the role of the project manager R = 0.57.
- The estimation of costs within the domain of cost management is in a positive correlation with existence of a project plan and the plan of stages (R = 0.55 and R = 0.57).
- Presence of the project manager and project board is correlated with R = 0.44, whereas the analysis of a problem with the presence of the project manager, R = 0.43.

7 CONCLUSION

The research conducted on a sample of the Croatian enterprises showed that, in regard to the use of specialized software tools (MS Project, Primavera, etc.), approximately 37% of companies gave a positive response to the question whether they use ICT as a support to the project management. In view of the fact that intensive trainings in applying software tools as a support to the project management are being provided throughout Croatia, we believe that the progress in this area will soon be visible. Of course, the technology will be far more effective if accompanied by a good methodology practice and other knowledge of managers and teams that participate in the execution of projects. A particularly significant result is that companies that stated that they do not use any specific methodology or project management standards - do not use any known software tools as a support to the project management, either. The correlation is R = 0.67. It is assumed that those companies do not perceive orientation toward high technologies and advanced methods as their priority.

In our research we presented in statistical correlations certain intuitively conjectured relations between the elements of standard technologies. It turned out that, apart from trivial relations within companies, there also exists interrelation between the budget and the duration of a project; the budget planning and the practice of the development of the scheduling of activities; the presence of the project manager and activity of controlling and analyzing of a problem; workout of cost estimation and existence of a project plan.

Although a large part of the Croatian companies state that they do not implement any of the well-known methodologies (however, PMBoK is present in 16% of the companies that state otherwise), the PM practice indicates that they do implement, and to a fairly large extent, the elements that ensure successful management: they take into account the costs, time, responsibilities, and the like. Obviously, they employ some internal methodologies or modules of contemporary ERP systems.

The expected progress in the future, in terms of acquiring knowledge and experience in the domain of projects management, which can be integrated through the system of standard methodologies and can be practiced with the support of ICT tools, will lead to the growth of intellectual capital and intangible resources of the Croatian enterprises. Such scenario might also lead to higher competitiveness and strengthening of the attributes of the economy of knowledge. That will be possible only if a favorable climate is created and cherished, and if preconditions are ensured for the adoption of the values of education and high technologies, especially in the domain of information and communication.

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Owners/managers acceptance of ICT innovation in small business

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ABSTRACT
Owners/managers' acceptance behaviour determines the rate of return and productivity gains in small business information and communication technology (ICT) investment. Acceptance behaviour can be explained in terms of innovation characteristics and user acceptance of ICT to gain productivity in small business. Diverse course of research have attempted to explain and predict owners/managers acceptance of ICT. In present paper we focus on owner/manager acceptance of ICT innovation in small rural business in Sweden. A theoretical research model of owner/managers acceptance of ICT innovation in small business is presented in order to be empirical tested.

Key Words*: Owner/manager, acceptance, ICT innovation, small business.*

1 INTRODUCTION

From a European perspective Sweden is a sparsely populated country and has long been at the front when it comes to expanding broadband and using ICT. Although there are differences between the regions, small businesses are generally more common in sparsely populated areas. Rural people and communities in Sweden are engaged in and depend upon a wide range of economic activities - from manufacturing to mining, from recreational services to agriculture and everything in between. The number of micro-enterprises (up to nine employees), and in particular the number of self-employed people (sole proprietors), is considerably higher in rural areas than in urban areas in Sweden (see table 1).

Table 1: Difference in small business structure between rural areas and urban areas, (Glesbygdsverket. 2007).

	Rural area	**Urban area**
Self-employed	65 %	48 %
Micro-enterprises	94 %	85 %
Employed in micro-enterprises	44 %	25 %

A review of the research on the adoption of innovations has not revealed any previous studies that investigate number of factors that suppose to have influence of ICT innovation in small business.

From an ICT perspective, small businesses are both understudied and unique (Riemenschneider, Harrison and Mykytyn, 2003; Sandberg, and Öhman, 2009; Sandberg, Wahlberg, and Pan, 2009). There is currently a lack of empirical research on the impact of ICT in small business. Often the research that has been carried out has taken a deterministic view of ICT.

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Research has also found it difficult to isolate trends in ICT from more general economic and organisational change drivers. (Dixon, Thompson and McAllister, 2002).

Innovation

Several research papers (Cohen and Levinthal, 1990; Dewar and Dutton, 1986; Dodgson, 1991; Dosi, 1982; Fischer, 2001; Garcia and Calantone, 2002; McDermott and O'Connor, 2002; Pedersen and Dalum, 2004; Rowe and Boise, 1974) discuss the definition of innovation from different perspectives.

Rogers (1995) defined an innovation simply as "an idea, practise or object that is perceived as new by an individual or other unit of adoption". The model which describes the diffusion of innovations (DOI) is frequently used to explain user adoption of innovations. The model defines the following technology based attributes of an innovation to explain the rate of its adoption: relative advantage, compatibility, complexity, trial ability, and observability. Rogers (1995) noted that differences in past experiences with technology also can result in the difference in level of innovativeness and attitude of an individual. Lakhanpal (1994) claimed that an individual's level of education, prior experience with the innovation, and attitude towards innovation also influence the degree of innovation adoption.

Thong (1999) concludes that four elements of context can be identified in technological innovation theories; characteristics of the organisational decision makers, characteristics of the technological innovation, characteristics of the organisation and characteristics of the environment in which the organisation operates.

Owners/Managers in small business

Previous research on owners in small business has identified: Owner-managers' capability gaps prevent effective new technology use, while the impact of new resources is also limited by existing staff competence (Chapman *et al*., 2000; Fallon and Moran, 2000; Martin and Matlay, 2003; MacGregor and Vrazalic, 2004), intuitive and organic styles of management and operation impact significantly on technology evaluation and implementation (Martin and Matlay, 2001; 2003), and owner-managers' motivations, values, attitudes and abilities dominate organisational culture (Culkin and Smith, 2000), and shape the communications and knowledge flows within the business (Martin and Halstead, 2003) as the owner-manager is the central to small business innovation, new technology adoption and use (Blackburn and McClure, 1998).

Blackburn et al. (1998) found that owner/managers were a key influence in determining use, based on attitudes to and level of ICT skills, and management course. High small business users of ICT exhibit signs of sophisticated understanding of ICT, how the technology can be applied, and to recognising how the ICT can be used to influence the support structures and primary activities within the business. (Blackburn et al., 1998). Dixon, et al. (2002) have shown opportunities to use ICT believe that it contributes to development of new products and services, creation of new customers, cost reductions, and improved productivity. Obstacles to use ICT in SMEs have been identified also; a lack of awareness of the potential of ICT, lack of IT skills base, high initial set-up costs, security/privacy issues, lack of staff to implement ICT, the heterogeneous nature of SMEs, the lack of research on the real impact of ICT on SMEs (Boekhoudt and van der Stappen, 2004; Ramsay et al., 2003).

The factors that affect ICT adoption in small business are a result of the owner's business outlook as well as the organisation's characteristics (Cloete, Courtney and Fintz, 2001). If the owner neither perceives the ICT to be useful, nor understands its potential, then s/he will be unwilling to adopt it (Iacovou et al., 1995). The level of computer literacy of the owner and a lack of knowledge on how to use the technology will result in the business being less likely to adopt e-commerce (Kirby and Turner, 1993). Julien and Raymond (1994) found that level of assertiveness and rationality of the owner in decision making would make the owner more likely to adopt the use of e-commerce if it suited the organisation.

If the owner is subjective and refers to the opinions of experienced people who recommend the adoption of e-commerce into the organisation, then he is also more likely to accept their opinions (Harrison et al., 1997). SME owners are also concerned with return on investment. The pressure to show a return often leads to small firms being more concerned with medium-term survival rather than long-term viability (Akkeren and Cavaye, 1999).

According to Hansemark (1998), the owner/manager of a small firm exerts a high degree of locus of control in decision making, which makes it valuable to study owner/manager related factors when studying ICT adoption decisions in SMEs (Thong, 1999; Riemenschneider et al., 2003). Innovative owners/managers are more willing to take the risk of adopting ICT. Furthermore, Premkumar and Roberts (1999) propose that level of education of owners/managers make them more innovative than others. Owners/managers with a high level of ICT knowledge are more likely to adopt ICT because they are aware of the potential benefits. An owner/manager who has a positive attitude towards acceptance of ICT is more likely to adopt IT, and in turn perceive the adoption of ICT to be economically and strategically beneficial to their business. Junghagen (1998) examined the propensity to use ICT among entrepreneurs and concluded that when owner/manager sees the link between business value and ICT they will enjoy it. Thong and Yap's (1995) study indicates that small businesses with owners/managers who are more innovative, possess more positive attitude towards adoption of ICT and are more knowledgeable about ICT are more likely to adopt ICT.

Purpose of this paper

The purpose of this paper is to propose a model that express factors affect the owner/managers acceptance of ICT innovation in rural small business. In this study, we link these factors to particular model of owners/managers acceptance ICT innovation in small rural business.

2. A PROPOSED MODEL OF RURAL SMALL BUSINESS OWNERS/MANAGERS ACCEPTANCE OF ICT INNOVATION

Number of studies of ICT acceptance in SMEs using the Theory of Planned Behaviour (TPB) (Harrision, Mykytyn and Riemenschneider, 1997), a technology-organization-environment framework (Kuan and Chau, 2001), and a comparison of reasons for adoption and benefits gained between SME and large business (Daniel and Grimshaw, 2002). One other study was found that bridged the gap between the adoption and acceptance literature integrating the TPB and Technology Acceptance Model (TAM) to explain adoption of a web site by small business (Riemenschneider et al. 2003).

The Technology Acceptance Model (TAM) is one of the most cited models on innovation adoption (Davis, 1986). TAM is a specific adaptation of the theory of reasoned action (Ajzen, 1991) to the study of IT usage (Dishaw and Strong, 1999).

According to TAM, perceived ease of use and perceived usefulness influence individuals whether to use an innovation or not. Perceived ease of use has been shown to be important in innovation diffusion in general (Rogers, 1995).

Innovation diffusion theory and technology acceptance model share the idea that the decision maker's perceptions of the factors strongly influence ICT adoption in small business. Like innovation and diffusion theory, the Technology Acceptance Model (TAM) is used to determine the factors causing an individual to accept or reject an ICT innovation.

Because owners/managers usually dominate small business decision-making processes, they also dominate technology adoption decisions and make the final of decision. The owner/manager who perceives the proposed ICT's usefulness and benefit positively will probably adopt the new technology. The owner/manager's attitudes toward, innovativeness and past experience of innovation and behavioural style also influence their perception of ICT innovations. Different owner/managers, facing the same facts, would have a different perception of how important ICT adoption is to an organisation.

Model assumption

In present model in figure 1, if perceived resources (PR) was compatible with the other constructs of TAM and assumes that PR should be task specific to be consistent with TAM's conceptualisations of perceived usefulness (PU) and perceived ease of use (PEU). PR created two sets of measure; a reflective instrument (perception of resource availability) and a formative instrument (perceptions of individual resources). External variables (EV) included owner/manager characteristics and cultural background assumes to influence PU, PEU, and PR. The present model attempts to take into consideration the impact of external factors and owners/managers characteristic to accept ICT innovation in small business. Present model propose that factors; perceived usefulness, perceived ease of use, innovativeness, attitude, and behaviour of owners/managers, impact small business innovation decisions. Perceived usefulness, perceived ease of use, innovativeness, attitude, and behaviour are factors importantly influencing owner/managers' ICT acceptance decisions.

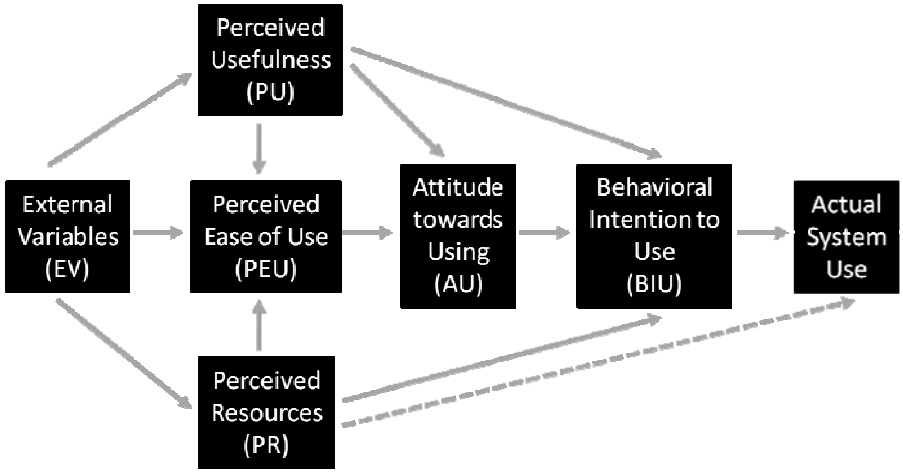

Figure 1: Proposed owner/manager acceptance model of ICT innovation in rural small business.

The importance are the relationship between factors; PU, PEU, and PR and AU. If there be a relationship between these factors it must be possible to make predictions about AUS.

3. CONCLUSIONS

In present paper we have proposed a model of owner/managers acceptance of ICT in rural small business, an extended TAM-model. The model presents how external factors (owners/managers characteristics) and technological factors have cognitive and affective effects on use of ICT.

While this study only considers the theoretical aspects and research framework on the issue of owners/managers influence ICT acceptance in small business, it provides a good starting point for further research in this area. Further studies are necessary to implement in order to validate the model.

There is also a need for further quantitative and qualitative research to get better understanding of factors that affect ICT adoption levels and its impact upon small business competitiveness.

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IMPROVING BUSINESS PERFORMANCE WITH MICROSOFT OFFICE 2007

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ABSTRACT

Microsoft Office is the most widely used productivity suite in the world. The 2007 version brought changes that are more radical from the user-perspective than the changes in this suite before. Applications in the 2007 version contain a number of new features and bring a significant change in the graphical user interface. As the changes reportedly add value to information workers using the (and thus improve business performance), and due to external compatibility issues with the previous version, the Trimo d.d. company decided on a full-scale organization-wide deployment, in spite of possible innovation adoption problems. This paper presents key success factors of this demanding technological innovation project, and its results. The latter are measured and reported at three perspectives: information users' perspective, IT-department perspective, and the whole company perspective.

