Some Personal Reflections on the Information Systems Community

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The publication of the first edition of the second volume of the Scientific and Educational Forum on Business information Systems (SEFBIS), of which I am honoured to be member of the editorial board, gives me an opportunity to reflect on aspects of the discipline of information systems as well as provide the reader with an introduction to the papers in the Journal.

One of the great things about being a member of the International Federation of Information Processing (IFIP) is that we are able to meet so many people from different countries and share our views and experiences. Indeed it was through Mária Raffai joining the Information Systems IFIP Community (officially called IFIP Technical Committee 8) as national representative for Hungary that I met her and she kindly invited me to join the editorial board of SEFBIS. In turn, her initiative, and that of her colleagues and the John von Neumann Computer Society, has enabled us in the IS community to find out about the excellent research in information systems being carried out in Hungary as evidenced again in this issue.

In her article *New Working Group in IFIP TC 8,* Mária Raffai introduces us to a new Working Group (IFIP WG 8.9) on the theme of enterprise information systems. You can find out more about IFIP at www.ifip.org (look first at technical committee 8 or TC8 on the right-hand side of the screen). Mária 's article introduces us to the aims and scope of WG 8.9 and also about their conferences. My own research seemed to align best with the Working Group 8.2 on the impact of IT on organizations and society and I came to many of their conferences (they are great fun as well as intellectually stimulating) and then became even more involved when I became Chair of that working group.

I am uncomfortable about having to expect you to write up your research in English. Research is difficult enough without having to write it up in a foreign language. But doing so, and publishing in SEFBIS, does give you the opportunity to have your work seen by an international readership. It is a very big debate where I live in France but even the French journal *Systèmes d'Information et Management (SIM)* has articles in both French and English. Certainly, the 'international language' of English enables our work to be seen by a wider audience. Of course, being English myself and living in a foreign country, it is easy for me to argue that!

It is evident that I would have not been able to read this research were it not for the fact that the journal is in English. And what a missed opportunity that would have been! Following Mária 's paper, we have a paper of Gábor Homonnay, which is in fact on a topic appropriate for IFIP WG8.2! Indeed, the way that the paper is written, using metaphors, is very appropriate to that group. The paper is about applications being developed by users themselves rather than the technicians and it is called *New Greetings Card from Userland.* Gábor is correct in arguing that users are not well prepared for the role, and suggests attributes, skills and competencies required. But the arguments made suggest something more fundamental, that is, making such requirements part of the education system and even culture. I like very much the fact that the author uses a metaphor called *Userland* so that the paper is both interesting and fun to read as well as being useful.

The paper of Milán Hasznics entitled *Construction Model for Corporate Knowledge Management Systems* is a research-in-progress paper as Milán is studying for a Ph.D. One of the great joys I get from my work is researching with Ph.D. students and I have been fortunate to do this in England, France and Australia. Most people's best research is done at this time! It is also a great pleasure to act as 'faculty' in PhD consortia as groups of research students from all over the world can meet and discuss their research with each other and with more experienced members of faculty. They are such stimulating occasions (and great fun too). It is obvious on reading Milán's paper that significant work has already been completed by Milán in the area of knowledge management even though it is modestly claimed in the summary that the research has only reached the 'end of the initial stages'. Knowledge management has been an important issue for some years and yet I wonder if we have come very far in providing *true* knowledge management applications. But the model provided in the paper, to produce a fully functional knowledge management system in a step–by–step manner, is a welcome contribution. I look forward to reading a later paper describing the final results of the research.

The following paper also looks at knowledge management. Andrea Kő and Zoltán Szabó provide an evaluation framework for an assessment of the development of knowledge management solutions in their paper *KM Systems Development Evaluation Leaning on IT Audit.* The authors describe the inter-relationship between knowledge management and IT audit and audit standards. Too often in our research we look at an issue in isolation and not enough on its relationships with other aspects, even those in other disciplines. I think more in terms of systems and their relationships with other systems and the environment (following von Bertalanffy) than in terms of decomposing into parts (following Descartes)! The failure rate of KM systems of 50% to 70% quoted by the authors is a salutary lesson, and I fear that this is repeated elsewhere in information systems applications. I particularly like the way the authors demonstrate their approach in a case study. This provides evidence to the reader that the evaluation framework proposed has been tested empirically and therefore is more convincing. This work was supported by the European Commission's 6th Framework Program, and again we are fortunate for opportunities for such collaborative work.

The second contribution of Mária Raffai concerns the important organizational issue of strategic alignment in her paper *The Need for Harmony of IT and Business Strategy.* The use of the word *harmony* is both interesting and apt, as it suggests real alignment, that is, the IT and business strategy being as one, rather than merely a technical configuration. It is more an alliance than an alignment. Mária correctly asserts that such a harmony within the organization is essential if it is to compete in the modern world. IT and IS expenditure should not be seen as a partly unnecessary and inflated cost but as a necessary investment for the firm. To support this, Mária proposes a very comprehensive *convergent* architecture which makes a very useful contribution to the issue. But she rightly argues that for this to be effective *it is necessary to change the developer's and even the managers' mind and style*. This is, of course, quite a challenge!

Csongor Németh's contribution concerns process modeling. The paper *Contribution of Process Modeling to the Efficient Business Adaptation* illustrates the importance of the modeling that supports the conscious engineering of processes. As Milán in the earlier paper, Csongor is studying for a Ph.D. Interestingly, following my comments on the earlier paper of Andrea and Zoltán, this paper starts with an explanation of the systems view of the world in the context of the research. It is good practice to define the terminology first, as is done here. The contribution to process modeling provided in the paper 'makes the operation well-grounded, helps in generating improvement ideas, and in evaluating the value of these improvements, that is in making the operation more effective and efficient.' Again, it is a joy to read of PhD research in progress and I look forward to reading later of the overall contribution. With such research students we can be assured our discipline is progressing.

The next paper of Attila Horváth looks at the impact of information technology in the finance sector. *The ICT Effect on Payment Systems* again stresses the multi-disciplinary nature of our subject, suggesting this application requires economic, legal and banking knowledge, along with IS and IT. The banking sector is one where IT has made an enormous impact. ATM systems, digital payment and online banking, for example, has greatly affected customer behavior and there have been many repercussions on the workforce, and not all positive of course. This paper provides a very good overview of the state-of-the-art and also suggests changes that are likely to be coming to that sector in Hungary. I recommend the paper as a very useful start to appreciating the potential of the new payment systems.

How appropriate that Miklós Vörös starts the abstract of the paper *The Educational System of the Zrínyi Miklós National Defence University* as follows: *'[The] Information society is a society for continuous increase of knowledge. Knowledge is the most important source of welfare - the production of knowledge is the main aim of economy. The character of knowledge changes in the information society - it becomes multimedia-like, trans-disciplinary, and practical.'* I started my career in IT working as a systems analyst in a number of companies for a few years but I soon realized that I would gain much more satisfaction in life if I returned to university to research and teach. Not only are we given the opportunity to 'produce knowledge', particularly in our field, but of course we have the great privilege of transferring our knowledge and influencing our students. It is particularly interesting to read in this paper how the National Defence University uses distance learning (supported by IT of course) in its teaching. Such an approach can make 'lifelong learning' a reality. This is part of what Miklós describes as the 'new learning environment' necessary because 'conventional education is unable to meet [the new] challenge'. It is very useful to read of the ways other universities meet the new educational challenges.

I have entitled my introductory paper to this issue 'Some Personal Reflections on the Information Systems Community'. I think this issue of the *Scientific and Educational Forum on Business information Systems* clearly shows that the information systems community is very healthy, in Hungary as elsewhere.

DAVID AVISON is Distinguished Professor of Information Systems at ESSEC Business School, Paris, France. He has also held posts at Brunel, Aston and Southampton Universities in England, University Technology Sydney and University of New South Wales in Australia, and elsewhere. He is joint editor of Blackwell Science's Information Systems Journal now in its seventeenth volume and recently rated as a 'core' international journal and the leading European journal in information systems. So far, twenty-five books are to his credit including the fourth edition of the well-used text on Information Systems Development (jointly authored with Guy Fitzgerald) as well as published a large number of research papers in learned journals, edited texts and conference papers. He was Chair of the International Federation of Information Processing (IFIP) 8.2 group on the impact of IS/IT on organizations and society, and is presently vice chair of IFIP technical committee 8. He was past President of the UK Academy for Information Systems and also chair of the UK Heads and Professors of IS and is presently member of the IS Senior Scholars Forum. He was joint program chair of the International Conference in Information Systems in Las Vegas 2005 (and previously research program stream chair at ICIS Atlanta), joint program chair of IFIP TC8 conference at Santiago Chile in 2005, program chair of the IFIPWG8.2 conference in Amsterdam, panels chair for the European Conference in Information Systems at Copenhagen and publicity chair for the entity-relationship conference in Paris and chair of several other UK and European conferences. He researches in the area of information systems development and more generally on information systems in their natural organizational setting, in particular using action research, though he has also used a number of other qualitative research approaches.

New Working Group in IFIP TC8 Information Systems Committee: WG 8.9 Working Group on Enterprise Information Systems

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ABSTRACT

At the beginning of the 21st Century the enterprises have to face with several challenges: the increasing system complexity and the strong competition, the information technology has more and more progressive influence on business and also on the society, the organizations, the number of the software-intensive business' environments and their impact on business processes are continuously growing. These facts force the managers to invest into the computing technology, to use the latest products and solutions of IT and also urge the specialists responsible for the enterprise wide applications to create effective, well adaptable and intelligent solutions in order to satisfy the increasing user's demand. The engineers must integrate the existing and the easy changeable newly developed applications, they need to ensure the interoperability of the different software systems running on different platforms.

But it is an enormous challenge! As we know, the computer industry is always looking forward to improve the software and even the application development productivity as well as the quality and the longevity of the created products. It seems that the methodology revolution is over, the international organizations and associations elaborate and accept standards for every aspect of distributed enterprise computing from analysis and design through infrastructure. It is high time to provide a professional association for the specialists in order to gather and help them in organized form.