Key Words*: Productivity suite, Microsoft Office 2007, migration, business performance, IT project, Trimo*

1 INTRODUCTION

Information technology (IT) changed the way office workers worldwide do their everyday work. Creating and spreading documents, analyzing and presenting data in variety of forms, managing personal information and communications, and creating information for supporting decisions, these are the tasks that an information worker has to perform daily, and these are the tasks that are largely supported by Microsoft Office productivity suite. Microsoft's collection of applications such as Word, Excel, Outlook and others, is "the application of choice"; a recent Forrester Research survey of 152 IT decision-makers at companies of all sizes showed that nearly 92 percent of the firms are using it (O'Neill, 2009). The new, 2007 version, brought a number of new features and most notably, entirely new graphical user interface called the "Fluent User Interface", replacing the menus and toolbars that have been the cornerstone of Office since its inception with a tabbed toolbar, known as the "Ribbon". Such a radical change represents a significant barrier for the diffusion of the new version, and efforts have to be invested to overcome the barrier, as only then the value-added benefits of the new features can be realized.

Migration to the Office 2007 is an important change project for every company and needs to be so treated. Project manager has to understand the new features, translate them into potential benefits for the Office' users, advocate the need for migration to the upper management, establish the interoperability and compatibility with existing IT infrastructure, and create a feasible plan of

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the migration – from the technological and users' perspectives. Managed and executed poorly, such a radical change project will result in grand-scale failure, failing to add the business value.

This paper presents an Office 2007 Migration project in an engineering company Trimo d.d.. We start with a detailed description of the challenge, continue with explanation of critical success factors of these projects, and describe the business outcomes of the new technology deployment.

2 THE PROJECT CHALLENGE

When making a decision on whether or not to migrate to the Office 2007, Trimo d.d. was asking itself the same questions that companies justifiably ask themselves: *"Is the Office system 2003 really not enough for our employees? Should we migrate to open-source productivity solutions, so we don't need to worry about the expensive licenses? Is the new 2007 version just a graphical-user-interface (GUI) experiment of Microsoft? Is the new ribbon-based GUI a confusing set of new icons or does it really makes a difference and how? Will the users see the added value of the new version or is it just too difficult for them to change?"*

Due to the scope of change-impact, Chief Information Officers (CIO) are vary of migrating. If the project is not executed properly, the mass of disappointed information workers can bounce back to the IT department, requiring helpdesk support. CIO of one of the five biggest Slovenian companies explains in an excerpt from a semi-private discussion:

> *"I have had enough problems with the existing computers and software, and I don't have enough people in the IT department. I cannot afford adding a new layer of complexity to our work by introducing completely new interfaced Office. I don't think we have enough hardware power, and the users are having problems using the 2003 even. 2007 would just confuse them, which means, much more work for us, and very bad opinion about the whole IT function in this company."*

In the times of economic downturn, no Chief Executive Officer (CEO) will tolerate an increased inefficiency caused by *"another failed IT project"*. On the other hand, if adopted and used properly, Office 2007 has the potential of bringing significant added value to the business users. Moreover, migration to 2007 seems inevitable in certain environments due to the need for compatibility with the IT environment the users operate in (business users have to be able to work with the 2007 file formats as important business partners use them too). Trimo d.d. was in such a position.

More importantly, in the times of recession, Trimo d.d. was interested in improving performance of the company. Some of the consulting companies (i.e. (Forrester Research, 2007)) reported up to 20% gains in information workers' productivity, 42% of the respondents agreed that the new interface is simpler and easier to use than the old one, 44% of the respondents were more satisfied with the work they did in the new version compared to the work they did in the old one. In Trimo d.d. we were interested where do these gains and positive feedback come from, and if they were applicable to Trimo*: What are the useful features which will improve how information workers do their everyday work? What will happen in the IT department and will we offset the demand for the helpdesk? What about the company level – will there be any positive effect?*

The company was thus in front of a challenge of deploying the radically new Office 2007 (characterized by the magnitude of the impact that change has in the company) in as smooth manner as possible. All activities in the deployment needs to strive for almost instant adoption by

the users, as these IT tools are the tools that are used in everyday work of an information worker – and can really make a difference in personal productivity.

Next section chronologically summarizes the important decisions of the Office 2007 migration project in the Trimo company.

3 DEPLOYMENT AND ITS CRITICAL SUCCESS FACTORS

3.1 Recognizing important features of the new version, and project team composition

First important step was to recognize actual added-value features of the new version. These are traditionally difficult to devise in detail from the software developers' marketing materials, i.e. website content and white papers. List of technical possibilities, functions and commands, does not translate well into the language of a business practitioner. For that, the project manager attended numerous product presentations and enrolled into a number of trainings.

This not only helped the project manager to understand the added value of the 2007 tools, to be able to decide for the deployment, but also to identify the appropriate external partners to whom the company will outsource (which) parts of the Office 2007 deployment. As with any IT innovation, there are technical (i.e. compatibility testing, installations) and human (i.e. idea advocation, training) aspects to the deployment project which need to be covered. For the latter, it is necessary to choose such a partner that will be able to clearly present, show and train the users to use the tools in order for their tasks to be easier, faster and cheaper with the new tools. Moreover, the opportunities and possibilities that the 2007 version offers in the context of the company, need to be presented and approved by the board of directors. For this, a person with appropriate mix of business- and technology- understanding is needed.

All in all – composing the appropriate team is essential. Those steps that cannot be superiorly covered by the existing human resources, should be outsourced to the best possible partner which will ensure appropriate knowledge transfer or technical capabilities. In Trimo d.d., the project leader was an open-minded individual with clear understanding of the business,and information workers' daily tasks. He was assisted by two external consultants who had led several Office 2007 migration projects and have had extensive experience of training users through experiential learning (Baloh, 2007).

3.2 Compatibility and performance testing

Trimo did pilot installations in most critical IT-architectural environments inside the company and thoroughly tested the performance and compatibility of the 2007 version. Reduced speed of operation is one of important factors that influence the adoption-resistance of a user (Venkatesh and Davis, 2000). Compatibility with existing applications (such as SAP which Trimo uses as an ERP solution and others) is likewise important. If i.e. data cannot be exported properly for analysis in Excel, it would be better not to use it.

Both compatibility and performance testing results were satisfactory. Office 2007 does not require better hardware specifications than the previous version, and the compatibility with existing software solutions was determined.

3.3 Advocating the added value of the project to the Board of Directors

The external partner presented and advocated the added value of the project to the Board of Directors. Such presentation needs to be backed-up by the facts about how the new version will benefit the business users and the company.

In Trimo, CIO, the project manager, and the external consultant, presented the planned activities of the project and expected outcomes. They also pointed out the magnitude of the project, as full understanding is needed to obtain the sponsorship from the top of the company.

3.4 User training

Probably the single most important aspect of the migration to the new version is the human aspect: how to ensure appropriate knowledge transfer, so that the users can benefit from the new features. Moreover, training has to be designed in a manner to demonstrate relative advantage, job relevance, complexity, output quality, perceived ease of use, compatibility and result demonstrability of the new tool. Perceptions of these are significantly related to intentions to use particular IT tool (Venkatesh and Davis, 2000, Van Slyke et al., 2002). General graphic user interface-, and specific, application-related-knowledge was transferred in a training programme that was attended by all Office-users.

Attendees were segmented into workshop groups by the context of their daily work. Workshops that lasted 3 times 5 hours were led by two instructors: one was the workshop moderator and the other was assistant who helped if any of the attendees needed help or extra explanations. The initial part of the workshop was devoted to the explanation of the new GUI, which was presented first in conceptual manner, so as to explain the "sense" and the "logic" of the interface. Commands in the Ribbon were not just listed or discussed in detail; in this first part, the focus was on the logic behind the new interface, so that the users could navigate through the GUI on their own later during the workshop.

Workshops were led in a manner to engage attendees in experiential learning, where learner should make discoveries and experiment with knowledge themselves instead of hearing or reading about the experiences of others. The new GUI requires so called "entry learning" which occurs with such an episodic, non-continuous change (Huber, 1991, Weick and Quinn, 1999, Tsang and Zahra, 2008); the learning in this case is not linked only to the new functionalities but also to the previously existing ones. User has to learn new functionalities and see how they will improve his or her work. Not only that, user has to unlearn what he has known before and re-learn again how to accomplish certain tasks, as this is different than it used to be. Commands in the 2007 version are namely not organized in monolithical text-based and technical-functionality-oriented menus anymore, but in graphical-based and task-oriented ribbon. In the language of Office 2007 user training, solving real-life examples showed how to use a particular tool in the context of problem-solving, in which that tool will be used later as well. Instructor first immersed learners in action and then asked them to reflect on the experience. As external limitations (time, cost) did not allow strict experiential education, we added instructors to the learning phases.

Each attendee also received "Office 2007 book" where the instructions on how to solve a particular problem were written. Such support has two benefits: first, attendees are not focused on note-taking during the workshop, and second, they can replay the solutions with the help of a book when a similar problem occurs in the future. The purpose was to increase the IT-capabilities of business users, prolong the learning phase of the attendees, with the goals of increasing the satisfaction and efficiency of end users, and decreasing the load of the Helpdesk department.

3.5 Software installations

Due to the radical change characteristics of the 2007 migration, Trimo agreed with the external consultant's recommendation that the software installations need to be instantaneous. The same day when an individual started his first day of training, the IT infrastructure department took care of removing the previous Office version, installing the 2007 version, and setting up initial preferences (such as username, initials, e-mail account, automatic archiving, and similar). Computers were thus 100% ready to be used when the next day an individual started his work.

The radical change approach was communicated in advance. We believe this has improved the motivation of the attendees to learn as much as possible during the workshops. Also, newly acquired knowledge could be tested in practice the very next day in the everyday work context of each individual. We also believe that such approach increased the perception of the "seriousness" of the project, further motivating individuals to learn as much as possible during the workshops.

4 RESULTS

The project and its results were measured through a three-step survey which included over 200 individuals. Before the training, users were asked about characteristics of their existing usage of the previous, 2003 version of the Office system. They were also asked about the existing network of relationships and connections between the employees, when they require advice about the Office applications. In the second survey, after the training, attendees were asked to assess the training itself and analyze their perceptions of the new technology. Finally, the third survey was administered two months after the training; we assessed the effects of the migration to the 2007. The results were measured and are reported at three perspectives: information users' perspective, IT-department perspective, and the whole company perspective.

4.1 Individual business user perspective

After a two-month usage, 83% of respondents strongly agree or agree that the new GUI makes their work more efficient, as it enables easier access to a greater number of useful features. 93% completely or strongly agree that the new GUI has improved design and feel. 75% say that they perform their tasks quicker as in the previous version, and 65% of the respondents completely or strongly agree that the quality of their output is higher.

Examples of welcoming features include improved handling of bigger amounts of data in Excel (manipulation, formatting), added features (filter by color, graphical conditional formatting), easier to understand mail merge in Word, possibility to save and share files in Adobe PDF format, improved Pivot Table engine and layout wizard in Excel, picture formatting tools in PowerPoint, easy-to-use professional-looking design wizards, and others.

Training satisfaction surveys have uncovered that individuals were highly satisfied both with the trainers and with the concept of experiential learning that was applied in the training. 90% of the respondents completely or strongly agree that the training is inevitable when migrating to Office 2007. Everyone strongly agreed that they would be able to engage new skills immediately.

4.2 IT department perspective

Helpdesk, contrary to expectations, is now less burdened with the Office suite support. 37% employees argue that they contact Helpdesk more rarely, and mere 4% think they require more help from the IT department. CIO estimates that there is around 20% less requests for help in the

Office segment. These results are especially promising as the data collection (survey) was made 2 months after the deployment; CIO expects that after a while, workload of Helpdesk resources in the Office area will be even lesser. Office 2007 deployment thus led to decrease of load of rare IT-human-resources, who can be redirected to other (i.e. developmental, critical) tasks. Most of the users that needed Helpdesk's support 3 or more times, have had specific questions about the GUI. It is interesting that over 45% of business users requested help in the area of those new Office suite features, that would improve more efficient and more effective work.

We can conclude that the training for the GUI is important, and that if done right, CIO can expect lesser of a workload for the IT department. To facilitate this result even further, trainee manual should accompany every training for the sake of improving the efficiency of the training and ensure better transfer of knowledge.

4.3 The whole company perspective

From the whole company perspective, Trimo d.d. experienced two effects. The first is a general improvement of what employees know to do with the IT. Experience of authors' shows that this knowledge is relatively low in general. An overall impression of this area is that IT-related competences are centralizing around few individuals inside the company; these "power users" know applications inside out, while the others (majority) only knew few basic features.

When doing the migration, we cannot overestimate the need for the training; however, migration to the Office 2007 version can serve as a vehicle for the whole lot of IT-competences improvement. The centralized applicable knowledge of advanced- and business value added-features can now be spread among a greater number of employees.

The effect of the decentralization is that each individual now knows how to perform more functionalities as before, and thereby improves the results of his or hers work (i.e. does tasks quicker, the output is of better quality). From the whole company's perspective, such an effect is highly appreciated, and one of probably the most important results ever.

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ICT in public administration

Social networking

Web 2.0

Society 2.0 - networking human potential

Faculty of information studies

E-government Services Maturity Model with Automated E-services Evaluation/Verification tools

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Abstract

In this research, we proposed a four staged model to evaluate the maturity of e-government service. To evaluate the presence of some parameters of an e-service we used a tool named Black Widow and to evaluate the level of maturity of a website, we have developed a tool named "e-government evaluation and verification tool". This tool checks the parameters are developed by using scripts. The development of intelligence test is further needed. In this maturity model, complete structure of level-one is proposed with detailed parameters and attributes. Integration of the used tools is yet required and to develop the remaining three levels for the complete functionality.

1. Introduction

"E-Government", refers to the use of Information and Communication Technology (ICT) by government agencies. This technology can provide a variety of services with better delivery of government services. The resulting benefits are eradicating corruption, increased transparency, greater convenience, revenue growth, and cost saving.

E-Government means utilizing technology for the accomplishment of reforms by fostering transparency, eliminating distance and other divides, and empowering people to participate in the political processes that affect their lives.

In Pakistan every tier of government related to ICT is fully functional but still fail to facilitate public because e-Government Services in Pakistan are being developed in an adhoc fashion without following any road map that could help to analyze the causes of their failure in meeting the public requirements. In this research we present a road map for Pakistan e-Government Services which evaluates e-Government Services and identify why their e-Government Services fail to help citizens. A survey of existing Pakistan's e-government services also identifies their status of maturity and reasons of the failure to meet public requirements.

Governments have different strategies to build e-government [1]. Some have created comprehensive long-term plans [2] while some have proposed continual improvement plans [3]. Others have opted to identify just a few key areas [4]. In all cases, however, the countries identified as most successful [5] have begun with smaller projects in phases on which to build a structure.