The Enterprise Centric Computing

The computing systems within the enterprises are not always so efficient than it would be excepted form the leadership and from the management. The different packaged applications cause overlapping functionality and duplicated information and moreover use multiple resources to solve the same problems. From business point of view there is an urgent need to integrate the separated so called island systems across the enterprise. And furthermore! The demand for using business-to-business integration adds a new dimension of the complexity [4]. The integration problem and/or the demand for using integrated systems must address not only to the disparate systems and data formats, but also to the differences between the enterprise's systems and the B2B message formats [1]. The interorganization cooperation from the standpoint of the computer systems is fluid, the partnership undergoes continuous change therefore the companies are forced to virtually merge their island systems by extranets.

The enterprise architecture makes possible to design well integrated systems with knitting the preexisting islands together. This is more effective way to satisfy user's requirements, rather than to develop new enterprise applications and/or components. But under the pressure of necessity on reaching low production cost and high quality in enterprise-centric computing, the software industry have to face the more and more increasing challenges. The demand for realizing the increased complexity is shown on the Figure 2-1.

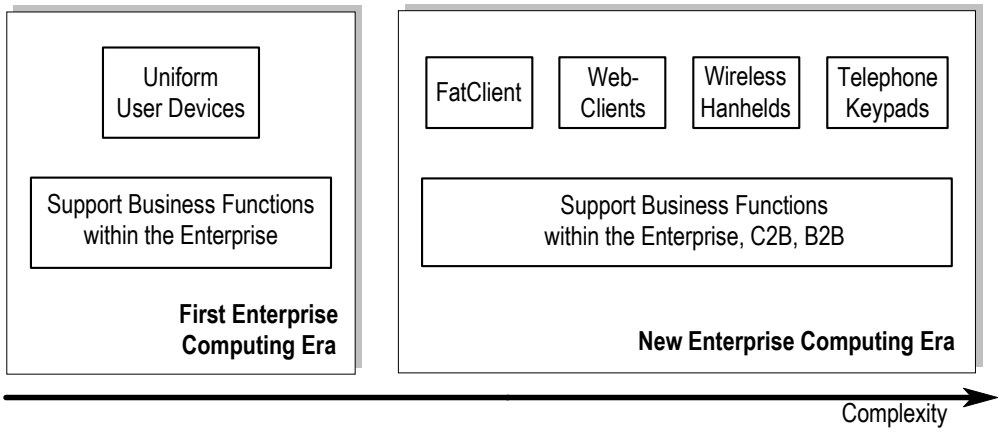

Figure 2-1. The pressure for realizing the increased complexity

The software industry has the answer to the social-economic challenges; it has solutions manifesting themselves in different concepts, methodologies, standards and tools. The results of the last years' research and innovation projects constitute the basis of the enterprise-wide computing, and give possibility to realize the application integration on a standard way [2]. Since the organizational need for the world wide cooperation requires solutions assuring the users on reliability, the specialists are forced to satisfy these demands. The multitier architecture of the computing systems (see Figure 2-2.) is suitable for the enterprise requirements, and together with the most important issues (component-based development, distributed computing systems, middleware that raises both the platform and programming abstraction levels, declarative specification in programming, standard modeling language that helps the unambiguous definitions through the whole development life cycle, separation of the concerns, creation and usage of design patterns etc.) gives the appropriate answer.

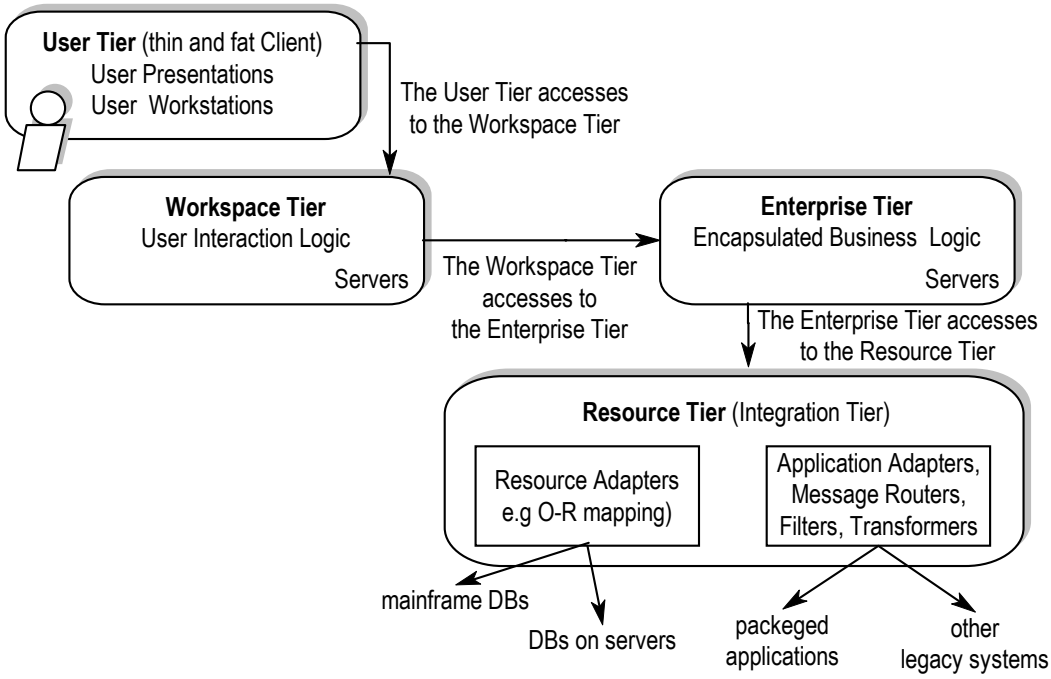

Figure 2-2. Multitiered architecture with EAI adapters and message management

❖ New Working Group in IFIP TC8

Mission of a Professional Branch

Before establishing a professional forum, the founders have to declare the mission, the main specialization fields, the aims and the strategy, the frame and the form of functionality, the conditions of membership, the roles, the tasks and the responsibilities. Besides it is also very important to clearly define a performable and controllable program.

Concerning to the challenges of enterprise information systems it seems, that a responsible association has to focus on the following problems:

- ICT impacts on business in different industrial sectors including manufacturing, service, transport, administration etc.,
- business process and workflow modeling,
- development tasks of enterprise wide, integrated applications: analysis, design, implementation; using simulation during the engineering process,
- enterprise computing concepts for specific domains (e.g. electronic and mobile commerce, or vertical domains: as finance, telecommunications, aerospace, control, defense, healthcare, etc.,
- solutions for collaboration (supply chain management (SCM), supplier relationship management (SRM), customer relationship management (CRM),
- enterprise architecture design and modeling on standard way: model driven architecture (MDA), component based development (CBD), service oriented architecture (SOA), collaborative development and co-operative engineering,
- service extension toward business intelligence and knowledge management,
- integration of the (legacy, new and future) enterprise applications, information and also the manufacturing systems,
- implementation of the new technology including ontology and semantic web support, middleware standards and systems (CORBA and J2EE, modeling, XML, RDF, OWL and UML),
- quality assurance, trust, security, and privacy issues in enterprise computing,
- international cooperation in research activity: information and system theory, engineering methodologies,
- creating and making public accessible samples, case studies, and other IT management issues.

The WG 8.9 Establishment Process

At the 36th TC8 Business meeting in Guimaraes (Portugal) professor LI D XU (Old Dominion University, USA) presented a proposal to start a new Working Group on Enterprise Information System (EIS). After a painstaking discussion the TC8 Board's members decided to postpone the decision and lead it open for the next TC8 meeting in 2007. The main acceptance condition of the new WG was a successful international conference organized in the relevant theme. On the regular annual meeting in 2007 (Santiago de Chile) A. MIN TJOA reported that the first edition of CONFENIS was well attended with more than 80 participants, and that the 2nd Conference is also under way of organizing (Beijing China, 14-16 October, 2007). As the aims, scopes and the executives of the new Working Group were finalized and were to be known, the TC8 leadership was made their decision. By the Decision No. 2006-10 the TC8 Board voted and unanimously approved the establishment of the WG 8.9 [3].

The Working Group on EIS (WG 8.9) focuses on the most important problems and solutions of Enterprise Information Systems. The members of the WG 8.9 make study of technical, organizational, and social aspects of EIS with emphasis of the business impacts, the efficiency and the implications of the new technology.

The WG 8.9's Aims

The aims of the Working Group Enterprise Information Systems are declared as:

- Provide a forum for international collaboration and dissemination of research and best practices in the enterprise information systems area.
- Establish close cooperation between academics and practitioners in the field of enterprise information systems.
- Increase the impact of research, and use development in the area of Enterprise Resource Planning Systems.
- Study and focus on the design, implementation and use of ERP Systems.

The Scope of the WG 8.9

– Concepts, theories, techniques, and implementation relevant to enterprise information systems.
– Identification of best practices encountered in the use of present day Enterprise Resource Planning Systems.
– Management of Enterprise Information Systems.
– Utilization of Enterprise Resource Planning Systems in small and medium enterprises.
– Enterprise Resource Planning Systems in the public sector.
– Applications of enterprise information systems in a supply chain environment.
– Enterprise Control System Integration.

The Board of TC8 WG 8.9

The Board of WG 8.9 was elected from the persons who took the initiatives in establishing a new working group, and who declared the mission and the program of it:

Chair

Li D Xu (Old Dominion University, USA)

Vice-Chairs

A. Min Tjoa (Vienna University of Technology)
Vladimir Marik (Czech Technical University)

Secretary

Maria Raffai (Széchenyi University, Hungary)

The WG 8.9 Conferences

The CONFENIS conference series is an IFIP conference initiated by the Information Systems Technical Committee that was considering to set-up a working group on Enterprise Information Systems. The founders have just established a CONFENIS mailing list in order to enable the members to discuss topics of common research interest on Enterprise Information Systems. Besides the mailing list, a CONFENIS forum has also been installed[1].

The conference series ha an international Program Committee (IPC), that is responsible for

– dissemination of the CONFENIS 2007 conference information among the colleagues and students and motivate them to submit their research works to the conference,
– providing the Conference with comments and suggestions on the topics of CONFENIS'2007.
– participating in the CONFENIS mailing list and forum to motivate the active discussion.
– reviewing 3 to 5 papers (depending on the received submissions and the expressed areas of interest, and
– they also may submit papers of their own.