1.1 Status of e-government in Pakistan

The existing e-government services in Pakistan are overviewed with the perspective of their usability and interaction abilities. Some mature e-government services were found like KWSB [6], KESC [7] institution supplying Water and electricity to the Karachi city provides online billing whereas the submission of online payment is still not available. Sui-Southern gas [8] is also providing online billing and online bills payment but we may not obtain a new connection without visiting their office in person. City District Government-Karachi [9] web portal provide some basic info forms and contracts information, yet complaints system does not get solve grievances like unavailability of water; sewerage lines chocked, street light facility etc. Electronic government directorate [10] presented a website with some basic levels training but this directorate fails to up-lift the standard of Pakistan e-government services like other developed countries. NADRA [11] has also developed a good system to know about status of applied CNIC but we may not have CNIC without visiting CNIC centre in person. Electronic directorate has yet mentioned only eight completed projects which also contain surveys. This directorate also has a list of twenty-nine under completion projects whereas fourteen projects are allocated in new budget [12].

Presently, Pakistan's e-government services are at the stage of developing e-government services. IT Departments have been established in Federal & Provincial governments; E-Government Directorate has also been established by Federal Government. Furthermore, Sindh IT Board & Punjab IT Board has also been established to oversee and regulate IT in public sector.

The published IT Policy is silent about mature services or maturity models [13]. The web standards are defined but automatic testing or evaluating mechanism is not available [14]. Present IT structure is lacking the formulating rules and laws which is an impediment for its implementation. Another lacking is of outsourcing model [15] in context of e-Government software, and lack of e-government services model. Therefore, the global e-readiness ranking of Pakistan is facing downfall.

Table 1.3
E-government status of South & Central Asia [16]

		Index	Rank in	
		2005	**2005**	**2004**
1	Kazakhstan	0.4813	65	69
2	Kyrgyzstan	0.4417	76	66
3	Maldives	0.4321	77	78
4	Uzbekistan	0.4114	79	81
5	India	0.4001	87	86
6	Sri Lanka	0.3950	94	96
7	Iran	0.3813	98	115
8	Tajikistan	0.3346	117	..
9	Nepal	0.3021	126	132
10	Bhutan	0.2941	130	165
11	Pakistan	0.2836	136	122
12	Bangladesh	0.1762	162	159
13	Afghanistan	0.1490	168	171
	Average	0.3448		

1.2 Phases of E-Government

According to e-government strategy of Government of Pakistan, E-government phases are generally divided into following four phases:-

Informational: This is the first phase and includes the provision of information alone.

Interactive: In this phase, E-Government provides some degree of online interaction. For instance, citizens can enter complaints or job applications online.

Transactional: Provides secure transactions with high level of authorization. Citizens can now apply online for passports, NICs and make payments online.

Collaborative: In this phase citizens and businesses collaborate with the government on processes, projects, etc. This is especially important for businesses working together with the government on projects.

1.3 Existing Maturity Models

Several existing e-government services are evaluated and each step of developing e-government services from scratch to mature services is studied. Several researchers have proposed models for the achievement of maturity in e-government services [17], but implementation of the models is still awaited [18].

Maturity model presented by Quirck [19] uses a survey based quantitative approach as an evaluation tool whereas maturity models presented by others do not contain such evaluation tools. A scale named EGOVSAT [20] is also provided by the American researchers for the evaluation of maturity, which focuses on the quality and usability of e-services. However component based evaluation tools [21] are available like Checker, ATRC (University Of Toronto, 2006), the Common Look Website Testing Tool (Treasury Board of Canada Secretariat), Net-Centric (Technologies Inc.), and Deque Ramp Grade (Deque Inc.,January 2005).

By the use of component based evaluation tools, several parts of a website can be evaluated as per guidance of W3C or any other customized maturity standardization. The existing tools do not support evaluation testing of a complete website or web portal or e-government services; instead the tools are limited to only a single page testing. In this context, a model for Pakistan e-government services has been developed with an automated testing or evaluation tool to verify the maturity of E-Government Services and the level of their maturity.

These tools [22] have initiated the need of having a universally or widely accepted maturity model for e-services. The requirement to have a widely accepted maturity model has become apparent which should also be equipped with automated tools, as well as it should accommodate all presented small & customized maturity models and customized tools.

1.4 Objective of Research

This research evaluated that the e-Government Services in Pakistan are being developed in an adhoc

fashion without following any coherent Maturity Model that could help to analyze the evolution of e-government services through various levels of maturity and identify the causes of their failure in meeting the public requirements. In order to enhance the e-government services, an e-Government Services Maturity Model is being presented for Pakistan that can evaluate e-Government Services & help to understand why their e-Government Services fail to help citizens. The model would also allow automatic evaluation of coherent services. Identify their level of maturity and reasons of the failure to meet public requirements. The model helps in automatic determination of the level.

2. Methodology

The survey of existing website developed by the government of Pakistan conducted in order to evaluate the parameters defined in level-I of proposed maturity model. The following websites from federal and provincial government choose for survey:-

Table 1.4
WEBSITES FROM FEDERAL AND PROVINCIAL GOVERNMENT CHOSE FOR SURVEY

S.No	URL	S.No	URL
1	Pakistan.gov.pk	12	punjab.gov.pk
2	pak.gov.pk	13	blochistan.gov.pk
3	presidentofpakistan.gov.pk	14	fdsindh.gov.pk
4	nrb.gov.pk	15	lgdsindh.gov.pk
5	tourism.gov.pk	16	foodsindh.gov.pk
6	pakrail.com	17	excisesindh.gov.pk
7	pakpost.gov.pk	18	lahore.gov.pk
8	sindh.gov.pk	19	pap.gov.pk
9	nwfp.gov.pk	20	sbp.org.pk
10	radio.gov.pk	21	hec.gov.pk
11	spsc.gov.pk		

The forty one parameters were investigated in each website as outlined in proposed maturity model.

The parameters and their usability result are mentioned in the table mentioned below:-

Category & Feature	%age
Uniformity / Design	**42%**
Home	86%
Uniformity	76%
Uniformed Style for whole website:-	76%
Fonts:- Color, Size, Type	86%
Bookmarks to jump each section	62%
Print widgets	5%
XML based Expender and Minimized	5%
Name of developer company with its CMMI level	38%
Screen resolution if not onto adjustable	19%
Statistical data	19%
Word less Messages	19%
Graphical Views	19%
Scripts	**11%**
Date of creation of page	0%
All dates of updates modifications	5%
Last modifier on	14%
Total visits of Page	29%
Time of opened page	10%
Accessibility	**42%**
Links of website	67%
Download link if any, in PDF	62%
FAQs	38%
Site Map	57%
A to Z	5%
Site map tracking on each link	24%
Search Engine	38%
Related Links	48%
Terms of use	**10%**
Terms of use	38%
Privacy policy	29%
User policy / agreement	10%
Security statement	0%
Security Feature	0%
Contents rating	0%
Help/ Documentation	5%
External links usage policy	0%
Basic info about Organization / institute.	**95%**
Contacts information.	**26%**
Telephone Numbers with Country and City Code of head office	90%
Telephone Numbers with Country and City Code of its branch office, attached office, at-	24%

tached independent authorities, boards etc.	
Fax Numbers of all above offices.	76%
E-mail address of all designation with embedded auto reply.	76%
E-mail address of all departments	14%
E-mail Address of general purposes i-e info, recruitment etc.	24%
Group mails facilities.	0%
Postal address of all above officers / Designation / Departments.	19%
P. O. Box Number of Organization / institutes.	0%
UAN Number. Special Number	10%
Toll free Numbers.	0%
Auto response Systems by using OCR, ICR	5%
Feed back from count down	29%
News Letters.	0%

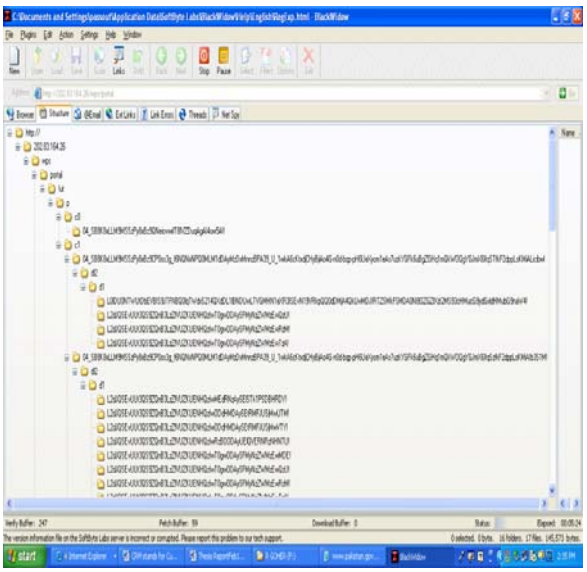
One of the main challenges for developing a globally accepted e-Government services maturity model is the establishment of an appropriate and context tailored model. All the initiatives need to be channelized in a careful, analytical and dynamic process. The process of developing required maturity model seems to be a very difficult task, requiring an emphasis on many aspects and processes, a holistic vision, as well as long-term focus and objectives. Many government institutions limit their activities to a simple transfer of their information and services online without taking into consideration the reengineering process [23] needed to grasp the full benefits. The government must have a clear road map for transition from manual to e-government initiative [24] in order to overcome the barriers for the required change. By learning a lesson from the private sector, e-Government must be customer-driven [25] and service oriented [26], meeting the needs of citizens and general public. The vision of e-Government implies providing wider public access to information as well as better, more equal services and procedures for public and businesses. Even when e-Government projects seek to improve internal government processes, the end goal should be making government serve citizens [27]. The finalized maturity model would play the diverse roles that citizens can play as partners, taxpayers, constituents, employees, students, and customer. For the sake of these requirement, level one of maturity model is proposed in detail whereas generalized view of remaining levels are also defined which need further elaboration.

Initially, we conducted a quantitative survey of existing Pakistan e-government services. The survey which is conducted consists of two phases; first phase for level-I of our proposed four levels maturity model while second phase for level-II of the defined maturity model. Findings of first phase of the survey, illustrate the causes of failure of e-government services to fulfill the public need. The usability principle was assessed and achieved 50% (Highest) and 6% (Lowest) as Highest and Lowest rating corresponding to the published service of Federal department of tourism www.tourism.gov.pk and Provincial assembly of Punjab www.pap.gov.pk respectively. It is also worth mentioning that the assessment is only for level-I of our presented maturity model.

In the second phase of survey only three e-government services qualified for the level-II as per defined parameters. The qualified three e-government services functionality level is not yet satisfactory. However they offer the parameters for level-II. Among these three e-services, one e-service presented by NBP does not offer services for Pakistan, provide facility to the United States only whereas second e-service is offered by the Federal Tax collecting agency named CBR [28] its usability level is 55% but website is not organize in mannered way and lacking user friendly design format. Pakrail [29] is the only government sector website which offers online payment and e-ticketing options, and therefore achieves 70% usability of level-II.

No e-government service in Pakistan may qualify for the level-III and level-IV.

These are the findings by manual survey based testing/evaluation, to automate this testing initially we used two different tools, one is Black Widow by SoftLabs and other one is e-government services evaluation and verification tool developed and proposed in the paper. Black Widow checks the website for availability and functionality of some parameters like broken links, e-mail addresses provided, links/pages available in the hosting space but links are not provided, and the files folders hierarchy at hosted space can be accessed / viewed by user of Black Widow.



Graphical view of Black Widow
Figure-I

To evaluate maturity level of e-government service, "e-government services evaluation and verification tool" has been developed using C# language in dot net framework. Initially, the tool calculates the total number of parameters used by scripts; however, further development of the tool would be undertaken in the next phase of research. All the features provided by Black Widow will be incorporated in the tool proposed.

Graphical view of
E-government Service Evaluation and verification tool
Figure-II

3. Issues and Problems

Several causes for failure of e-government were observed [30] during the course of research. The overall issue is the lack of several basic requirements. Some of frequently observed issues are given in brief:-

3.1 Online Payment.

The availability of earlier online payment option in e-government services is being deprecated in the world and ever new options are being introduced. Even in Pakistan's private sector household entities are being sold through online payment. But Pakistan government as yet fails to present a framework and flexible laws to enable this option in their e-government services. During this research several senior bureaucrats of Government of Pakistan contacted and asked them for availability of online services, but they shows there inability due to non availability of related rules and laws. No clear policy or directions as yet issued regarding the matter.

3.2 Absence of Maturity Model for e-government services.

The e-government directorate has yet made several efforts to develop mature e-government services by developing web-standards, security frameworks, and outlined IT Policy but maturity model for e-government services and their automatic evaluation and verification is not yet presented. However, presented model in the research may help e-government directorate to define a road-map for development of mature e-government services besides the adhoc fashioned development. Completion of our next phase research may present this improvement automatically and fully functional solution to the problem.

3.3 Absence of e-government framework for Pakistan.

Federal government directorate may play an important role to define a centralized e-government framework [31] with the support of rules and laws. All government institutions may be directed to develop their e-government services on the basis of federal directorate recommendations. Information parameters can also be defined at this stage to know what government information is to be published publicly and which information is needed to be published on certain security and passwords or authorized access basis. The framework may be developed on the basis of existing three tiers of e-government these are:-

(i) e-government framework [32] for federal institutions and department.

(ii) E-government framework for provincial level institutions and provincial government [33].

(iii) E-government framework for local government and their further three teirs.

Preferably an open source portal based framework will be useful for government sector like dot net nuke [34].

3.4 Implementation Issues.

The implementation on developed strategies, rules, standards, policies, and directions is an important issue towards successful e-government in Pakistan [35]. E-government Directorate and departments have been established and defined strategies like IT policy, web standards, e-mail usage policy etc, but the implementations on defined strategies are not being followed/implemented, due to digital divide and several other issues, some of the government agencies blame recommended services are costly, inefficient, and lacking quality.

3.5 e-government outsourcing Issues.

The e-government services development strategy is based on outsourcing. The outsourcing way of development is basically an adhoc based arrangement and never get mature, on completion of the project contractor (who developed the project from scratch) do not take interest in the project even continue payment is offered on yearly basis they just attend the project to release their payment. Further, upgradation of project never provided until a new full-fledged PC-I is proposed as a new project which is again adhoc fashioned development.

3.6 Lack of availability of Laws and Rules for e-government services.

E-government Directorate is being functioning since year 2001, but no Act, Rules are yet notified to give legal cover to the web based e-government activities. IT policy and web standards are released, but they does not have any legal weightage, if these policies are not adopted by the government sector, no legal action can be taken.

Last month Federal Government released an Ordinance named “Prevention of Electronic Crimes Ordinance 2007”, which is yet to approve by the new assembly. If the same ordinance does not approve with in three months this will expire and no existence of Ordinance will be treated. Further, several rules are required to provide legal cover to various government activities. Frequently used rules are listed below:-

- Privacy Rules Under the E-Government Act of 2002.
- E-Transactions Rules

3.7 Lack of end user involvement.

The successful implementation of e-government project depends upon the feedback of user and participation of end user’s in the project.

Unfortunately in e-government projects, project developers do not knows who will be the end user of project because in several cases end user as for concerned if data entry operator’s usually recruited after development of project. In other cases end user usually a lower grade employee and frequently transferred from one office to other, so they never consulted for their input during development of project. Second end user in e-government services project is general public, democracy in Pakistan do not yet established. There is a clear and long distance between e-government and public [36] due to long tenure of dictatorship and armed forces ruling in Pakistan, in this sequence usually these developments kept secret from public and can be viewed by general public after released, whereas true sense of e-gov is that citizens can participate as partners, taxpayers, constituents, employees, students, and customer.

4. Recommendation

We hereby recommend following parameters to improve e-government services in Pakistan beside efforts made as yet by the IT sector of government of Pakistan:-

4.1 In-house development

The development of in-house e-government services is not an easy task and requiring a lot of expertise in each and every field of ITC, requiring planning for a careful, analytical and dynamic process. Software development team members would have to play the diverse roles. Long working hours needed besides govt. official timings. Besides, excellent IT qualifications [37], willingness, sincerely, hard working, and aggressive minded professionals are needed to kick off the project.

Recruitment on contract may also be discouraged and permanent employees may be entrusted in the

projects by offering attractive benefits and speedily promotion on successful completion of project [38].

In house developed projects will be property of government; no user base certification will be required, to distribute the software in entire government, development team members would also be available to upgrade further if required.

By this way government will also be equipped with an excellent team of ITC expertise to upgrade Pakistan towards development of nation wise projects like Pakistan's Grid, Pakistan's cluster, Pakistan's e-government framework [39] , Pakistan's operating system, Pakistan's e-government maturity model (already initiated by the author) Pakistan's e-government crime control etc.

4.2 Adopting a maturity model

A maturity Model named "e-government services maturity model with automatic evaluation/verification tool" is already developed in the current research which may be adopted by the government after some deliberation on open issues.

4.3 Creating an e-service group in CSS

Central Superior Service Group (CSS) services is treated an important government services group to provide reliable and quality services for the government sector. This group covers all important functions offered by the government of Pakistan, some of them are as follows:-

1. DMG 2. Income Tax 3. Police

4. Information 5. Foreign Service 6.Post Office

etc.

The current era is the era of boosting ITC in the world; almost developed countries have fully equipped Ministries, Departments, Directorates, and Boards in the field of IT. To recognize the importance of this field an e-government service group may also be added in the existing structure of Federal Public Service Commission (FPSC), CSS group of services. Accordingly CSS group officers nominated by FPSC in e-government service group may be posted in the administrative posts of IT in Ministries, Departments, Directorates, and Boards of Pakistan.

4.4 Imposing ban on out sourcing e-government services

Due to high number of failure of e-government services projects. The government should impose complete ban on out sourcing e-government services project in the office of provincial and federal government.

5. Future Work and Open Issues

By observing existing literature we may say, this era is the most important in context with developing mature e-government services [40]. The developed countries are being utilized e-government services. As per estimation approximately 92% [41] public services are diverted to e-government services and the true essence of e-government services is achieved [42] i.e. public centric e-government services.

Presently, the need is to develop country wide or global services by developing rights management hierarchy. Developed countries are now working on the projects such as developing nation-wide grid, country-wide cluster, etc. The small level frameworks and portals are available free of cost and open-source; an operating system is shipped along with all the tools required for small business organizations such as financial system, exchange for communication, directory, databases, website builder etc.

Pakistan's e-government services are yet to upgrade existing e-services to mature services. Present IT structure is lacking the formulating rules and laws which is an impediment for the implementation of mature e-government services. The impediments in the achievement of mature e-Government Services are lack of IT expertise in government sector, lack of outsourcing model in context of e-Government software, and lack of e-government services maturity model.

In Pakistan government, there is no concept or provision of in-house development rather they depend on out-sourcing the required software to be developed. The limitation of out-sourcing the software development is the lack of support or future changes required to be implemented by the government as soon as the outsourcing company winds up its business. The new outsourcing company does not accept the previously developed software and it requires software to be developed altogether from scratch.

We present an automated evaluation tool of coherent services which identify the status of e-Government services maturity and reasons of the failure to meet public requirements. In this maturity model, four levels of maturity are outlined while complete structure of level-one is proposed with detailed parameters and attributes. Future work may be the integra-

tion of the used tools and to develop the remaining three levels for the complete functionality.

6. Conclusions

The finalized maturity model would play the diverse roles that citizens can play as partners, taxpayers, constituents, employees, students, and customer. For the sake of theses requirement level one of maturity model is proposed in detail whereas generalized level of remaining levels are also defined which need further revision..

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Geo-Data Mining Based on Municipality or Postal Code or Geo-Unit Knowledge Discovery

Marijan Manoilov[1]

ABSTRACT

The paper analyzes some extra synergy of data warehousing and data mining, when both phases are based on municipality or postal code geo-unit. Data warehousing and data mining in general are very popular techniques/methods, which have already been studied in detail and have also been widely used. However, if both techniques/methods are based on municipality or postal code as a geo-unit, they may yield some extra synergy, which has not been systematically analyzed nor widely used thus far.
In order to explain this concept of extra synergy, some basic terms regarding data warehousing and data mining are analyzed, and further some advantages and disadvantages of this concept are examined. In addition, a simplified case of such an analysis is presented in order to contribute to a more extensive usage of this concept when suitable.

Key Words*: data mining, data warehousing, geo-unit knowledge discovery, municipality, postal code.*

1 INTRODUCTION

We live in a world that is data rich, but information poor (Jawei Han, Micheline Kamber, 2006). Decision support systems use data mining and knowledge discovery as the answer to this problem. Data mining and knowledge discovery techniques/methods are becoming widely accepted as nowadays available data exponentially increase. Data mining as a process may be defined as the multiphase task of extracting hidden patterns from data; however, there are a lot of different approaches available (Cios, Kurgan, 2002; Feelders et al., 2000; Cabena et. al., 1998). Most of these approaches include several tasks or phases and all of them take into account at least two phases that I want to focus on:

a) data warehousing or data preparation phase and
b) data mining or modeling/search for patterns phase.

Some other phases of the data mining process, like understanding the problem, understanding the data, evaluation and refinement of results, dissemination of discovered knowledge etc. are also important. Nevertheless, they are not so crucial for the concept of geo-data mining based on municipality or postal code that I would want to analyze them in this article.
In many cases data warehouses may include municipality or at least postal code information. I want to focus on the fact, which is sometimes overlooked, that municipality or postal code is also a geographical[2] or geo-unit and may be used for geo-coding. Such geo-coding may open new

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[2] *I use the abbreviation of the term "geographical" and not "spatial" because geography deals with the space on the surface of the Earth, and for a municipality or a postal code the term "geo" is more appropriate than "spatial".*

possibilities to use not only standard (non-geo) data mining techniques and methods, but also to use geo-spatial data analysis techniques and methods. Geo-data warehouses or geo-data mining by themselves are not very new concepts, but if they are based on municipality or postal code, they may yield some synergy, which has not been systematically analyzed nor widely used thus far.
My main research focus is to analyze such synergy, but in order to explain this concept I would like to first examine the minimum requirements for data warehousing and data mining, which I want to upgrade with the concept of municipality or postal code as a building block of the whole process.

2 MINIMUM REQUIREMENTS FOR DATA WAREHOUSING

Data warehouses as concepted by W.H. Inmon (2005) consist of data preparation or creating special data structures that are subject-oriented, integrated, non-volatile and time-variant in order to support management's decisions. Inmon also defines differences between primitive data, used in transactional systems, and derived data, usually used in data warehouses. Some differences are presented in Table 1. The very essence of the data warehouse concept is, in my opinion, more qualitative than quantitative, and the characteristics mentioned in the right column of Table 1 may also be used as a definition of a data warehouse. Although the very concepts of data warehousing and data mining have evolved because of large data sets and exponential growth of data, I think that it is not necessary that only large data structures are categorized as data warehouses.

Table 1: Differences between Primitive Data (Transactional Systems) and Operational Data (Data Warehouses), Adapted from W.H. Inmon (2005)

primitive data (transactional systems)	operational data (data warehouses)
• Application-oriented • Detailed • Accurate, as of the moment of access • Serves the clerical community • Can be updated • Run repetitively • Requirements for processing understood a priori • Performance-sensitive • Transaction-driven • Control of update a major concern in terms of ownership	✓ Static structure; variable contents ✓ Subject-oriented ✓ Summarized, otherwise refined ✓ Represents values over time, snapshots ✓ Serves the managerial community ✓ Requirements for processing not understood a priori ✓ Analysis-driven ✓ Redundancy is a fact of life ✓ Supports managerial needs ✓ Low, modest probability of access

A small data set or a "flat table" may also be considered a data warehouse if it fulfills the conditions mentioned in the right column of Table 1, although Inmon assumes large data structures.
I would like to add another qualitative characteristics specific for operational data or data warehouses. I consider that data warehouses should also include data from different sources.

3 MINIMUM REQUIREMENTS FOR DATA MINING

Data mining is a misnomer which can be explained with a metaphor: mining of gold from rocks or sand is referred to as gold mining rather than rock or sand mining. Thus, data mining should have more appropriately been named "knowledge mining from data" (Han, Kamber, 2006).
There is also a confusion regarding the definition of data mining as a process and as a phase in the process. Some authors, for example Cabena et al. (1997), use the term "data mining" as a synonym of "discovery of knowledge". Some other authors, for example Larose (2004), define the term "data mining" only as a phase in a multi-step process called "knowledge discovery". Again some other authors, for example Cios, Kurgan (2002), use the acronym DMKD ("data mining and knowledge discovery") for the whole multi-phase process, but in the same instance they also use the term "data mining" only as a phase in DMKD. I prefer to use the term "data mining" instead of the acronym DMKD; however, please note that in some cases I use this term as a synonym for the DMKD process as a whole, while in some other cases I use this term only for the phase in this process, to which some refer as the "modeling" phase, for example P. Chapman, et al. (2000).
Some authors (Han, Kamber, 2006) define the data mining phase as extracting or "mining" knowledge from large amounts of data. As explained in minimum requirements for data mining, I believe that data warehouses do not have to be defined with quantitative criteria but with qualitative ones. Drawing an analogy, data mining may also be defined with qualitative criteria, and I think that data mining may be defined as "any kind of advanced data analysis that is based on data warehouses". The phrase "advanced data analysis" may be explained in many ways. As defined by Han, Kamber (2006), it is important that data mining goes far beyond the narrow scope of summarization-style analytical processing of data warehouse systems, by incorporating more advanced techniques for data analysis. Data mining involves an integration of techniques from multiple disciplines, such as statistics, machine learning, high-performance computing, pattern recognition, neural networks, data visualization and other disciplines.
I believe that it is not necessary that data mining incorporates all or some of the abovementioned advanced data analysis techniques and methods, but that it is more important that data mining is based on data warehouses, and that it incorporates at least one advanced data analysis technique/method.

4. GEO-DATA WAREHOUSING AND GEO-DATA MINING BASED ON MUNICIPALTY OR POSTAL CODE

4.1 Concept Based on Municipality or Postal Code Information

In many cases data warehouses may include municipality or at least postal code information. I want to focus on the fact, which is sometimes overlooked, that a municipality or a postal code is also a geographical or geo-unit and may be used for geo-coding. Not only that, it may also be a building block for data warehouse construction in the cases where data from different sources are not allowed to be merged because of different privacy protection and other laws. In such cases data from mentioned sources may be aggregated on the postal code or municipality level, and then merged without any concern for violating privacy laws and regulations. If data warehouse basic case or record corresponds to municipality or postal code level, such data warehouses may

be addressed as geo-data warehouses, because they may be easily geo-coded and represented on a map using GIS (Geographic Information System) programs, for example Regiograph/District, which are capable to geo-code data only on the basis of postal code or municipality information.
Such geo-coded or geo-data warehouses may easily comply with some of the qualitative aspects of data warehouses, for example:

- ✓ data is summarized on post code/municipality level,
- ✓ data from different sources may easily be combined if they include addresses or at least postal code information,
- ✓ data has a static structure and variable content: usually it is a flat table, rows represent postcodes/municipalities, columns different variables or attributes,
- ✓ certain data is redundant: usually different sources have some equivalent variables.

Moreover, all other aspects of data warehouses may easily be accomplished, depending on the specific case, for example they may serve for decision support, service management etc.
Geo-coding data warehouses based on municipality/postal code may open new possibilities to use not only standard data mining techniques and methods (mentioned in Chapter 3), but also geo-spatial data analysis techniques and methods, for example the territory optimization algorithm used in GIS District[3]. Furthermore, some statistical multivariate data analysis methods, such as k-means clustering, take into account Euclidean space. Geo-space is not equal to Euclidean space, but in some cases it may be close enough and k-means clustering may also be used like a geo-data mining method.

4.2 Advantages and Disadvantages of the Analyzed Concept

In order to facilitate the decision-making process about whether this concept is suitable for different scopes, an analysis of some advantages and disadvantages of data mining based on municipality or post code is presented.
The main advantages of this concept are:

- it enables the aggregation and merging of very different data sources,
- municipality/postcode data may be derived from land line telephone numbers (for example all land line telephone numbers from the biggest operator in Slovenia are geo-coded),
- a wide range of free access data is available on municipality level (for example from EUROSTAT or from the Statistical Office of the Republic of Slovenia),
- legislation and different guidelines usually constrain subjects to distribute and present data on individual level, which is not the case if data is distributed or presented on the municipality/postcode level,
- such data structures and data mining results may be presented on attractive data maps,
- such data structures are not very large and do not need large IT resources,
- there may be some synergy due to the combination of some data mining and geo-data mining tools and methods.

There are also some disadvantages of this concept, which are:

- aggregated data is more difficult to interpret,

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[3] *http://www.gfk-geomarketing.com/en/geomarketing_software/district/overview_of_features/optimizing_territory_structures.html*

- the selection of aggregation functions is subjective and may yield to different results,
- the results on individual level may yield greater added value than the results on aggregated level, such as postcode or municipality level (but nevertheless, aggregated level geo-segmentation may yield better results than no geo-segmentation, for example in direct-marketing),
- municipality or postal code may change over time (some units may be merged together, some may be divided etc.) and this fact may present some difficulties when comparing results over time or aggregate some data for different time periods,
- since municipality and post code geo-units overlap, subjects have to choose one of them or build separate data-warehouses for each of the mentioned geo-units,
- in the future legislation may constrain merging, distributing and presenting data on municipality/postcode level.