The whole review process is handled online, and the IPC members undertake the responsibility for a fair and efficient reviewing process with a high standard.

CONFENIS'2006

The 1st IFIP TC8 International Conference on Enterprise Information Systems (CONFENIS 2006) was held in Vienna, Austria in 24-26th of April 2006[2]). More than 80 participants from around 30 countries have attended the conference and enjoyed valuable keynote speeches {e.g. Dewald Roode (ZA, chair of IFIP TC8); Bill Olle (UK, IFIP TC8), Gottfried Vossen (Director of European Research Center for Information Systems), Thomas Li (Director of IBM China Research Laboratory)} and 86 presentations. The conference proceedings are published by Springer as a series of IFIP.

CONFENIS'2007

The members of WG 8.9 are now on preparing the 2nd IFIP TC8 WG 8.9 International Conference on Enterprise Information Systems (CONFENIS 2007[3]) which will be held in Beijing (14-16. October 2007).

The topics of interest at the Conference in 2007 include, but are not limited to:

– enterprise information systems in different sectors
– effective and intelligent eEnterprise solutions
– business process and workflow modeling
– enterprise integration, enterprise engineering
– engineering concepts, paradigms, methods, tools
– inter enterprise solutions: collaboration

[1] see http://www.confenis.org/phorum/index.php

[2] see www.confenis.org/confenis2006/www.confenis.org/index.html

[3] see www.keylab-imie.org/confenis2007/general/index.aspx

– enterprise architecture design, model driven architecture (MDA), service oriented architecture (SOA),
– application integration (EAI)
– up-to-date enterprise computing technologies (ontology, semantic web, middleware standards)
– enterprise computing solutions: Business intelligence (BI), knowledge management (KM), software quality assurance (SQA)
– trust, security, and privacy issues in enterprise computing
– research results in different subfields
– future generation enterprise information systems
– newly developed, specialized applications, studies, samples

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[3] Final Minutes of IFIP TC8 Information Systems 37th Meeting of National Representatives in Santiago de Chile (2006).

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New greetings card from Userland
About the application culture

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ABSTRACT

Nowadays more and more the user is responsible for his/her application. The real practice shows us, that they are not prepared enough and properly for this role. This presentation would give some major attributes what kind of skills and competencies they must have for having better applications. The major key elements are (1) the business studies from young ages, (2) the training for higher level of application culture, (3) the importance of samples and patterns and (4) the taking into account the environmental constraints.

The IT/IS specialists have important role in the applications by their developments, by their maintenance- and change management support. But the fundamental player and the major determining actor concerning the final result of the application is the user. We can and we have to provide better and better education, qualification for IT/IS specialists. But please do not wait better application results until the user's application-education is not solved properly.

The Userland

These minds below come from Userland. Please take into account, that Userland is an ideal country, therefore the view-point might seem to be special. Userland is far away. It is over the Ocean. It is over the Internet Penetration and even over the ECDL Land too. They are not surrounded by Really Real World (Real World is a Hungarian Big-Brother-like TV series), even not by Big Brother Land. They might live normal human life.

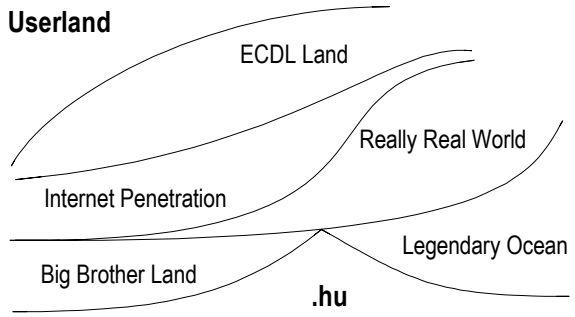

Figure 3-1. The relation of Hungary and Userland

They lived in harmony until they haven't lost their innocence, until they haven't used integrated application systems. The integrated applications became inconceivable and strange for them. First they have not understood what happened to them, later they were confused by the events of the application. The applications remained strange and dangerous. The users almost hated the integrated applications.

This bad situation was solved by a chance. The user became the only, exclusively and ultimate responsible of the application, because of many reasons. The user alone should defend the application during an audit or validation from that time.

There were three important conditions to make this role-segregation successful:

- appropriate trained users for their role,
- managers who accept this responsibility segregation,
- IS/IT specialists who's cooperation is based on this new situation.

The applications are fully successful in Userland, because

– users understand their roles and responsibilities,
– they are able to write appropriate, complete and detailed user's requirements,
– they can properly test, use and control the applications,
– they are familiar with the application development life-cycle, therefore they can work together with the developers/consultants.

Common idea in Userland, that every graduated people will become user one day. Therefore it is essential to prepare them to this new role. It is a permanent task from the nursery till the university and more. And Userland does it, it has a long tradition. You will see how.

Application Studies

Application studies are not equal to computer sciences. Even more not equal to PC usage, to ECDL knowledge. They are important pre-requisites only. They are important to stepping into the application studies.

There are four major elements of application studies:

– business studies from young ages,
– application culture studies,
– samples and patterns concerning applications and their developments,
– about the environment of the applications.

It is obvious, that all four domains are widely understood, where the words about the application culture are on the culture itself and ethics too, where the experience behind samples and patterns is also communicated, where the environment covers the every day's public thinking and feeling too, etc.

Business Studies from Young Ages

Business surrounds us. It surrounds us from the cradle till the old ages. Therefore even the small users are educated to the business. It is not too difficult. Could you imagine, that the business is told in a lullaby? Could you imagine how to explain the business to the small children? For example Richard Scarrey had answered it in his book: What Do People Do All Day? (By the way the Hungarian translated title seems to be better: *Tesz-vesz város,* roughly re-translated: Do-Take City.) So it is not a wonder to start it in young ages. And please take into account, that the young ages are more flexible, more sensitive to the new ideas, especially in teen-ages. Imagine the result if young people are dealing more business studies than watching TV series.

The target is to understand the whole world around us. The communication might start with picture books: how the things are working around us. This is practical for all future orientations. Deep and detailed business study could come in the secondary school. The effort depends on the study book and on the teacher. Business could be explained more interesting than a crime, if the student realizes and understood the details, the roles and responsibilities, the inter-actions, the background interests etc.

We have to know, that there is no fast-food method for the business and application studies. There isn't three weeks long course to become experienced user. Some weeks and some months are not enough to understand and feel the business. It is a long way from the nursery. And it is endless.

Theory and practice are usually twins, in the business too. And business is a special domain: it is a soft knowledge, where practice is more important than theory. The theory without practice remains useless. It is impossible to understand the theory without the practice. This is why practice is the priority in the education.

Some aspects of the business studies (concerning later coming application aspect):

– communicate always about practical things,
– make understand the different players, the different roles, the battle between different interests,
– understand and imagine the business flows,
– to know standard core and background flows,
– understand how to finance the business,
– show the job segregation, the responsibilities,
– able to analyze and document the flows.

The world is turning to the flow oriented responsibilities. New positions occurred: Chief Flow Officer, Flow Responsible etc. Flow oriented business studies are needed to fulfill the new requirements.

(By the way the flow orientation is classic and eternal, from the pre-history until the current system-analysts.)

Application Culture

We spend the majority of our life with our applications, with our systems. We spend much more time with our applications in the office like with our family at home. How happy we are with our systems? How happy we are in our business? The goal is to live in harmony with our applications, especially with our integrated information systems.

Application culture means a set of knowledge:

- Understand IS flows, always based on business flows,
- Ability to define user requirements,
- Thinking always together with the environment, in links, in dependencies,
- Accept and prefer standard solutions,
- Able to create controls of applications,
- Be sensitive on „application hygiene", keep the applications in good conditions.

You are near to the goal if you train general human culture at first. Greek culture, Roman culture, European culture, Shakespeare, Schiller, etc. Application culture is very vulnerable without general human background. The basis is the knowledge of the general culture. Special application „flavor" could make the general culture easily digested for young students. This is the „hidden-style" of application culture study. The final mix will be strong and ever lasting.

The application history is very important. The application history seems to be similar to the Genesis. It was also a creation. People must understand the evolution of the integrated applications. Let us see the same-like story:

- Separating hardware and software, separating operation software and application software: a first day,
- Put application out of the computer room, to the desks: a second day,
- Make the systems transactional with central databases: a third day,
- Creating integrated systems and large scale applications: a forth day,
- Make the systems controlled and secured, make user oriented: a fifth day,
- Connect and link everything together: a sixth day.

And till that time User saw it was good. But the second look told him the contrary. The integrated large scale applications are unsafe. They contain bugs and errors. The efficiency is not high, in spite the promises. The global result is not what the User imagined before. Therefore the seventh day was the day of awakening. User had to realize, he/she is not omnipotent. And he/she has got the punishment because of the failed creation: he/she has to maintain the application forever, he/she has to change the versions every three years, and he/she has to work always on the change control. It is eternal punishment. We can ask important questions knowing this history:

- Are the current systems really what we wanted to have?
- Are we trained and cultured enough to realize our faults and errors?
- What are the key factors of the successfully integrated applications?
- Could all these things or problems be trained?

And here comes the final question:

Would it be trained?

Large scale applications, integration, merges and globalization; they are what we could not avoid. Therefore all we need some medicine, some immune-material against the wrong side of complexity and globalization. The best medicine, if we understand all the things around us. We have to realize the unchangeable things, and we have to know the way of modification of changeable things.

The most important balance of global acceleration: the application culture. This is our future.

People must understand why the banks not send eMails for gathering information. People must understand why it is important to update the master data. People must understand why the previous clerk did in the flows his/her action? People must understand the consequence of his/her action. People must understand the applications.

Some further results should come also from the application culture:

– Sensitivity of asking questions: always be able to put questions,
– Sensitivity of complete understanding: out away the limited thinking.

The application ethics is also important; it should be communicated during the study. Computer technology gives many advantages, but gives also many possibilities of frauds, incorrect actions etc. too. All users must be trained for correct and ethical usage.