4.3 Some Possible Applications of the Concept

Since a more exhaustive presentation of certain cases would have easily exceeded the scope and extent of this article, only one straightforward case is presented in short. This simplified case may contribute to motivating potential users for a more extensive usage of this concept when appropriate, or when the advantages of the concept prevail over the disadvantages (which have been presented in the previous chapter).
This example highlights a simple data warehouse based on data from the Statistical Office of the Republic of Slovenia that consists of a flat table where rows represent Slovenian municipalities and columns some variables regarding asbestos and other roof covering materials. This data warehouse includes also some other data regarding roofers data base of a specific company and some other available data regarding this subject. Some of this data is presented in Figure 1. Municipalities marked as “D” indicate a high level of houses with asbestos roofs (which need to be changed) and low level of alternative type of roofs.

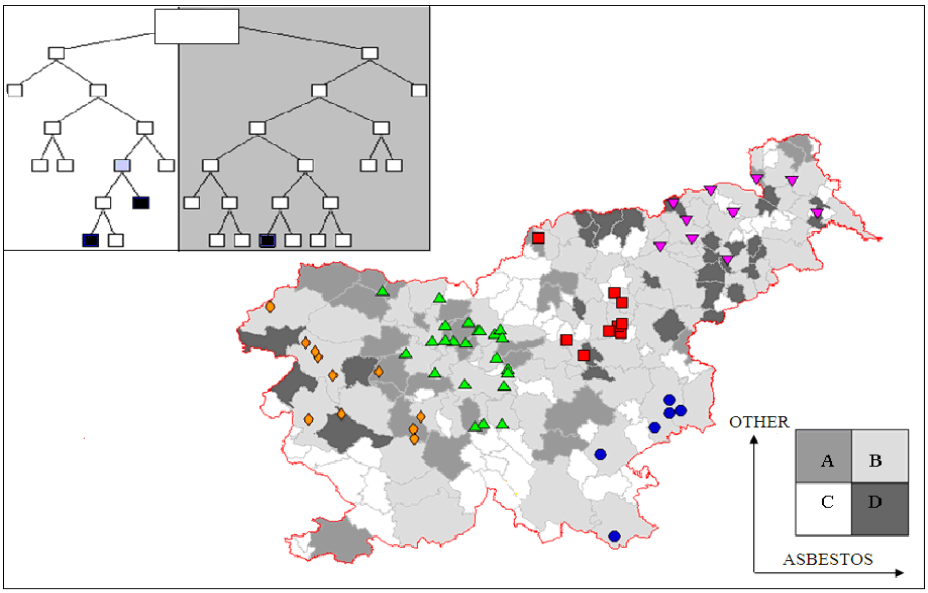

Figure 1: Selected Data and Results of the Presented Case Study

Points on the map indicate geo-coordinates of specialized roofers. With territory optimization algorithm (for example implemented in Regiograph/District) municipalities marked "D" may be optimized for selected roofers regarding different multiple criteria. Moreover, some data mining techniques, such as classification trees, may be used to explore which variables discriminate municipalities labeled "D". This analysis points out groups (nodes) of municipalities with a high "D" ratio. A further analysis shows that there is a high absolute number and a relative proportion of farmhouses and one of groups of municipalities also has a high purchase power index. Those municipalities are very suitable for direct marketing actions of companies specialized in replacing asbestos roofs with healthier alternatives.

5 CONCLUSIONS

The idea of data mining based on postal code/municipality does not present any revolutionary new method by itself, but combines some already established methods and techniques, and with this particular combination adds some synergy and opens new perspectives in this field.
The ambition of this concept is to support managerial community in the decision-making process or to reduce costs of some activities, such as direct marketing.
This concept has some advantages and disadvantages, which have been analyzed in order to make the decision-making process about whether to implement the concept easier. Finally, a simple case is presented in order to be more illustrative and specific.
One of the disadvantages of this concept, which has not been presented, may be the terminology itself. The term or the phrase "data warehousing and data mining based on municipality or postal code" is a bit lengthy. Perhaps this concept should be entitled differently, for example "geo-unit knowledge mining". This term is slightly more extensive, but encompasses all the ideas presented in this article.

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The Influence of Increasing Security Systems and the Destruction of Privacy

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ABSTRACT. The strong development of information and communication technology (ICT) as well as the fact that there are currently over 800 million on-line users worldwide, bring us to the position of rethinking carefully about where all this data is going. Sending and receiving secure data is a well known concept. But what about data in the "open space" where everyone who knows how and has adequate technology can intercept or eavedrop our data and use it against us, to harm us or our family or to destroy the organization where we working in. The traditional answer to these influences is the development of strong security mechanisms and systems which will be able to protect us (in most cases) from our self and from others as well. Such security systems have the possibility to monitor all communication between users in a specific network or subnet and collect all information exchanged between them. And this is what we see as the main problem. Someone who monitors the system has access to all information about the network's users and can take advantage of these data as he pleases. This means that someone allways has full access to all private user data. Herein we introduce some ways of protecting users from legally monitoring of their private data.

Key Words. security, privacy, open systems, protection, cancellable biometrics

1 Introduction

In a situation where there is no strict law about computer security and data protection, the potential victims are unprotected. The most important law in the European Union (EU) is the Directive 95/46/EC of the European Parliament on the protection of individuals with regard to the processing of personal data and on the free movement of such data (1995). According that Directive, most EU countries and membership canditate countries have to create and adopt their legislation. Secondly there is also the Directive from European Parliament of concerning the processing of personal data and the protection of privacy in the electronic communications sector (2002). This recommendation tries to make order in everyday usage of electronic communication, especially in Internet and e-mail communication. And the last law important for this paper is Convention 108 (Council of Europe, 1981). In this Convention, the Council of Europe gives basic recommendations about protection of individuals. In this Convention we can find some basic privacy concepts regarding the protection of individuals that gives the necessary preconditions to use biometric systems.

These three recommendation laws establish the foundations for the development of a basic security system, but, there is no unique description of crucial terms like privacy and personal data. In (..., 1995) the lawmaker said that personal data *shall mean any information relating to an identified or identifiable natural person ('data subject'); an*

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identifiable person is one who can be identified, directly or indirectly, in particular by reference to an identification number or to one or more factors specific to his physical, physiological, mental, economic, cultural or social identity. In order to make it clear, layers used term sensitive and describe data like more or less sensitive for individuals privacy or deterring what is personal data. On the other hand, there is no punishment for people nor organizations that break these laws. For example, lawyers concur that someones name and family name is sensitive data which means that this data is personal and can compromise someones privacy or security. But, how many people have same name and family name? As an example, take the family name Horvat which is most popular in the north part of Croatia. We can assume that more then 50 000 citizens have this family name, and probably about 7000 citizens have the same name. So, we can't agree that someones name and family name is personal data. Why? There is no distinction between these 7000 citizens in their names and family names. If we can connect someones name, last name, street, house number, car etc. and from these data conclude what person we described this data we can be considered as personal data.

Today's most popular social networking application developed into a great opportunity for identity theft and the abuse of someones privacy or personal data. People usually don't think about such issues, but when it happens it's already too late for thinking. In a context of open communities which will use all benefits of ICT (which is a foundation for enhanced life quality) it is important to assure that every user has the right to know what is going on with his/her personal data and in which purpose this data will be used.

So, the major problem is how to use personal data in public services and protect them from unwanted usage. In the following a model that could address the stated issues concerning security without privacy destruction shall be presented.

2 What is important?

The most sensitive part distinguishing between sensitive and insensitive date, is the development of a unique model for data classification. Some research (Zhang et al., 2005) gives us a good base for it. In our proposed model we assume that only data that can uniquely identify a person is sensitive. Such data can be a social security number, other unique numbers of the person (e.g. driving license number etc.), as well as some biometric characteristics. Other types of data which can characterize a person but without additional data can't identify the person, like first name, last name and/or street address, are considered to be less sensitive data. Such data can be used in order to describe a person but it can be combined with some other data that could lead to identification. And finally, the third and last category of data is data which are not sensitive at all. Such data can be freely used and in order to identify the person one would have to combine it with several different data types. Examples of such data include hair color, weight, occupation etc. Using this data we can describe a person but we can't identify it.

We used a definition of data privacy in which privacy is considered to be data security with data protection in good sense. Still, one of the first definitions of privacy (Culnan and Armstrong, 1999) was that the information privacy is the ability of the individual to control the terms under which personal information is acquired and used. These two definitions are very similar. Let's observe, for example, a medical records data of some person. If we see only medical data without health security number or persons name and family name, we have only general few assumptions about someones health. But when we connect this data with sensitive (more or less) personal data we have a different view, and we know much more than we usually want or have to. But this "visible" data about us is not only personal or private data that describes us. We put lots of electronic footprints

detailing our behavior and preferences; for example our buying habits are easily profiled.

We can't say what this data is or isn't important, for someone who making forensic or criminal analytics all this data can be very important, but in everyday use maybe it isn't. For this paper we will use our classification.

3 Tools

To achieve a wanted level of privacy and personal data protection we will use biometric data. Biometrics or biometric identification refers to identifying an individual based on her or his distinguished characteristics. Biometrics is the science of identifying or verifying the identity of persons based on physical or behavioral characteristics. Physical biometrics, like fingerprint, hand geometry or iris, are characteristics generally measured (or sampled) at some point in time. On the other hand, behavioral biometrics like signature, voice or gait consist of the way some actions are carried out and extended over time (Bolle et al., 2003). A typical biometric system is depicted on figure 1.

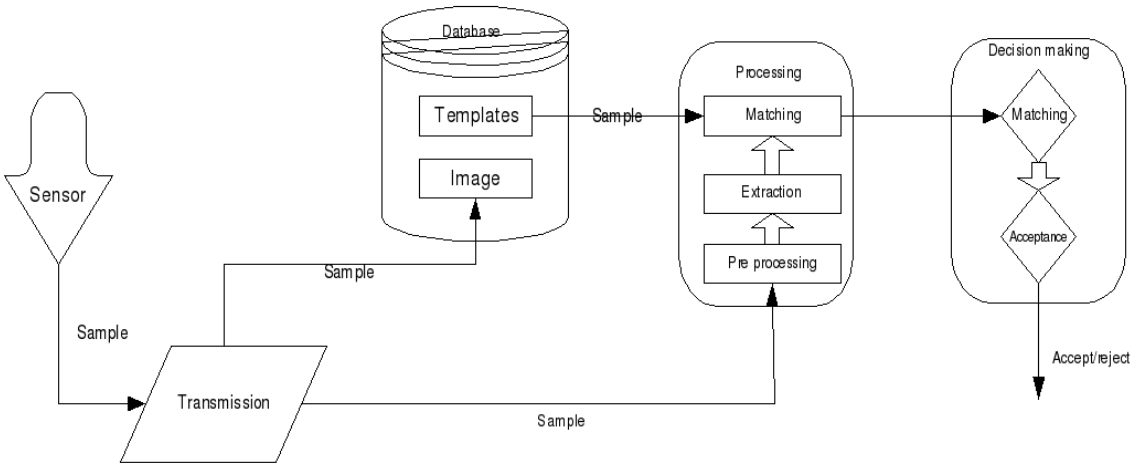

Figure 1: The main modules of a biometric system (source: Wayman (2000))

At this point, for this paper, the only important thing is the way of how to process biometric data. One of the problems with processing is the fact that biometric characteristics are most personal data. This is in a way like using the wolf to guard our sheep. But, as argued further, it is possible.

We will use biometric data for person identification (in a secure manner) and for the protection of personal and private data. To do so, we must use so called "hard" biometric data. Such data is unique for every person. The most obvious example are fingerprints. Why this data? This data is ideal for identification purposes, since such data is unique and there is no other person with the same data. If we use other characteristics (which aren't "hard") like voice, there is a probability that two persons have similar voices, which makes the distinction between them a hard task. The other reason is that it is much easier to develop cancelable biometric characteristics form "hard" ones. Cancelable biometrics is a concept in which biometric templates are transformed into a different form. But, in contrast to encrypted templates, they do not need to be transformed back into their original form before they can be matched to new samples for authentication purposes. In fact, for the transformation function we choose the one which is noninvertible, so that the template cannot be transformed back into its original form even if we want it to. The matching is performed by transforming the new acquired sample with the same transformation, and then making the comparison in transformed space (Bača et al., 2008).

This concept ensures that the original biometric template doesn't exist in the system. As such, it is not in danger of being exposed. The privacy issue is thus completely nonexistent. Even if an attacker is able to get to a transformed template it will be completely useless to him. He cannot use it to construct an artifact which could enable him to impersonate the original user. Even further, the template couldn't be used for identification purposes, like for instance law enforcement agencies use it to find a criminal. The existence of transformation functions allows simple control over which services have access and which haven't. The authorized services will have the knowledge of the transformation function, and the other will not. But this concept is not created only to address the privacy issues. The fact that the stored biometric templates are created by using a transformation function on the original biometric templates enables the creation of new templates by using a different transformation function on the original biometric templates of the user. If one can generate a new biometric template, the old one can be canceled. Biometric security systems which implement the concept of cancelable biometrics can enjoy all the benefits available in classic password based security systems (revocability and ability to reissue) but with preserving the benefits of biometric systems. Biometric templates are bound to the user so that they cannot be given to someone else. They cannot be stolen or forgotten. And they have a greater resilience to brute force attacks since they have a greater information space (Bača et al., 2008).

4 Model

The proposed model was developed, in the first place, for useage in a multimodal biometrics smart card environment and gave very good results from a practical perspective. The foundation of this model is the cancellable biometrics template which is the main input to the model. All users who have access to the database can freely use all data from the database without special approval, so where is the catch? All free data is non sensitive or less sensitive one. Sensitive data is encrypted by the given biometric characteristics in a so called biometric hash, and, in order to make all process more secure, we use cancellable biometric templates for the approval of using this data. The sensitive data owner must give her or his permission for its useage, otherwise, the data can be used but, nobody can connect it with the correct person. This way we make it possible to use all kind of data without special permissions, whereby the data owner is always protected from possible vulnerabilities.

Let's observe one typical example, health care. When patient come into the doctor's office she or he must give the doctor a smart card and do authentication through some biometric scanner. This way the patient allows the doctor to read all data from her or his database. The doctor can put some data about the patient into the smart card and/or into the database of the medical information system. If some other doctor wants to approach to specific patients data he must get approval of the patient using his or her biometric key. This biometric key is literally a part of the patient, so there is no way to get access to patients information if he or she isn't in physically present at the hospital.[1]

This approach can be implemented to all public services including government, tax paying, bank accounts etc. The most valuable advantage of this model is its adaptability to lots of situations, its protection of privacy, personal data protection and information security at the same time. The main problem of the proposed model includes practical issues concerning the acquiring and implementation of biometrics databases for all potential users.

[1]Here we presume the normal case, but off course there are ways to spoof biometric devices using death samples etc.

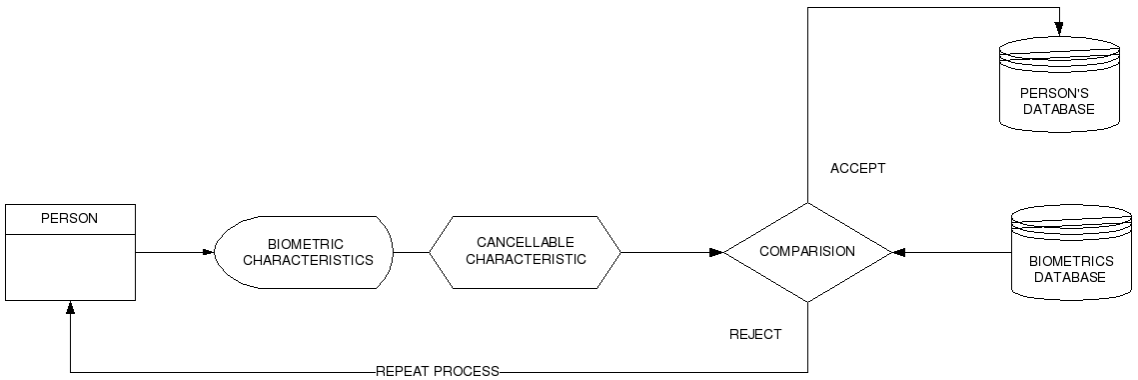

Figure 2: Prototype of Multimodal biometric smart card model

5 Conclusion

In this paper we presented a model for the protection of privacy and personal data. The model is based on using biometric characteristics in two perspectives: (1) as characteristics system authentication and (2) as characteristics for allowing the use of personal/private data. This model can opens several questions concerning the selection appropriate characteristics and as well as practical implementation issues. The most important factor as usual is user acceptance. If the user accepts using a biometric characteristic this model could give excellent results. Another open question is the development of an auto regulatory system for privacy and personal data protection. This system should address the privacy and security issues described in a social networking environment. We envision that such a system maybe be more adequate then the one we propose, but this kind of approach requires essential changes of user behavior and trust.

6 Future Work

For our future study we will try to use formalized knowledge in security and in data protection. If we imagine a common semantic wiki system where users can add formalized knowledge about known security issues on a particular platform certain intelligent agents could be developed. Such agents need to be able to analyze the semantic content on the wiki system with regard to the particular PC configuration, and common issues using the semantic content. On the other hand, malicious users could try to compromise the semantic wiki system, due to its openness, in order to do harm or gain access to users PC-s. To prevent such possibilities the use of potentially malicious formalized knowledge has to be minimized. To do so the social network has to be formalized with trust relations between users. Such trust relations will help in constructing a dynamic hierarchy of most trusted contributors with their respective trust-ranks.

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The local authority organization of citizen oriented service

Karl W Sandberg[1]

ABSTRACT
The primary objective of most e-governments is to better serve citizens. To improve the services to citizens, the local authority need to reorganisation and use new information and communication technology (ICT), to delivery of services to citizens irrespective of geographic location. Main idea of this paper is therefore to identify factors that are important to enable local authorities to develop citizen-friendly service in sparely population areas. To succeed in the achievement authorities must take advantage of the experience of customer-oriented services in private sector, need to become more citizen-oriented in their activities (citizen relationship management, CiRM), leading to new forms of organisation (front-back office), and embracing new ICT-technology ICT (e.g. mobile technologies) in order to bridge the distance between citizens and local authority to deliver future e-service.

Key Words*: Citizen service, ICT, CiRM, organisation, local authority.*

1 INTRODUCTION

Europe approach to e-inclusion refers to the effective participation of citizens and communities in society through their access to Information and communication technology (ICT). The social inclusion and individual empowerment is important to establish e-democracy and citizen-centric driven e-inclusion for all (Kaplan, 2006). The public sector in Sweden try to improve the relationship between government and citizens, achieved by means of providing e-services (Buß, Runde, and Sniehotta, 2003).

e-Government services not only have to match the needs of the citizens for whom they are intended, but should also correspond with the needs and work practices of the civil servants who provide and deliver the service in question. If this is a bad match, it can reduce the quality of the service that is delivered: civil servants may encounter obstacles when working with the system or may use the system ineffectively (Lambrou, 2003).

Many governmental ICT projects appear to fail because of a lack of attention for the interests, attitudes or work practices of the civil servants who have work with them (Rekenkamer, 2007).

Traditionally, local authority has established specialized ICT organizations to deal with technology issues in the public sector. Though, rapid changes taking place in ICT-technologies and business models require a fundamental rethink of the organizational structures and institutional plans for ICT organizations supporting local authority. Apart from the public sector, the private sector has some useful lessons of experience to present in this respect.

Information and communication technology acts as an enabler allowing organizations to work in radically new ways, to share information, to break old rules and not only to create new

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processes but change existing ones simultaneously, being supportive to decentralization by means of customization. There is a clear and strong link between reorganizing government back-offices and the e-services available to the citizens Mobile technology is about extending the availability of an e-Government infrastructure and could be considered as a new kind of front-end access to public services, as an integral part of e-Government (Kushchu and Kuscu, 2003; Roggenkamp, 2004; Mühlbach and Wagnitz, 2005; Sandberg and Sundberg, 2007; Sandberg and Wahlberg, 2009; Sandberg and Sundberg, 2009; Europe's Information Society, 2004; Sandberg and Sundberg, 2004).

Main idea of this paper is to examine whether the ICT technologies could enable citizen-centred service from local authorities in sparely population areas in Sweden. Are there any innovative approaches to organisational plan to local authority deployments in a rural regional context?

2. A CONCEPTUAL MODEL OF E-GOVERNMENT SERVICES

The European Commission defines e-Government as: "*The use of ICT in public administrations combined with organisational change and new skills in order to improve public services and democratic processes and strengthen support to public policies.*" (European Union, 2004). E-Governance is the public sector's use of ICT with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process and making government more accountable, transparent and effective.

2.1 Citizens service requirements

To get the right information at the right time and the right place is not so easy for the citizens. ICT provides great opportunities for access, facilitating the need for citizen centred e-service development and delivery. However, there are still problems in determining what citizens want and need, and how to provide e-Government services in user-friendly and effective way (Phang, Sutanto, Kankanhalli, Li, Tan and Teo, 2006).

From the user perspective, e-Governance, related to local authorities in present paper, consist of three components: Government to citizens (G2C); government to government (G2G); and government to businesses (G2B), as seen in figure 1. E-government activities include not only intra-governmental processes but also the interface between businesses (G2B/B2G) and the interface with citizens (G2C) (Chang and Kannan, 2002).

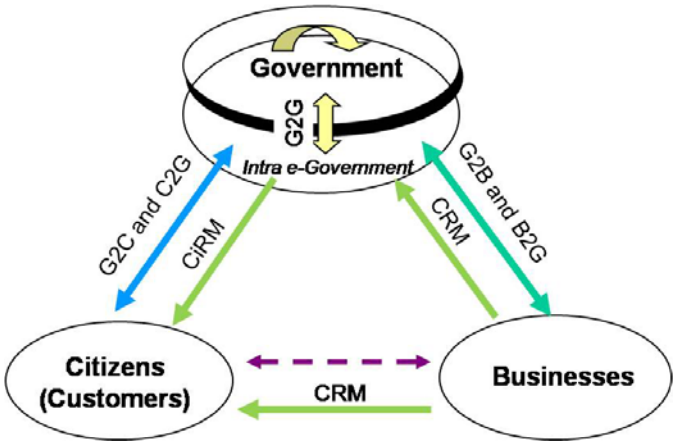

Figure 1: The extent of e-Government.

2.2 Citizen Relationship Management (CiRM)

Customer Relationship Management (CiRM) shares the objective of improving citizen orientation in public administration with e-government and new public management. CiRM refers to a cluster of management practices, channel and ICT solutions based on CRM (see figure 1). Basic principles of CiRM are personalisation (information, services), integration (planning processes, business process, service development), interaction (channels, communication), and selection/ segmentation (data analysis, identify the citizens requirement of the public service). Moreover, quality/performance measurements, change management and a strategy promoting citizens oriented culture (Wahlberg, Strandberg, Sundberg, and Sandberg, 2009; Schellong, 2005, 2008).

2.3 Employees' acceptance of new ICT-technology

Employees' acceptance of ICT and intention to use it for work processes depend on least following factors; the perceived usefulness of ICT, the perceived ease of use of ICT, and the perceived availability of resources for ICT use (Davis, 1989; Mathieson, Eileen, and Wynne, 2001). Perceived usefulness is defined as the extent to which an employee believes that using a particular ICT will enhance her or his job performance. The ICT is expected to explicitly increase their productivity or make their job easy and increase their job effectiveness. Perceived ease of use is defined as the degree to which a person believes that using ICT will be free from effort. The advantage of ICT on this dimension is that it plays an important role in citizen and personal applications. Perceived availability of resources includes resources such as time available for performing or learning to perform a task, level of support available from other employees particularly from information services, and technology attributes such as system availability, cost of access, documentation, and perceived level of control over the technology. Other significant factor is employee gender. Venkatesh and Morris (2000) have shown that men consider perceived usefulness to a greater extent than women in making their decisions regarding the use of a new technology. Agarwal and Jayesh (1999) proposed that individual-level differences such as education, similar prior experience, and beliefs about ICT have also an impact on the acceptance of technology.

2.4 Organizational change

In the private sector the main driver of organisational change is the need for businesses to adapt to changing competitive conditions. But how does this relate to a public sector environment where competition does not exist in many of the areas of service provision. What drives organisational change in this instance?

Researcher has found that the potential of cost savings was not the main driving force behind development of e-Government. Instead e-Government work has been primarily motivated to make government more efficient, citizen-oriented and customer-friendly. The key issues to be addressed for successful implementation of reform include the need for understanding and support by senior management, and the willingness and ability to accept new ways of working (Sandberg and Sundberg, 2009; Sandberg and Sundberg, 2007; Timonen, O'Donnell and Humphreys, 2003; Accenture, 2002).

Murphy (2002) found the need to facilitate acceptance of new technologies, particularly ICT, was ranked far lower than market forces in surveys of drivers of organisational change. The acceptance of ICT requires a flexible organization at the same time that ICT increases the capacity to implement work flexibility. Organisational change can be a principal motivator for the introduction of new technology, just as obsolete technology can hinder the adoption of

new organizational practices. It can be seen from various studies that the relationship between ICT and organisational development has the capability to engender a flatter organisation with less hierarchical levels, decentralised operation based on revolutionary communication technologies, the transformation of hierarchical structures based on networks, and the creation of new horizontal and strategic autonomous agencies.

3. ORGANIZATION OF CITIZEN-ORIENTED SERVICE

To build a true citizen-oriented participatory local authority, it is necessary to raise the quality of local authority in terms of process efficiency, service and participation, in terms of accessibility, usability, responsiveness and credibility. In addition, local authority internal work process (back-office) and the relationship between the local authority and the citizens (front-office) are also important factors, especially from the point of view of the citizens who are the beneficiary of the services. The cost and benefit of participation should also be considered in line with these factors, present in figure 2.

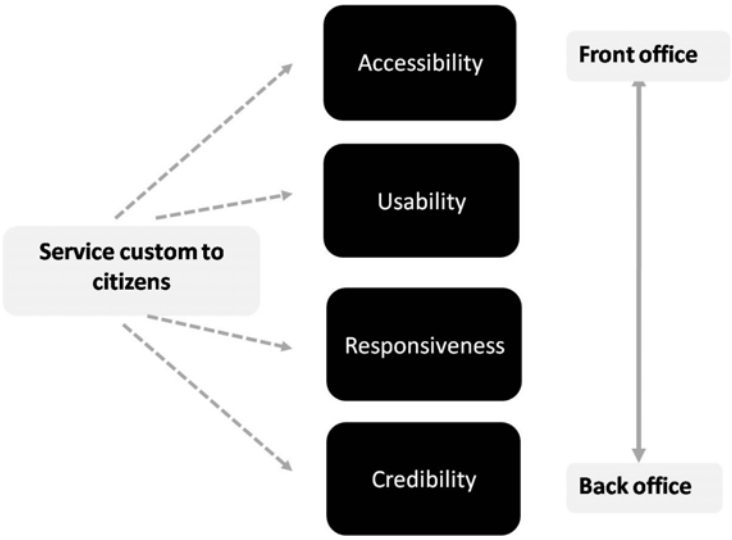

Figure 2: Organisation of citizen-oriented service in local authority.

Accessibility is an important factor in citizen satisfaction of service delivered by local author, since it decide the cost of participation.

Usability. The issue of usability arises from the process of using local authority services, and whether it is possible for anyone regardless of their capabilities to use the services in question in an appropriate manner. Efforts to increase user satisfaction through citizen oriented services and develop service custom to citizens.

Responsiveness. Responsiveness is associated with providing services that fit the values and demands of the citizen. A speedy and suitable response to a request and timely updates are elements that impact responsiveness. Accountability of local authority servants can be increased by establishing a collaborative work system that coordinates process within or between divisions in local authority.

Credibility. A basic approach for increasing credibility involves ICT; a system to protect sensitive information in order to enhance security and recovery of data and service, a system should be set up to continuously monitor complaints and listen to customer demands, in minimizing customer mistrust and dissatisfaction.

4. CONCLUSIONS

This paper provides several preliminary insights into the citizen's' adoption of local authority e-services. The primary objective of this paper was to provide a conceptual model how to organisation of citizen-oriented service in local authority adoption of e-government. The model is developed on an analysis of the substantive literature on e-government and is proposed as: A general model of e-government which serves to inter-relate aspects of ICT innovation with process change in local authority in rural areas.

A coherent framework for further empirical research is proposed to provide the practitioners with a set of manageable, strategic levers to promote greater citizens acceptance of e-services from local authority. Future research can also examine role of ICT in government-to-citizen (G2C), government-to-employee (G2E), Customer Relationship Management (CiRM) government-to-business (G2B), and government-to-government (G2G) environments.