Samples and Satterns

There is a craftsman's profession, in spite of all standardization and industrialization. Mastering is always through examples and experiences. The best application specialists have started their carrier at an experienced master, as the craftsman's knowledge was provided through apprenticeship for centuries.

The world is running ahead. Therefore there is no way to provide enough scholarship for apprentices, to provide enough on-the-job training. This is why the patterns and samples are essential. They can give more practical knowledge than any study-book.

The majority of the problems could be deducted to samples and patterns. The quality of individual solutions would be appropriate using samples and patterns. And samples give the special approach of similarities, analog solutions. The current stile of best practices is also set of samples and patterns. The IS/IT technically independent samples, patterns are very useful and eternal.

Many domains are worth being a domain of samples and patterns:

– system development life-cycle itself,
– elements of user requirements,
– identification,
– raw data management,
– typical business flows (core and back-office flows),
– built-in controls,
– risks in the applications,
– test methods (from Traceability matrix until create test cases),
– flexible reports,
– management reports,
– application documentation etc.

The most important to realize the elements especially the key elements inside the various samples and patterns. Those will understand well these examples, who can differentiate the elements and who can analyze, classify them.

Samples teach us, that there are many same good solutions for one given problem. The best way to fail the system is thinking in one, ultimate and only good solution only.

About the Environment

The TV ads and the ads from the newspapers tell us: not characteristic, but able to form young people are needed, who can be formed to the habit and culture of the company. Who do not think too much, but who follows the rules. Who are not too much creative and inventive, but who can copy standard procedures and can work by the procedures only. The superficial opinion is that companies need robotized employees, who can accept all instructions, even the not clever ones too. The result is Arthur Andersen and Enron.

The good example is contrary: really thinking, open minded employees are needed, who know their environment, have opinion about things, especially on their own activities. They will follow the rules, but they will criticize them if necessary. These open minded people would able to write appropriate user requirements. They will work in the team together with the IT/IS specialists, but not as a marionette.

Now the companies start to hire experienced assistants instead of fashion models, and experienced specialists, because it is impossible to set up complex systems and integrate applications without experiences and without practice in the concerned field. Clever and characteristic employees are needed, who can take the responsibility for their domains, which are able to define requirements and can control the processes and the whole business flow.

Special competency is the risk management. This is one side of the highest level of the user knowledge. Taking the responsibility is one thing. Taking the responsibility with minimal risk, this is the final goal. Risk management study is impossible without appropriate experience.

Summary

We may find many more useful aspects and domains for the education of all graduated people to reach the optimal level of application knowledge. We have to work on this direction: to complete the needed user knowledge portfolio. It is important.

But more important is to start the education of business background in young ages, and to set up the studies of application culture and application samples and patterns. The whole world is turning to controlled applications. More and more Sarbanes-Oxley like laws will come. Users must defend their applications during the various audits. Let us give them the chance to do it properly!

Construction Model for Corporate Knowledge Management Systems

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ABSTRACT

The purpose of this paper is to provide an overview of the progress of my Ph.D. research. The main goal of this research is to construct a model according to which an effective, IT supported corporate knowledge management subsystem can be established. Nowadays, the proper management of the intellectual capital is of outmost importance. The inevitable component of achieving sustainable advantage over the competitors is the effective knowledge management. Just like quality assurance systems, the knowledge management should serve as a corporate subsystem supporting all the activities of the company. In this presentation, a model is to be introduced. The usage of this model enables the user (e.g. the CKO – Chief Knowledge Officer) to construct a wide coverage, fully functional knowledge management system in a step – by – step manner.

Introduction

The high level steps of the method for establishing *an effective, IT supported corporate knowledge management subsystem* are the following

- Separation of autonomous activity units, which can be classified using the value chain model of Michael Porter (1985) [5].
- Identification of inter-autonomous unit subsystems. The structural elements of the company that are members of such subsystems can be effectively used as a channel of interaction between the autonomous units. These channels are highly needed as we are to create a corporate knowledge management system that represents the possible maximum of the intellectual capital of the entire firm even at its smallest component. The structure of the knowledge management system that is suggested by our model, is very similar to the sophisticated hub and spoke data warehouse architectures at the high level. Of course, there is an exception due to the tacit knowledge storability problem: only explicit knowledge can be handled by a centralized solution.
- After the separation process, we can identify the properties of the system components. In this phase, the adequate knowledge management activities (or activity packages) can be assigned to each component using the KM activity matrix. Both the autonomous and the channel components can be handled in the same way.
- After the assignment of activities, we can also assign IT support solutions, accordingly to the activities specified during the third step.
- Optimization step: elimination of duplicate IT components, identification of alternative communication channels via commonly used systems.
- The step of completion: the assignment of personnel.

The model, the sequence and the KM activity matrix are parts of my Ph.D. research results.

Intellectual Capital as an Asset

As it was mentioned in the abstract, the proper management of the intellectual capital can result in sustainable competition advantage. The exact value of the intellectual capital held by the actual company is difficult to express in numbers. The key guideline in this question is the difference between the actual market price and the price approximated by the accounting. This difference has two main components: the intellectual capital and the effects of the stock market. This classification is displayed in Figure 4-1.

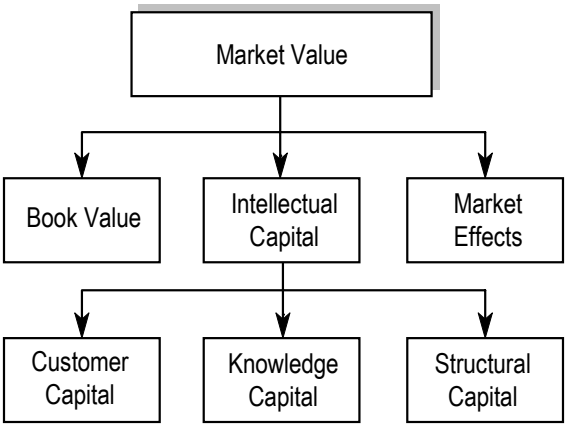

Figure 4-1. Components of the intellectual capital

The disturbance in calculating the exact numeric value of the intellectual capital is caused by the presence of the effects of speculation. The purpose of knowledge management is the proper handling of this capital and ensuring the dominance in business competition – this is the reason why the importance of this specific field can not be denied.

Approaches of KM

Nowadays, as companies attempt to maximize the utilization of the knowledge possessed by the firm, multiple methodologies arise. The key of differentiating these approaches is determining their emphasis ratio placed on codification (capturing and disseminating knowledge while relying on media) or personalization (linking the knowledge to the carrier). The two extreme cases are the following:

– Personalization is everything! The tacit knowledge [6][8] of our employees must be managed, while the codificated knowledge is to be ignored.
– Codification is everything! The tacit knowledge is hard to transfer, and this transfer is sometimes spontaneous and occasional. The redistribution and constant extension of codified knowledge is prioritized.

From the perspective of IT supportability, I believe the adequate way is somewhere between the two extremities described above, depending on the structure and activities of the organization that is to be supported. The codification should highly benefit from the wide accessibility, effective data retrieval and the dense data storing capability of modern IT systems. The personalization activities can be effectively supported by the widely accessible IT systems that offer a wide range of interpersonal communication solutions. This guideline will be followed through the entire planning process.

Remapping the Company

It is imperative in the case of a company of complex activities to separate specific, autonomous structural units that require different knowledge management methodologies (the KM profiles of this context will be explained in the following chapters). The two main types of corporate units (important from the perspective of KM system construction)
– Activity units and
– Communication units.

The separation of activity units of a company is to be based on the value chain model, shown on Figure 4-2. (Michael Porter – 1985 [5]).

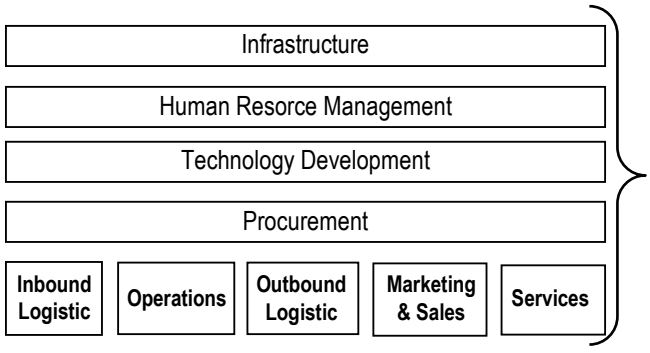

Figure 4-2. The value chain model [5]

Any structural unit that fulfills the role of one or more of the components of the value chain model is to be considered as an *activity unit.* It is important to determine the borders of a functional / separable unit according to the activity it can autonomously comply. In case of multiple activities, the partitions, created during the remapping step can overlap. The minimum complexity (granularity) of activities should be determined accordingly to the magnitude of the company.

Once the activity units are selected, we must identify or design the structural components of the company that will be responsible for the facilitation of the interaction between the previously mentioned units, in the following; these will be referred as *communication units.* The communication units will also be tasked with monitoring the knowledge transfer, and selecting the transferable knowledge between the activity units that are connected. These are virtual units that can be materialized. The spectrum of implementation of communication units is wide: communication units can be for example autonomous, registered expert groups within the enterprise, or a commonly used, automated knowledge map and address storage unit, moreover a commonly used relaxation lunge situated between the activity units that are to interact.

This step is only necessary in case of *multiple autonomous activity units.* This view of structure leads us to the parallelism with the hub-and-spoke data warehouse architectures.

Note that the decomposition based on the Porter model, can not be applied in the case of purely project based organizations. The proper decomposition of organizations of this type is a part of the upcoming research tasks.

Hub and Spoke Architecture

The hub and spoke architecture –shown on Figure 4-3.– is the design guideline for the most complex and the most capable data warehouse implementations. The "strength" of this architecture lies in a centralized data storage component with localized data marts (smaller data warehouses that are synchronized with the central storage), which enables the user to perform either quick queries or deep searches throughout all the data possessed by the owner company.

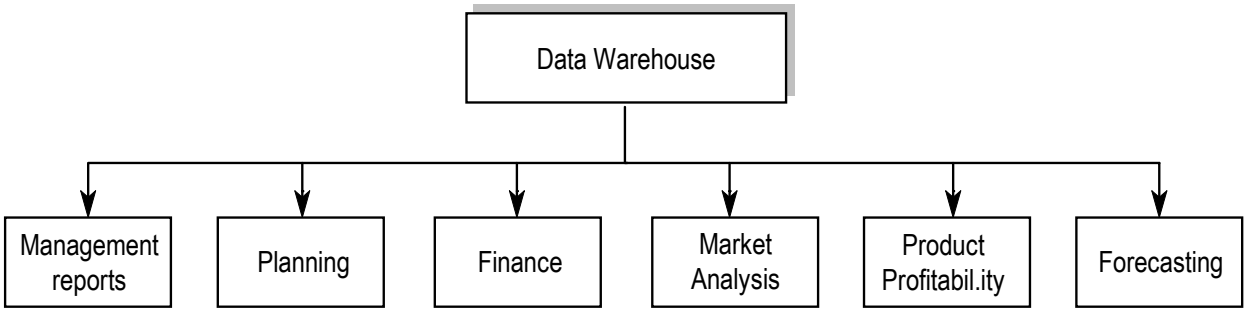

Figure 4-3. Hub and spoke data warehouse architecture

The data warehouse of any type can only fulfill its duty when it is connected to all of the functional parts of the owner company, and contains conclusive data upon the entire functionality. This is the point where data warehouses and knowledge management subsystems are similar: the connectivity to all corporate units – both the hub and spoke architecture based data warehouses and knowledge management subsystems must be:

- Connected to all relevant information streams within the corporation
- Accessible in a centralised manner
- Capable of dissemination of massive proportions of information

These three points compose a parallelism according to which I intend to use the structure introduced at the hub and spoke architecture for the high level representation of my model.

The unit separation of a company from the aspect of the knowledge management results in the structure shown on Figure 4-4.

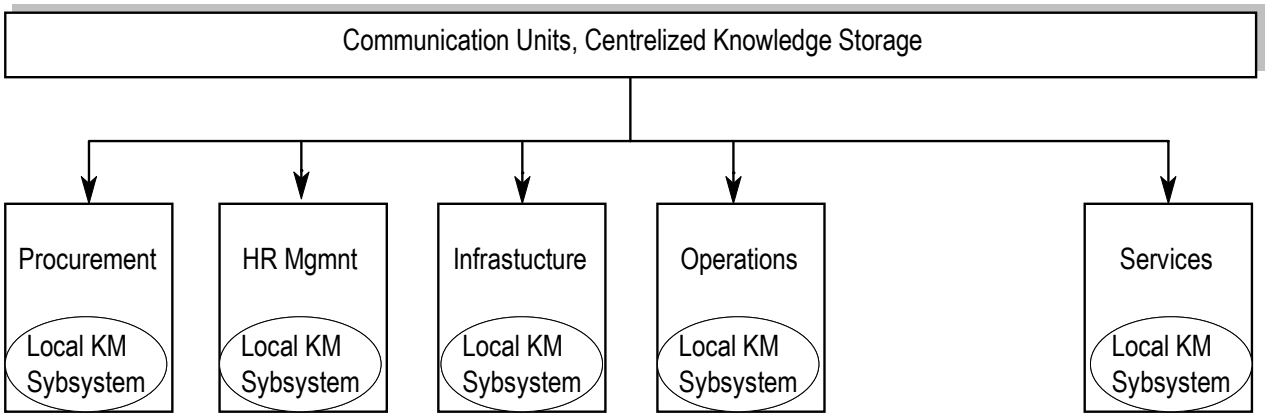

Figure 4-4. High level map of knowledge management structure

Before detailing the knowledge management systems of the activity and communication units, we must deal with the problem of the centralized data storage. First, we must clarify that the high level knowledge management structure displayed above describes purely organizational structure and no IT solutions at all. Certainly, the codifiable knowledge can be stored in a centralized way, but there are serious problems with the centralized storage of the tacit knowledge. In the case of tacit knowledge the only way to grant its availability is to make it possible to find and access the carrier. If the person that needs the tacit knowledge and the carrier are in the same unit, the task of tacit knowledge transfer is to be delegated to the local knowledge management subsystem.

Communication subsystems may form subsets within the company. If we are to make the most knowledge available in any point of our organization, no activity unit should remain unconnected. To reach this state we can create new, artificial communication units, or reassign the employees of the intersection as a member of all intersecting communication units. The simplified structure of the ideal state is shown on Figure 4-5.

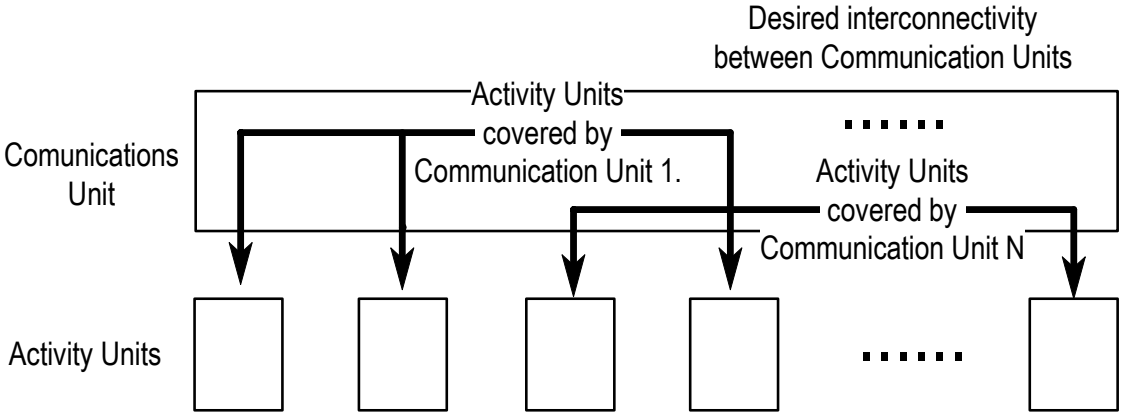

Figure 4-5. Ideal high-level structure

The KM Activity Matrix

The localized knowledge management subsystems usually perform various tasks with the same goal: make the knowledge transfer and creation process more and more effective. Examples for such tasks are: organizing trainings, maintaining databases about tacit knowledge locations, facilitation of self-organizing expert groups etc. The KM activity matrix was constructed to give a systematic framework for the assignment of tasks of the local KM subsystems. The construction of the KM activity matrix is shown on Figure 4-6. The cells contain knowledge management activities, categorized accordingly to their nature (see Figure 4-7).

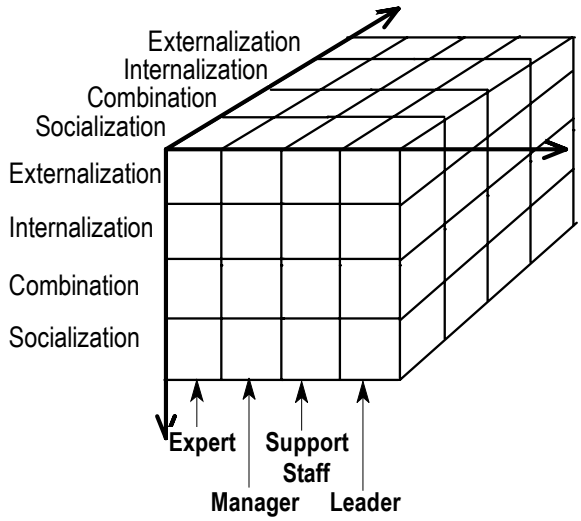

Figure 4-6. KM activity matrix

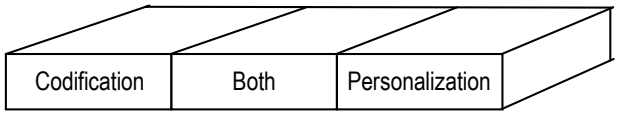

Figure 4-7. KM activity matrix cell

Explanation for the concepts used in Figure 4-7:

– Codification is the process that can be effectively used when dealing with explicit knowledge: the explicit type of knowledge can be recorded easily by writing down, loading it into a database etc. The codification process embodies the progress of capturing this type of knowledge, recording it with an adequate media type, and making the recorded volumes accessible – for example, a bi-lingual language lecture book holds the codified knowledge about the grammar and the vocabulary of a foreign language.
– .
– Personalization is the only way to effectively preserve tacit knowledge within the organization. To conduct personalization, the tacit knowledge must be reconnaissance, the carrier must be identified and added to the intra-organizational chart of carriers. This chart should be widely accessible.
– Some jobs require support from both types of methodologies: for example, a car exterior designer must consult with material property tables for conclusive data (which is clearly codified knowledge), but also may need the help of more experienced designers (tacit knowledge) to create a car that impresses the customers by it sight.

Now, the contents of a cell are specified, we need to clarify the semantics of the dimensions of the matrix.

Dimensions

The dimensions of the KM activity matrix are of two different origins. The coordinates of axis 1 and 2 are composed of the elements of the set specified by Karl Erik Sveiby [1] as the four key players of knowledge management. Axis 3 is based on the spiral model of knowledge creation. The activity content of the cell, determined by the three corresponding values of coordinates represents the activities conducted between the specific types of staff (first two coordinates), of the specific phase of the knowledge spiral.

Key Players

According decades of corporate experience, K.E. Sveiby determines four major groups of players in the field of knowledge management, the brief descriptions of these groups are in the following:

– Leader: capable of cooperation and can cope even with the experts. The leader possesses the vision and the power to change into a new direction.

– Manager: capable of cooperation- the task of a manager is to maintain the functionality of the company and keep heading in a predefined direction – the "great preserver".
– Expert: excellent workforce in his/her own field, a capable problem solver usually with narrow perspective. Needs guidance, only cooperative with its own class.
– Support staff: Facilitates the work of all other groups in its own, regulated way. The education level of the members is usually lower.

This classification fits the most complex variant of KM systems: the knowledge management of the knowledge organizations. This fact ensures us that the model remains useful if we apply it (with restrictions – of course) to other types of organizations as well.