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VESPRO: a virtual environment for practicing safety procedures

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ABSTRACT
VESPRO (Virtual Environment for Safety PROcedures) is a 3D virtual environment for the explanation and practice of common safety procedures which must be applied in public places. It can be used both for teaching in a efficient way the safety procedures both for assessing the user's performance while putting them into practice. In the tutorial mode, safety procedures are illustrated within the maps created by the user by means of a 3D environment where the events are simulated and a human character is shown while completing and describing the task required by current safety standards. Earthquakes, fires and gas leaks are simulated and their intensity can be tuned in order to vary their effects and by consequence to modify the behavior of the character showing the suitable procedures. In the practice mode the user controls the human character in the 3D environment in presence of the above mentioned events. On the basis of the operations carried out by the character the performance of the user are assessed in terms of correct application of the required safety procedures.

Key Words*: safety; virtual reality; simulation; 3D.*

1 INTRODUCTION

Nowadays safety on the workplace is an important issue as the number of accidents is continuously rising despite the social and technical improvement of working conditions and independently on the kind of work. For this reason in many European countries it became mandatory the adoption of safety measures which can vary depending on the nature of the workplace but which share the main directives. Safety measures include both structural modifications involving the buildings or machineries both the training of the workers to face the main dangerous events in order to teach them the most suitable operations to carry out in such eventualities. The training of the personnel is performed on the workplace by means of special courses where main information are provided to the workers and sometimes practices and exams for the assessment of the learning are contemplated. The organization of these courses and exams implies a not negligible investment of resources thus in the next years it came up the necessity of creating instruments to substitute or to be put aside to these traditional courses in order to improve the knowledge of safety procedures. Thanks to the development of informatics many of these instruments were developed to be used on computers.
In this paper a novel instrument for the education of workers to the application of safety procedures is presented. The so called VESPRO (Virtual Environment for Safety PROcedures) tool simulates user defined 3D virtual environments where the most common safety procedures are explained and where the learning degree of the users can be evaluated.
The paper is organised as follows: in section 2 most common instruments for the teaching of safety procedures are presented, subsequently in section 3 the VESPRO software and all its

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features are described in detail and in section 4 a final discussion on the tool is presented together with its future expected developments.

2 INSTRUMENTS FOR TEACHING SAFETY PROCEDURES

As the instruction of workers about the safety procedures on the workplace has became mandatory the editing of *ad hoc* instruments has become a key issue. Some companies started creating their own teaching tools while others left this task to companies specialized in the production of such tools. For many years despite the development of computer based learning tools the main instruments for the teaching of safety procedures did not exploit the potential offered by such technologies thus the main resources consisted in handbooks and posters.
Handbooks and posters are often designed for the building they are addressed to and adapted to the particular procedures used in the workplace describing both the structure of the buildings and the detailed description of the procedures to put into effect. The main advantage of this kind of instruments lies in their specificity by respect to the place of application of the procedures and on the easiness of consultation (mainly for the posters which can be quickly examined even during an emergency) and completeness of information provided. On the other hand they are not appealing for the users and they do not offer tools for the self assessment of the learning except simple quizzes. Video courses as well have been developed for the description of safety procedures. In this case they have the same characteristics of posters and handbooks but in addition they offer the possibility of showing by mean of short films or animations how to perform certain operations. The main drawback of video courses is that they are not location-specific due to the cost of their realization so they cannot provide particular information on the structure of the building and on location of salient objects.
Computers have been used for the development of e-learning tools with different levels of interaction with the user, completeness and nature of the information provided. Most common tools are based on textual information including speech, images, movies and animations which give the user a complete multimedial knowledge. Many of the developed softwares can be used on-line and are easily updatable and customizable and offer instruments for the evaluation of user comprehension so that many of them are used even for students examination.
The last evolution of educational tools on safety procedures is represented by graphics applications reproducing highly interactive virtual worlds which can simulate real environments and situations as much realistically as possible (Zayas Perez, Marin, Perez, 2007) (Chin-Teng et al., 2000). Simulation in this framework is a powerful medium for the transmission of certain kinds of information as it allows the user to explore the virtual scenario he is immersed into (Philbin et al, 1998; Regian, Shebilske, Monk, 1992). Virtual simulators can provide the users who simply walks within the virtual scene information on the structure of the buildings, the position of main objects and faithfully reproduces on the screen the effect of any sort of phenomenon such as fires or earthquakes so as to give the user the opportunity of living virtually some realistic experiences answering some practical questions such as how an extinguisher is used or on the time necessary to reach the exit within a particular building which could not be effectively answered in any other way (Moshell, Hughes, 2002) (Winn, 1997).
There are some noticeable softwares exploiting virtual reality for this purpose among which the following ones can be signalled:

- "WI-PIE Emergency simulator" was realized for the training of workers on the legal standards of 626 directive concerning security on the workplace. This software creates 3D scenarios where users have to perform several tasks and are evaluated on the basis of their

performances. Particular attention was given to the educational aspects of the tool, in facts legal issues and information on the security procedures are described in detail.

- "Vayersoft emergency fire evacuation simulation" is another tool with similar purpose which includes an exhaustive tutorial on the safety procedures followed by interactive sessions on particular tasks easily adaptable to the exigences of any company.
- "Program-Ace Emergency evacuation simulator" simulates not only fires but also other events such as earthquakes and tornados. This software allows the cooperation among the users and the communication among them so as to allow the possibility of organizing collective strategies which can be evaluated by an automatic system.

3 THE VESPRO SOFTWARE

The Virtual Environment Simulator for Safety PROcedures (VESPRO) is a 3D simulator for teaching safety procedures and for experiencing them in a virtual environment. VESPRO reproduces user defined workplaces from user defined maps (created with standard open source softwares) where the user freely moves his avatar interacting with the object present on the scene. Maps are designed to reproduce faithfully the workplace they are related to including the position of objects to be used in case of emergency. VESPRO can simulate different kinds of harmful events (even contemporaneous) such as gas leak, fires and earthquakes whose intensity can be decided by the users. The basic mission of this software is to give the possibility to the user of living in a virtual world the emergencies that can occur in the real world with richness of peculiarities which make this experience as real as possible. VESPRO peculiarities include the possibility of living the virtual experience in maps reconstructing actual workplaces and involving the use of suitable instruments to face the emergencies. A further strong point of this tool is the possibility of evaluating the user's reactions to the emergencies directly in the virtual environment allowing the software to correct his mistakes and suggest the procedures to apply.
From the technical point of view VESPRO was realized in the Python programming language exploiting the Panda 3D engine. Panda 3D engine contains a set of libraries for the creation, management and rendering of virtual environments.

3.1 Overall sight on VESPRO

The main characteristics of VESPRO lie in the possibility it gives of learning the safety procedures and practicing the them in the same environment they are designed for and, at the same time, it allows the evaluation of user' s performance in terms of accomplished tasks.
The developed software is logically subdivided into three parts each one characterized by a different approach of the interaction between user and environment. This division was done in order to maximize the emphasis on the learning and the practice phases. More in detail the three parts are the following:

- *Teaching phase* – In this phase the user has no direct interaction with the environment and the avatar autonomously moves within it while the software describes, by means of texts, images and animations, all the safety procedures to be performed in case of the selected events. In this phase the procedures are described in detail and include the description of the exit paths, of the security exit, on the use of objects in the scene and on the general behavior to be adopted.
- *Exploration phase* – In this phase the user can freely move within the virtual scene, interacting with the objects, acquiring confidence with the building and getting information. In this stage the main features of the environment are highlighted. This phase

favors the memorization of a multitude of information such as the location of the objects to be used, the exit paths, the safe places, the security exit and many others. Some screen shots showing the virtual environments are shown in figure 1.

- *Emergency simulation* – is the main stage of the software. In this phase the user can decide to start the simulation of one or more emergencies, then he has to move within the scenario facing the dangerous situations and performing the due tasks. Within this stage the user 's performance is evaluated and a report on such evaluation is shown at the end of the simulation in order to let the user correct his mistakes.

Figure 1. Two sample screenshots of VESPRO during the exploration mode. The image on the left shows the third person view while the image on the left the subjective view.

3.2 The disasters in VESPRO

Currently three types of disasters have been implemented in VESPRO although it is designed in a modular way in order to allow an easy addition of more configurable events. In particular it was decided to simulate the most common ones: earthquake, fire and gas leak. These events in the simulation phase can occur simultaneously (as often happens in the reality)

Disasters have effect on the environment and on the avatar. For instance the presence of a fire in a room generates smoke and can affect the electrical system of the room; earthquakes can block doors and damage the stairs and can break gas pipes generating gas leaks and compromises the functionalities of the electrical system; gas and smoke concentrations limit the visibility inside the buildings. Furthermore each disaster can have different intensities which influence their effect on the avatar and on the environment. The intensity of fire for instance determines its propagation speed, the quantity of generated smoke and by consequence the maximum permanence time of the avatar in the surrounding area. Figure 2 show the virtual representations of the implemented events.

3.3 The avatar in the virtual world

The virtual world simulated by VESPRO is explored by means of a human-like avatar designed in order to maximize the interaction capabilities of the user with the environment and to be graphically realistic. The avatar is visible on the screen in third person with a camera positioned over its shoulders in order to allow a good visibility of the avatar and of the surrounding scene but it is possible to change the visual by switching to the subjective view where the camera is placed in the position of the eyes of the avatar; this latter view allows the movement of avatar head which enhances its exploration capabilities. The avatar can carry out a wide set of actions. For moving it can walk, rotate, move sideways and run and these single actions can be combined.

Figure 2. Screen shots corresponding to the fire (left) and gas leak (right) representations in VESPRO during the simulation mode.

Several tricks have been implemented to increase the realism of the control such as a reduction of control when the avatar is moving fast. The avatar can interact with many objects present in the scene and which can be useful to accomplish the security procedures. For instance it can open and close doors and windows, pick up and release objects, operate light switches, electrical panels and alarms. Moreover the avatar can use the object it collected such as the fire extinguisher to stop a fire, or the wear safety helmets, the fire blankets or the gas masks to move safely in the building.

3.4 Emergency simulations and performance evaluation

In the emergency simulation mode one or more of the implemented disasters occur and the user is asked to put into practice the learnt safety procedures. Such safety procedures are different depending on the type and intensity of the occurred event although there are many tasks shared among the different typologies of events. On the basis of the behavior of the user when fulfilling the required operations an evaluation of his performance will be drawn up.

When facing the disasters the avatar has to carry out several actions which can be divided into *tasks* and *reactions*. A *task* is an operation whose execution is fundamental during the emergency and which must be accomplished in the suitable moment and within an arbitrary limit of time. On the other hand a reaction is an action that the user executes responding to particular or unpredicted events. Typical tasks required to the user are the following: the activation of the general alarm; ring up the suitable emergency number; reaching the gathering zone; extinguish fires; close gas valves; aerate the rooms. Typical reactions that the user can execute are: go away from the fire or from smoky rooms; reaching safe zones when an earthquake is occurring.

The aim of the user is the fulfillment of all the required tasks possibly in the correct order and in time. If the user fails in one of this tasks its performance decreases as well as if one expected reaction is not executed as for instance moving away from a fire or leaving a room in presence of toxic gas. The rating system for the performance evaluation is straightforward: the starting rating is A and each time a task is not executed in the expected time or proper reactions are performed the rating decreases to B, C until Z proportionally with the seriousness of the mistakes committed by the user. At the end of the simulation a report is presented to the user. This report, which is shown in figure 3, contains the evaluation of the performance on the emergency simulation and highlights in detail each error made during the simulation.

Figure 3. The report on the users performance after a disaster simulation: completed and uncompleted tasks are highlighted as well as an overall rating of the performance.

4 CONCLUSIONS AND FUTURE WORK

The proposed software was developed with the aim of teaching efficiently the standard safety procedures to be put into practice on the workplaces in order to face the most common emergencies. The approach of VESPRO is based on the immersion of the user in a desktop virtual world where safety procedures are first taught and then practiced in a framework which allows the evaluation of user learning of the described concepts. The use of a realistic and personalized virtual environment assures the transmission of a very detailed full multimedial knowledge and his complete involvement. From the performed test sessions VESPRO achieves the expected results as it is able to make memorize to the testers the salient tasks to be performed together with the structure of the building the procedures are designed for including the positions of objects which can be used in the case of emergency, the location of security exits and the exit paths. From this point of view VESPRO results more efficient and complete than traditional methods used. In the future further events will be modeled and the use of more objects will be implemented in accordance with different kinds of buildings and workplaces.

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Modelling Information System in Public Administration – Integration of Services: Case of Slovenian Ministry of Higher Education, Science and Technology

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ABSTRACT

The Ministry of Higher Education, Science and Technology of the Republic of Slovenia (MHEST) decided to develop a new information system that would enable electronic services in higher education, integration of different information subsystems within the ministry, and connection with information systems of stakeholders outside the ministry, like other ministries, universities and others. The MHEST decided to start the project with a higher education information system model development. It also intended to identify and reduce administrative barriers as a part of broader government initiative. It issued a public tender and selected an organisation to carry out the work. The project focused on services that should be supported by the new information system, business processes within the ministry and amongst the stakeholders, and functional requirements. Having defined the services, use cases and high level process diagrams were made. The business processes were presented by the Business Process Modelling Notation (BPMN). A system architecture was proposed based on the principles of the Service Oriented Architecture (SOA) and functional analysis was completed by a set of functional requirements. The system development model and functional requirements would be used as a part of documentation in a public tender for the MHEST's information system development.

Key Words*: information systems, higher education, service integration, web services, business process management.*

1 INTRODUCTION

The information systems (IS) development is a complex process requiring a structured approach. The MHEST decided to develop the new IS in two stages. In the first stage, the functional requirements and the IS model were prepared. In the second stage, a detailed IS design would be prepared and implemented.

Several frameworks for IS and software development have been proposed recently, e.g. the incremental and iterative development methods (Cohen et al., 2004), rational unified process or RUP (Kroll, Per, Kruchten, 2003), extreme programming known as XP (Beck, Kent, 1999), and the rapid application development known as RAD (James, 1991). The main features of these methods are similar, but with a different focus. In the IS modelling

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process, some methods are focused on a data model, others on processes, user requirements, allocation of resources, and so forth. Regardless a chosen method, the IS development process should be driven by organisation's needs. As there are differences between organisations, their needs and requirements are met with different information systems. In practice, different methods should be combined in the IS modelling process. The business needs, requirements and processes should be considered. A special focus should be on the impact the IS would have on the organisation, its processes, its employees and other IS users. Often, a sector regulation and various standards should also be considered. By taking all these factors into account, the IS modelling becomes a very complex process, which can be successful only with clear business directions.