The Process Model

The spiral model which was set up by Nonaka and Takeuchi [4] [9] is used to represent the knowledge creation process, by considering the flow of the knowledge. The stages and the process are displayed on Figure 4-8.

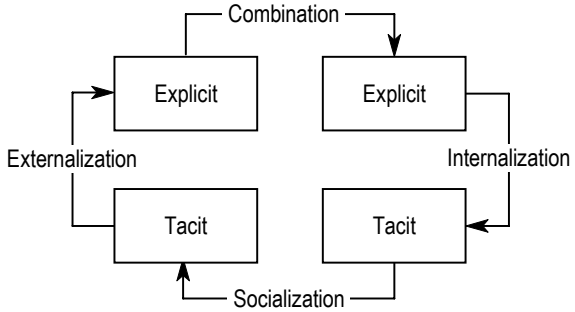

Figure 4-8. Knowledge spiral model[4]

The brief explanation of the stages:

– Externalization: making the personal tacit knowledge accessible by codification (writing essays, tutorials, etc.)
– Internalization: turning the explicit knowledge into own, personal knowledge; mainly similar to learning.
– Combination: creation of additional knowledge by combining the elements of explicit knowledge.
– Socialization: Direct transfer of tacit knowledge, mainly executable in a master-student relation.

Once we have the proper profile identification along with the exact coordinates within the matrix, we need to use repositories to select the corresponding solutions.

Repositories to Research

During the process descriptions, I am going to refer to various repositories. These repositories along with the construction model are parts of my Ph.D. research objectives. In the current stage of the research, the purpose, and some major properties of these repositories are specified. The main goal of the next research phase is to fill these repositories with elements.

Classification Repository

The classification repository is a collection of the classification factors. Any kind of organization should be precisely categorized using this system of factors. Once the class, the organization belongs to is determined, the classification repository should give us the corresponding profile type.

Profiles Repository

In this repository the possible organization profiles are summarized. Each profile contains an activity collection and a protocol description. The activity collections are based on the KM activity matrix – actually a collection is a subset of KM activity cells composed accordingly to the current profile. The protocol description contains the forms of interaction; activity unit of the current profile should comply with the communication units it is connected to.

Communications Repository

The communications repository is a simplified repository with few, complex profiles of activities for communication units.

IT Solutions Repository

This repository is contains the assignment alternatives between KM activities and information technology solutions. Due to the quickly changing environment of the information technology, the IT solutions repository should contain three components:

- High level repository: the solutions are described on the level of their class, specified accordingly to the capabilities of the solutions it contains
- Assignment matrix between high level IT repository and knowledge management activities.
- Low level repository: the set of the classes and their members: the exact IT solutions that can be purchased on the market. This repository may only gain an initial status during my Ph.D. research. This repository will has to be refreshed continuously if the construction model is to be applied.

Having all the repositories available, we can start to customize our KM system.

Model Based Corporate KM System

1. The first step is to map the structural units of the company accordingly to their activities. The choice of the classification factors should be composed of the elements of the classification repository. From this point we are able to (a) identify the activity units (b) identify alternatives for communication units. We must form the set of communication units to ensure maximal connectivity among all activity units in the way mentioned above. Once the knowledge management network is topologically complete we may proceed with step two.
2. In the second step, the local knowledge management of the activity units is to be founded. During step one, the separation process identified not only the borders of the specific activity unit, but also determines its profile accordingly to the classification factors. The construction of local knowledge management systems will be conducted via the following steps: (a) assignment of employees into the groups of KM key players, (b) specification of km activities according to the profile taken from the profile repository and (c) selection of types of interaction towards the connected communication units from the profile repository.
3. In the third step we select the activities to be complied by each communication unit from the simplified communications repository. The selection depends on the communication types of the connected activity units.
4. In the final phase, we must assign the personnel to all activities within the units, and assign IT solutions to support them. The assignment of IT systems should be committed in three phases accordingly to the IT solution repository: (a) assign the proper solutions to each knowledge management activity, (b) eliminate duplicate IT systems using distributed or network based systems, and (c) organize training for the personnel.

Summary

The Ph.D. research which is outlined in this paper has reached the end of the initial stages. The hypothetical model introduced here has the purpose of giving a systematic framework to the construction processes of corporate knowledge management systems. If this model succeeds, the applier organizations will be able to increase values of their intellectual capital (shown on Figure 4-1).

- Advanced KM structure – increase in the value of structural capital
- More effective knowledge management – increase in knowledge capital, represented by employees
- Indirect effect: more efficient knowledge base at the customer relations – increase in customer capital.

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KM Systems Development Evaluation Leaning on IT Audit

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ABSTRACT

The primary goal of our paper is to provide an evaluation framework for an assessment of the development of knowledge management solutions. The relation between knowledge management and IT audit has numerous sides. Knowledge management processes can support the IT audit and vice versa. The auditor has to be knowledgeable about the system and its environment in order to perform the audit. He has to capture and structure the relevant knowledge to understand the purpose, the functionality of the system, to reveal the potential risks regarding the system. The auditor has to map, acquire and evaluate relevant knowledge during the assessment. Well developed knowledge management processes can support these audit activities and leverage the results. Poor knowledge management activities will make IT audit cumbersome and limit the usefulness of the outcome. Knowledge management systems can be valuable sources of audit-relevant knowledge. IT audit itself is a knowledge-dependent activity. Our paper analyses the relationship of knowledge management with audit standards. We investigate the specialities of KM developments from audit point of view (particularly important aspects of audit, specific control objectives). A case study, based on experiences gained from GUIDE project (IST-2003-507498 funded by the European Commission's 6th Framework Programme) illustrates the findings.

Introduction

Many IT development projects can be supported by knowledge management solutions. The most promising ones are ontologies and ontology-based knowledge management systems. Developments of ontology-based applications are hot topics nowadays, especially at the field of the development of complex and large, enterprise-wide applications, like e-Government solutions (at national and international level). These projects are not "simply" IT projects, but complex knowledge management projects with special KM-related characteristics and risks. Assessment and audit of such developments requires special approach. During the evaluation of knowledge management solutions, knowledge management related aspects have to be assessed also, which gives additional requirements for audit.

Audit methodologies adopt risk-based approach, so IT auditor has to deal with risks assessment during the early stages of the audit. While our paper focuses on IT audit and knowledge aspects of IT audit, knowledge audit also a relevant concept. First let's discuss the most important relevant definitions and their relationships!

Knowledge related audits are classified into two groups in the literature. "The information audit is a process that will effectively determine the current information environment by identifying what information is required to meet the needs of the organization" (Henczel, 2000: p 11). In this definition information audit is a tool that can be used to identify strategically significant information resources, and also identifies those tasks and activities that create knowledge and those that rely on the transfer of knowledge from other areas of the organisation (Henczel, 2000). An information audit concentrates on developing a 'knowledge' map of recorded information assets. It can also identifies the information created and assesses its value, identifies the expertise and knowledge assets and the information gaps, reviews the current use of external and internal information sources, and maps information flows and bottlenecks within those flows.

A knowledge audit looks more specifically at the tacit knowledge and knowledge of the organization that is the knowledge, information, expertise, experience and company know-how that its staff have in their heads. Knowledge audit means an investigation into the organisation's knowledge 'health'. It is conducted to identify an organisation's knowledge assets, how they are produced and by whom. Typically a knowledge audit has two main objectives: to identify the 'issues that impact on knowledge creation, transfer and sharing, and to identify which knowledge can be captured, where it is needed and can be reused, and to determine the most efficient and effective methods to store, facilitate access to and transfer of the knowledge. (Henczel, 2000) "A complete and detailed knowledge audit offers comprehensive examination, review, assessment and evaluation of a company's knowledge abilities, its existing knowledge assets and resources, and of its knowledge management activities. The knowledge audit is a fact-finding, analysis, interpretation, and reporting activity which includes a study of the company's information and knowledge policies, its knowledge structure and knowledge flow. The audit brings high visibility to the organisations knowledge assets" (Hilton, 2002).

A knowledge audit is a systematic review of the firm's knowledge assets and associated knowledge management systems, a review of the adequacy and integrity of important organizational assets and systems. It is problem-oriented; it investigates what knowledge is available, what knowledge is missing, who needs this knowledge, and how the organization should use the knowledge (Liebowitz, 2000).

Information systems audit is a process, which collects and evaluates evidence to determine whether the information systems and related resources adequately safeguards assets, maintain data and system integrity, provide relevant and reliable information achieve organizational goals effectively, consume resources efficiently, and have in effect internal controls that provide reasonable assurance that business, operational and control objectives will be met and that undesired events will be prevented or detected and corrected in a timely manner (ISACA 2005).

Relationship of knowledge management and IT audit can be described from several aspects; we can explore many exciting problems by investigating this interrelationship. Next sessions will focus on the IT audit domain, emphasizing the knowledge-related problems and issues.

Relationship of KM with Standards

Standards for IT management and security are crystallized by consensus or compromise from best practices discussed by a large group of individuals from various organisations. Standards or methodologies for managing IT services (e.g. COBIT and ITIL), security standards (e.g. Common Criteria, ISO 15408), system acquisition (Bootstrap, ISO 12207, etc.), implementation standards (PMBOK, PRINCE2), quality management (ISO 9001), and risk management (COSO) are based on best practices. Most governance regulations (such as the Sarbanes-Oxley Act in the US) require the implementation of these best practices. Organisations usually choose a de facto standard to be compliant (i.e., the risks of using an internally developed standard with omissions or errors are reduced by using de facto standards), and larger organisations have learned that drafting their own policies for security is often much more costly and less successful than basing their polices on ISO 17799 (Oud, 2005).

Knowledge management penetrates many (or most of the) organizational activities, especially in the field of IT. There are several knowledge-oriented aspects of the above mentioned standards. Typically the standards provide common language to facilitate the implementation and utilization. Organizational learning plays crucial role in the adaptation process. The best-practice oriented standards and methodologies also put the emphasis on the externalization of knowledge by knowledge repositories, comprehensive documentation and the formalization of relevant tacit knowledge. Standard patterns of knowledge-sharing are frequently provided by these standards (e.g. documentation forms offered by PRINCE2).

One can select several highly knowledge-dependent control-objectives from CobIT and processes form ITIL:

- The core function of ITIL is configuration management, where disseminated, sometimes even tacit (!) knowledge should be collected and represented in a complex model of the organizational IT infrastructure (including not only hardware, software and network, but also services, procedures, incident records, etc.). The problem here is not the presentation of the inventory, but the exploration of complex and sometimes hidden dependencies between the various elements.
- Change Management provides control over the infrastructural changes. This control requires detailed knowledge about the infrastructure, and also formalized and traceable knowledge sharing during the procedure.
- Incident management and problem management are popular and widely used functions of ITIL. Incident management is responsible for the smooth functioning of the IT services by implementing quick fix to recover IT services in the case of an incident. Problem management is a proactive approach that prevents the repetitive occurrence of incidents. Both functions require knowledge sharing, up-to-date information concerning the infrastructure and services, and the implementation of a comprehensive knowledge base (about incident handling methods, solutions). KM related applications, e.g. expert systems and data mining can also be used.

Ontologies, knowledge repositories, knowledge bases and additional KM solutions can be very helpful in the implementation efforts. Without having these facilitating tools and methods the implementation of ITIL functions and processes almost impossible and very risky.

In the case of COBIT we can observe similar situation too. Just mentioning a few high level control objectives, like Assess risks (PO9), Manage third party services (DS2), Ensure continuous service (DS4), Develop and maintain procedures (A14) we can see, that knowledge embodied in procedures and formal systems, techniques like knowledge sharing, ontologies, etc. are prerequisites of the implementation of such control objectives.

It is clear from the above mentioned example, that KM tools and solutions are prevalent and inevitably necessary elements in the implementation of IT standards, as they can significantly reduce risks and facilitate the adoption. Knowledge management is a key enabling factor in the utilization of IT service and management related standards. In the next part of the paper we will investigate the reverse side of the problem: how can risk management and IT standards facilitate knowledge management related initiatives?

Features of KM SD Projects

The risky nature of system development projects is demonstrated by the high number of failed initiatives. Methodologies and standards have been developed to overcome this problem. In addition to the difficulties of system development, operational risks of a successfully implemented system should be managed with appropriate IT service management and security standards. Most of the above mentioned audit and service management oriented standards and methodologies are focusing on the operational aspects.

Due to their complex nature high level of risk can be associated with the development of KM systems. KM projects failure rates estimated range is from 50% to 70% (Ambrosio, 2000). That is true for the operation too. Let's take a closer look at the typical risks of KM system developments first!

- The built-in knowledge of some KM systems (e.g. expert systems, etc.) is very complex and requires special perfection in the field of IT and also knowledge management. Post-implementation control/audit of such system can be very problematic. Lack of maintenance and knowledge validation could lead to the omission of the system.
- Unclear definitions of the organizational needs emphasizing the real role of knowledge management systems.
- Unconsolidated or unclear terminologies would lead to failed systems or to inconsistent knowledge content in the systems. Another concern is the missing knowledge structure. That is why

knowledge management systems, especially ontologies can play really useful role in system development. It is also especially true in the case of international developments.
– Ethical and legal concerns and limitations should be taken into consideration.

On the other hand KM systems are the sources of special operational risks:

– Potential uncontrolled access of knowledge assets enforces organizations to concentrate on security issues
– Potential damage of these assets can be very harmful, as the accumulated knowledge can be lost. Inappropriate changes would cause poor quality and decreased usability. As the non-IT specialists' role can be very important in the maintenance and further development of such systems, tight control of these activities is a crucial requirement. Change management of the KM systems can be very complicated and time-consuming due to the complexity.
– Incident and problem-handling of KM systems requires special expertise, and makes documentation especially important
– Although the availability requirements of the KM systems are not so high than of the backbone transaction processing systems, downtime of these applications is really expensive.
– All of the above mentioned issues are even more complicated, if the KM systems are provided by an external company. Definition of SLAs can be very complex effort. As the value of such systems and services may be eroded by the dynamic shifts in the business and competitive environment, maintenance and further development is a problematic but crucial issue.

Specialities of auditing KM system development come from the special characteristics of these projects. They are related to the IT field (all the IT project management issue is relevant) and also to knowledge management, because knowledge management related risks have to be counted. To perform the audit well, the auditor has to be familiar with many possibly separated fields, like the IT development environment (e.g. ontology development tool), the knowledge management environment, the applied standards, the knowledge domain, which is prepared. Several roles have to cooperate smoothly during the audit process, like domain experts and IT experts. Therefore assessment of KM system development is a complex task, with many interrelated dimensions. Next part of our article offers an evaluation framework to support the auditing.

Evaluation Framework for KMSD Process

During the KM system development, related risks have to be managed properly. It should be determined what level of risk-tolerance is appropriate. It depends on the organizational culture, the control activities effectiveness, and the applied standards. Risks and their assessment have special importance nowadays according the higher significance of change management. As it well known all knowledge management initiative is a change in a company. Nowadays enterprises have to cope with the continuous change, which is true for the KM system development also. Domain knowledge is renewed possibly during the development; it depends on the complex environment (e.g. regulation, legislation) environment. Adaptation of the system to the new requirements requires efficient change management. New knowledge management systems can help reinforce an organization's cultural routines requires new attitude against the knowledge management processes. Success of a knowledge management project, depend on economic returns. Unfortunately economic returns have been difficult to quantify, therefore we must rely on another indications of success. To prove the capitalization, utilization of the new system is a justifiable demand of the management. Benefit calculations can be indirect, e.g. improved level of customer satisfaction. Because of the frequent huge investment, evaluation of a knowledge management project - KM system development - has special importance. During the development several risks have to be managed, e.g. organizational changes, fluctuation in the relevant legislation or because of the missing motivation system refusal. At least three types of risks can occur in a KM system development project: IT related risks, project management risks, knowledge management

risks. Our approach is a risk-based approach, dealing with the most important risks categories, in order to support the evaluation of development. The evaluation framework risk dimensions are the next:

- Information management policies: SDLC (e.g. in ontology development CommonKADS)
- Standards used – (e.g. COBIT , ITIL)
- System documentation management
- Regulatory compliance
- Compliance to knowledge management requirements
  - the embedded knowledge quality, and
  - the knowledge process quality – e.g. the way of knowledge sharing
  - way of change management
- Project organization e.g. roles related knowledge management (domain expert).

The first step of the risk evaluation is a list of finding in a certain KM system development. Next step is to reveal the impacts of findings (see Table 5-1.). A numeric value is assigned to each risk dimension with a range of 1(commendable) through 5 (unsatisfactory; see Table 5-2.). A weighted audit rate is the average calculated from the subjectively assigned value to each of the six risk dimensions (in our example it is 2,84). If the weighted audit rate is below 3, the significance level is low, if it is 3, the significance level is medium, if it is above 3, the significance level is high. Likelihood is a subjectively assigned value (it can be low, medium and high). The assigned level of likelihood is a reasonable reflection of a chance, that the weakness may be capitalized. Significance level and the likelihood determine risk level according to the risk rank matrix (see Table 5-3).

Table 5-1. Risk evaluation

Finding	Risk dimensions	Weighted Audit Rate
Description of	Information management policies	1
	Standards used	3
	System documentation management	3
	Regulatory compliance	5
	Compliance to knowledge management requirements	3
	Project organization	2
	Weighted audit rate	2,84
Significance level: Low; Likelihood: High; Risk level: Medium		

If a risk level is high, there were substantial deficiencies during the development of KM system, project is not managed properly (project processes and elements were poorly handled), knowledge management characteristics were no considered. If a risk level is medium, there are weaknesses, but not from the all aspects. If a risk level is low, the project, the development process was well managed.

Table 5-2. Audit Rating Scale

Rating	Description
5 Unsatisfactory	The auditable dimension/activity was not in compliance with policies, systems and procedures.
4 Improvement is needed	The auditable dimension/activity was not always in compliance with policies, systems and procedures.
3 Average	The auditable dimension/activity was generally in compliance with policies, systems and procedures.
2 Good	The auditable dimension/activity was in compliance with policies, systems and procedures. Some control deficiencies were identified, but these are not expected to lead to major risk.
1 Commendable	The auditable dimension/activity has achieved its goals and objectives. The auditable dimension/activity was in compliance with policies, systems and procedures. No significant control deficiencies were identified.

Table 5-3. Risk Rank Matrix

Significance level	Likelihood	Risk level
High	High	High
High	Medium	High
Medium	High	High
High	Low	Medium
Low	High	Medium
Medium	Medium	Medium
Low	Medium	Low
Medium	Low	Low
Low	Low	Low

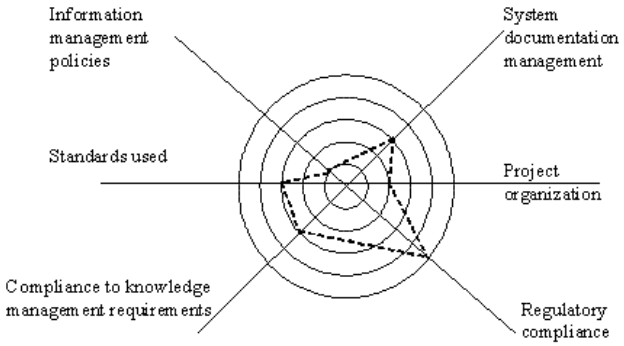

Figure 5-1. Evaluation Framework for KM System Development

Guide Case:

Application of Evaluation Framework for Guide Informal Ontology Development

We demonstrate the usefulness of the above described evaluation framework through the application it for a real case, for a knowledge management system (Guide ontology prototype development) assessment. We present the main features of the development in the next and the followed section displays the application of the evaluation framework for Guide ontology prototype development.