The goal of the project presented in this article, was to create the IS development model for the MHEST to support its higher education processes and reduce administrative barriers. The model was prepared following the ministry's strategic directions and national higher education policy. It includes relationships with all information stakeholders in the higher education in the Republic of Slovenia. The model is technology independent, therefore it presumes technology-independent application connectivity and high degree of data connectivity between all stakeholders, by considering known standards and code books – both, Slovenian and international.

The IS model is based on higher education services and business processes, functional requirements defined together with the MHEST, and IT guidelines in the public administration, defined by the Ministry of Public Administration. The model proposes an efficient design of the higher education information system, taking into account the latest practices in developing similar information systems. Having in mind different platforms, used by the stakeholders, evolving technologies and changing regulations influencing the supported business processes and user requirements, the IS model is designed to be flexible, scalable, and to support integration with different platforms. It follows the current trends in information technology, such as a Service Oriented Architecture (Rosen et al., 2008) or Enterprise Application Integration (EAI). The modelling was done by using the Unified Modelling Language (UML) (Fowler, 2004; Boch et al., 2005), Business Process Modelling Notation (BPMN) (Weske, 2007), and classical entity relationship data modelling.

The article is focused on the application of the above mentioned techniques and architectural principles to different levels and stages of complex IS design. In Section 2, the methodology is briefly described. The problem domain is described in Section 3 and results are presented in Section 4. The core building blocks of the system are presented in details, with some examples of techniques applied in system modelling. In Section 5, a short discussion concludes the article and underlines the key guidelines for the implementation.

2 METHODOLOGY

The model contains a complete functional specification of the MHEST information system and is technology neutral in terms of the underlying database, hardware, software platform, operational system, etc. The project team decided to use elements of the FURPS[3] model, developed at Hewlett-Packard (Grady et al., 1987), which is now widely used in the software industry as a model for classifying software quality attributes. Following the FURPS model, the team paid special attention to functional and non-functional requirements. The team gathered relevant information and requirements at several meetings with the representatives of MHEST. It also examined thoroughly the relevant policy, legislation and procedures of MHEST. The MHEST's employees were very helpful in all stages of the model design, especially in describing services, use cases and processes.

In the IS design different software tools were use, and the following diagram techniques, i.e. the BPMN for describing business processes, entity relationship diagrams for a data model, UML use cases for describing high level functionalities, XSD and pseudo code similar to the xsd specification for defining interfaces. Other diagram techniques were also used such as data flow diagrams, informal pictograms for an architectural diagram, and other techniques for describing specific characteristics of the system.

3 PROBLEM DOMAIN

The higher education information system should gather, store and manage data about all higher education institutions in the Republic of Slovenia, their study programs, students, graduates and employees. It should allow for a safe, controlled and effective exchange of data between the participating organisations, i.e. the MHEST, council for higher education, statistical office, universities, independent higher education institutions, national research agency, centres for social work, other ministries, student resident halls offices, and others.

The information system should provide a public access to specific data about study programs and higher education institutions that should be publicly available. The system should also meet high security standards and ensure the protection of personal data in accordance with the respective legislation. The following functionalities should be supported, i.e.

- Accreditation of higher education institutions
- Accreditation of study programs
- Registration of higher education institutions and study programmes
- Procedures for monitoring, assessing and assuring the quality of higher education institutions and study programmes
- Habilitation procedures
- Planning of preregistration announcement and enrolment in higher education

[3] FURPS stands for Functionality, Usability, Reliability, Performance and Supportability.

- Registration of enrolled students
- Planning for budgetary financing of higher education institutions
- Subsidies for student accommodation
- Subsidies for student transportation

These are the basic functionalities of the future higher education information system.

4 RESULTS

The model of the MHEST information system includes a list of IS functionalities, description of services and use cases, high level process diagrams, IS logical plan, and requirements for reliability, portability, localisation and security. The documentation also includes detailed diagrams and description of the system. This section gives a brief description of methods applied in the IS model design.

4.1 Functional requirements and use cases

The core functionalities of the system presented in Section 3 were defined together with the representatives of the MHEST. Use cases for all functionalities were designed at working meetings and within working groups. Final versions of use cases, accepted by the MHEST, were obtained in several iterations. In most cases, four or five iteration were required. Figure 1 presents an example of a use case diagram of subsidising student transportation.

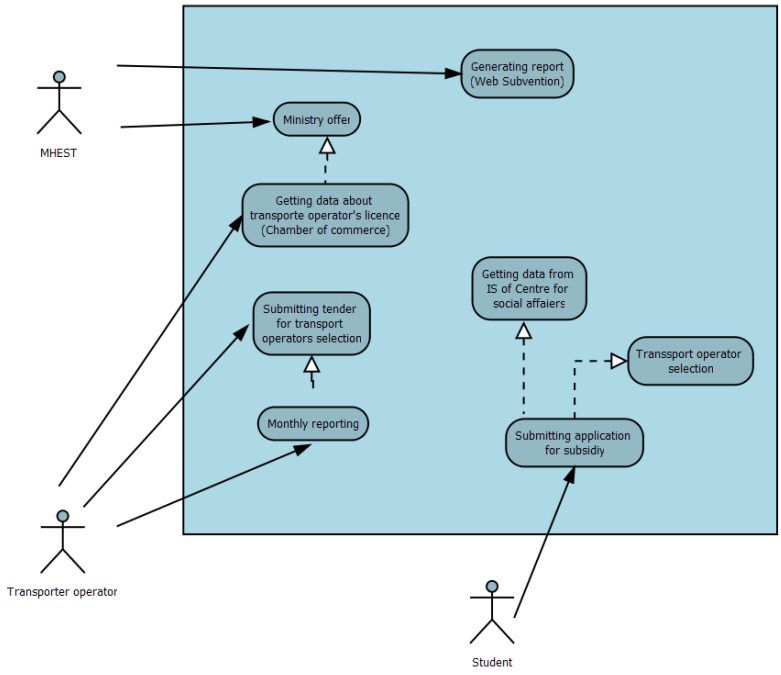

Figure 1: A use case diagram of subsidising student transportation.

For each use case, a process diagram was designed.

4.2 Business process model

A business process model defines related, structured activities or tasks that produce a specific service or product for a particular customer or customers. Business process modelling is usually performed by modelling tools. In our case the BPMN was used, which is a notation for business process modelling. The BPMN evolved from the classical process diagrams under the domain of Object Management Group (White and Miers, 2008). It provides a graphical notation for specifying business processes in a business process diagram. It uses a flowcharting technique that is similar to the UML activity diagrams. The BPMN enables different levels of abstraction. It can be easily understood by business users but also used to represent complex process semantic. The basic elements of BMPN are events, activities, gateways and flows. A process may begin with an event that initiates a sequence of activities. Basically, there are three types of events, i.e. start, end, and intermediate events. An event can be e.g. a message, timer, rule, error, or link. A flow represents a sequence of activities, flow of messages or association. Gateways can split or merge flows. The flows can be executed in parallel or only one at a time. Conditions for splitting or merging flows and the way they are executed are defined in gateways.

Organisational aspects of business processes in the BPMN diagrams are depicted by two types of visual frameworks. A pool is used to represent major participants in a process. If a process flow crosses organisational boundaries, each of the organisations is represented in a separate pool. A structure within a pool may contain one or more lanes representing different sections or organisational units inside the organisation. Therefore, lanes are used to organise and categorise activities within a pool according to a function or role. A process can be further explained by using footnotes, frames that connect related elements, and data objects.

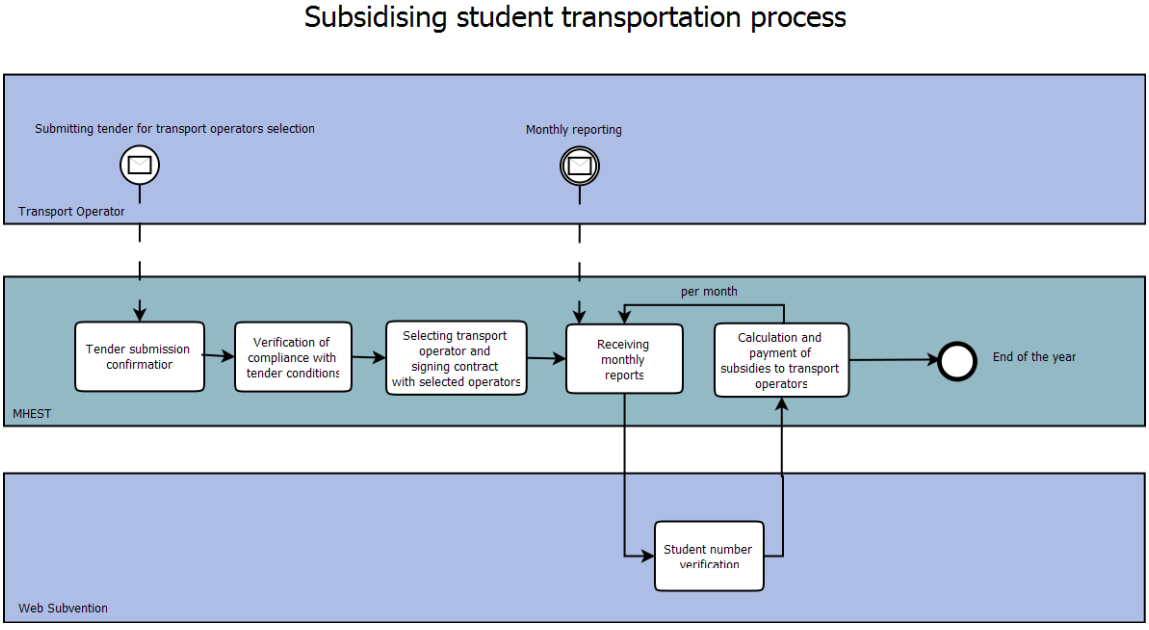

Figure 2: A BMPN diagram of subsidising student transportation process.

In Figure 2, an example of a BPMN diagram is shown, prepared in the process of modelling the MHEST information system. A diagram reveals relationships between organisations, involved in the process of subsidising student transportation. In order to reduce administrative barriers, the higher education information system should enable not only a support for internal processes within the MHEST, but also business process flows between different participating organisations. So as to improve efficiency of public administration, the higher education information system should enable and/or improve interoperability, e-cooperation, e-inclusion and reduction of administrative barriers.

4.3 Data model and integration

Data modelling was used in analysing the information requirements of the MHEST. The data model contains a comprehensive set of data supporting business processes described in the previous subsection. A logical data model in a form of the entity-relationship diagram was prepared in a standard notation, normalized in the 3rd normal form, which enables optimal implementation in any relational database management system. The reference data model, prepared during the project, will serve as a basis for the final data model. The reference model is flexible and expandable. New attributes and entity types can easily be added during the implementation, if new business requirements occur. In the project documentation, the reference data model was structured in details and depicted in standard entity relationship diagrams in more than thirty pages.

The data model includes classification codes such as Klasius and ISCED. It is suggested to use established standards for naming tables, attributes and codes, considering also international recommendations in the field of higher education.

4.4 Service integration

There are several institutions involved in higher education processes, exchanging a vast amount of data. By developing a new information system for higher education, the amount of data exchanged amongst institutions will certainly increase. The Slovenian e-government policy emphasises the importance of data exchange between institutions, interoperability of different information systems, reduction or elimination of administrative barriers, and compliance of data and processes with international standards due to integration into e-government initiatives at the European level.

After thoroughly considering functional requirements, it was suggested to implement the MHEST information system in accordance with the SOA architecture, where the information system functionalities were exposed to other systems through interfaces. The interfaces were documented and they defined a set of input parameters (messages) and returned values. Input and output messages were defined by schemes (see e.g. Figure 3).

The interfaces should support web services, including the protocols such as e.g. SOAP 1.1 or 1.2 and WSDL 1.2 or 2.0. The web services should be compatible with the WS-Addressing specification and the WS-I Basic Profile 1.0-1.2.

Interfaces were defined with pseudo descriptive schemes for the exchange of data between all participating institutions. In Figure 3, there is an example of enrolled students data sent to the MHEST by Slovenian higher education institutions.

Higher education institution ID

Study programme, study field, study level ID (recurring element)

Type of enrolment (full-time / part-time) (recurring element)

First year of enrolment (recurring element)

Number of enrolment places available

Student (recurring element):

Student ID, first name, middle name, last name, date of birth, address

Number of enrolment places for students enrolled in parallel courses, graduates, foreign citizens and Slovenians without citizenship (only for the first year). For each of these:

Student (recurring element):

Student ID, first name, middle name, last name, date of birth, address

Number of enrolment places in accordance with transfer requirements (only for students enrolled in second year or above)

Student (recurring element):

Student ID, first name, middle name, last name, date of birth, address

Figure 3: Description of an interface for the exchange of data of students enrolled in higher education.

5 DISSCUSION

The MHEST decided to use a top-down approach for its new information system development. That approach required strong involvement of the MHEST's experts, both in defining functional requirements and monitoring the project. By the top-down approach services and business processes could be defined independently of current practices. Many services and processes were not supported by any information system therefore the top-down approach was the best option.

As there were many organisations involved in the higher education processes, the most critical factor was to gather complete information and map business processes that cross several organisational boundaries. Participants who describe processes to business analytics were usually focused only on a narrow set of activities, performed within their organisation, or within their functional role. Therefore, it was crucial to gather information from all participating organisations and to define a clear boundary between the parts of a process executing within and outside the MHEST. The participation of all organisations is also

important in optimising business processes, reducing administrative barriers, and assuring optimal integration of various information systems. The team encountered several legal constraints that required changes in legislation in order to enable system integration and reduction of administrative barriers.

The system development and changes in legislation should be performed simultaneously. However, it is very important to adopt changes in the legislation before the completion of the system development and implementation. Therefore, co-operation between various ministries involved in the processes in higher education would be of vital importance. Without changing the legislation, the identified administrative barriers could not be removed and it would not be possible to automatically process data, collected by other ministries or organisations. Therefore, same data would be recollected by several participating organisations. That would raise the amount of collected data and would have a negative impact on the efficiency of administrative services and business processes.

The information system, supporting the higher education processes at the MHEST, would be very complex and should be developed in a progressive way in several phases. Only the most important functionalities covering the core business processes should be selected for the first phase. Simultaneously it would be wise to perform vertical integration between ministries at a certain level for optimal design of the information system.

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