Guide Ontology

Prototype Development

Conceptualization initiatives for identity management domain are currently a hot topic and at the same time a challenge because of many reasons: the continuously expanding e-services, fast technological development shorter life cycles of the identity management solutions (e.g. new initiatives for national identity cards equipped with biometric identification), legislation environment (e.g. national data protection laws) and security issues. One of the best approaches for knowledge structuring is the ontology. To support the knowledge sharing between project partners and to provide a common base for the partners in GUIDE project (IST-2003-507498 funded by the European Commission's 6th Framework Programme) we developed an ontology prototype for the identity management domain. Ontology development is dependent mainly on the applied methodology. So far, number of suggestions for such a methodology has been published, as people reflect their experiences from ontology building. While formulating the methodology for identity management domain, we have leant on some parts of other methodologies also, like TOVE, Menthology, Plinius, Enterprise Model Approach and CommonKADS (Schreiber 1999) and Sure-Studer ontology development methodology (Fensel 2003). Our approach is a mixture of the abovementioned methodologies, but Sure-Studer ontology development methodology was the most decisive one.

Several ontology tools could support the implementation. PcPack4 (PcPack4 is an integrated suite of knowledge tools designed to support the acquisition and use of knowledge) has been selected for implementation from a number of alternatives. The most important reasons for this choice were the similarity of the theoretical background between the research task and PcPack4 philosophy (it supports various methodologies, like CommonKADS, MOKA etc.); and the effective support in knowledge modeling and knowledge acquisition phases.

One of the most important benefits of the system is knowledge management-related; the enhanced level of knowledge dissemination and sharing between project partners, due to web-based features (Figure 5-2). Another advantage is that results can serve as a conceptual base (common base to avoid inconsistencies in terminology), and it can be reusable in any IT project at the identity management domain, through usability and reusability of the knowledge base. It offers support for data modeling and knowledge modeling activities. Collaborative development is made possible through the discus-

sion forum feature. Return on investment in identity management projects can be achieved through applications which are built on the identity management solutions.

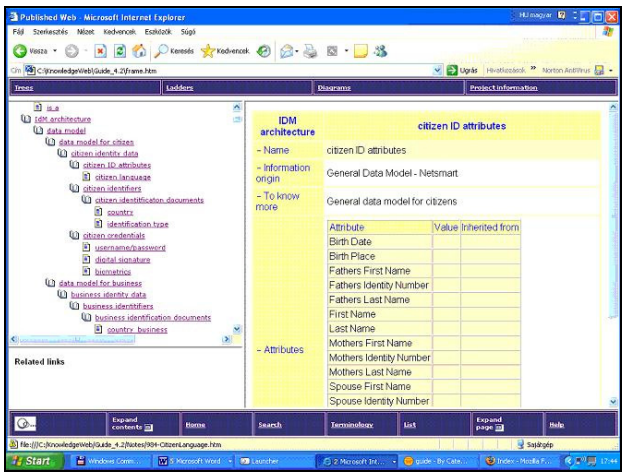

Figure 5-2. The .html version of the ontology, the objects tree and the annotation of citizen ID

The Evaluation Framework

Applied for Guide Ontology Prototype Development

In this section we apply the evaluation framework for the above described Guide ontology prototype development. That project was knowledge management-related and IT –related at the same time. Applying the risks dimensions from risk evaluation table we prepared the following summary (see Table 5-4.).

For "information management policies" dimension we gave 2. The ontology development applied CommonKADS methodology, which is considered now de facto standard for the development of knowledge-intensive systems (Fensel 2001). From security aspects, these information assets are well-protected; an html version is public, but the ontology itself not. For "standards used" dimension we gave 2, because COBIT was applied and standard ontology language output was used (RDF). "System documentation management" dimension got 2. We used a collaboration environment and document management system for documentation purposes. "Regulatory compliance" dimension got 3. The nature of the system was determined by the consortium. For "Compliance to knowledge management requirements" dimension we gave 3, because knowledge management processes (especially knowledge sharing) quality was improved by the system. Knowledge items have owners who responsible for maintenance. Change management is supported through the discussion forum and version management. "Project organization" got 3 also, because we couldn't achieve the perfect separation of duties (the knowledge management related roles were combined IT related roles; see Figure 5-3).

Table 5-4. Risk evaluation

Finding	Risk dimensions	Weighted Audit Rate
Description of finding.	Information management policies	2
	Standards used	2
	System documentation management	2
	Regulatory compliance	3
	Compliance to knowledge management requirements	3
	Project organization	3
	Weighted audit rate	2,5
Significance level: Low; Likelihood: Medium; Risk level: Low		

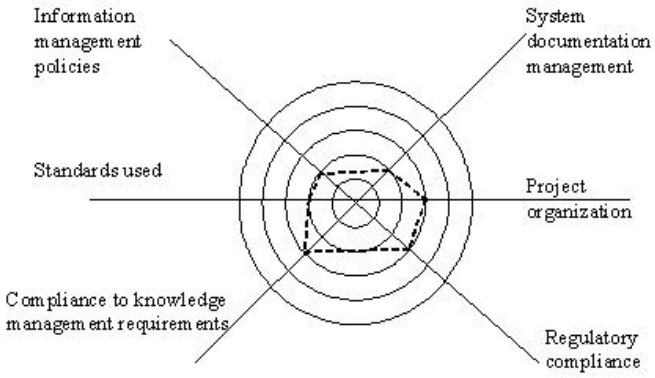

Figure 5-3. Evaluation Framework for Guide ontology prototype development

Conclusion and Future Works

Both knowledge management and IT audit are hot topics nowadays and they can get advantages from each other methods, solutions. Evaluation and assessment of knowledge system development is very important, justification for the undertaking of the project has to be proven. Because of the vital roles of risks during the development, our evaluation framework applied a risk-based approach. We counted both knowledge management related risks and IT related risks.

Future research will concentrate on the further exploration of risks categories, which can occur during the development and the improvement, refining the evaluation framework. Another goal is to test the framework on cases in order to collect inputs for further analysis of the certain knowledge management system development projects characteristics.

Acknowledgements

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http://www.guide-project.org/.

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The Need for Harmony of IT and Business Strategy

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ABSTRACT

At the beginning of the third Millennium the enterprises have to face every day with the challenge of the strong competition of the dynamic evolution and the impact of the info-communication technologies (ICT). The global e-Economy forces software-intensive business' environment and the IT-strategy have to be the organ part of the business strategy. In such situation the responsibility of the ICT specialists is continuously growing. They have to create effective, well adaptable and intelligent solutions in order to satisfy the increasing user's requirements. In order to comply with the goals defined in business strategy the computer professionals have to solve lots of problems: they must integrate the existing legacy and the newly developed applications, they need to ensure the interoperability of the different software systems, and they have to create flexible and easy changeable solutions. But it is huge challenge! The developers have to be always ahead of the business' requirements; they need to be able to forecast the ongoing processes.

Challenges of the 21st Century

At the beginning of the 21st Century the enterprises have to face with the challenge of the increasing system complexity and the strong competition, the information technology has more and more progressive influence, the organizations, the number of the software-intensive business' environments and their impact are increasing. As virtual enterprises and new forms of co-operation are coming into existence, the IT plays key-role both in business strategy and in business processes, better to say the IT is an organic part of the business domain and it becomes the most important driving force for surviving (see Figure 6-1).

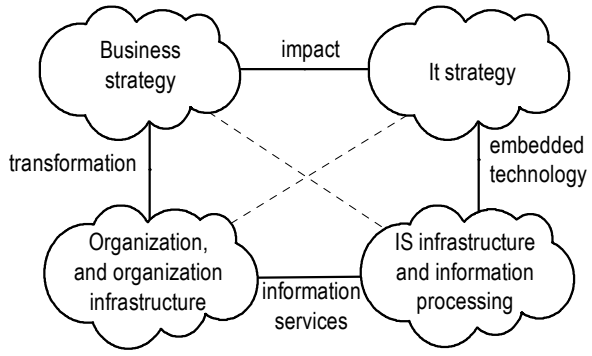


Figure 6-1. The strategic alignment model [4]

As the info-communication technologies (ICT) create "virtual business space", it is easy to operate information systems regardless of physical-geographical location, and to communicate on a synchronized concurrent way [2]. The management responsible for the innovation projects has to face the new challenges; they have to fight against both technological and economic power. To realize their business goals in the new environment they have to change their philosophical outlook, their way of thinking they need to profess new paradigms, and they have to find the best solutions. This means that *evolution process* forces the enterprises to use effective solutions and *to fit* themselves into the global e-economy, to the so-called *new economy*. Both from theoretical and practical aspects, *the organizations need to define the problem-space, to model the business domain and the Corporate IS,* they must *apply reusable components* and *computer-aided tools for planning and implementing.* It is already beyond doubt that the most progressive sector is the *info-communication technology and ICT service*.

The Impact and the Role of IT

The information is becoming the key factor of the business processes, such as making decisions, controlling and fulfilling the production procedures. As it makes a high demand to find an appropriate philosophy for the real world's abstraction it is necessary to review the definition and the role of IS. Gathering, converting, storing, processing and taking care of the information systematically are competitive factors that influence the business success. Although the information management systems (IMS) is functioning by the same rules as the other social-economic systems, it has special characteristics as follows:

1. The information system (IS) influences and even determines the success or causes failures in the organizational processes.
2. The realization of the information strategy is the organic part of the business strategy and it is the main competitive factor.
3. The level of information infrastructure strongly influences the interaction between the business partners and the customers etc.

It is definitely stated, that the information system is one of the most important business components in the process of achieving organizational scopes. In order to reach the corporate goals the organizations have to possess the appropriate management available at all hierarchy. But in this context the so-called hierarchic-structured organizations could not be effective anymore. New business revolution is going on, where the organization architecture undergoes on significant changes and the "cyber-corp" type of organizations (cybernetic corporation) will arise and where this new organization architecture is optimized to businesses in the digital, wired world. J. Martin emphasizes the concept of the value stream with end-to-end set of activities. This concept *focuses on the satisfaction the single customer's requirements*; it defines that the IT can undertake the well computerizable routine decisions and even the decisions on the management and strategic level, and ignores all of the traditional boundaries of organization [9]. The result is a new organizational architecture with only few levels of hierarchy; a structure in which the value chain processes get the main importance, and the emphases of the control based upon the independent work of the professionals (the transition process see on Figure 6-2).

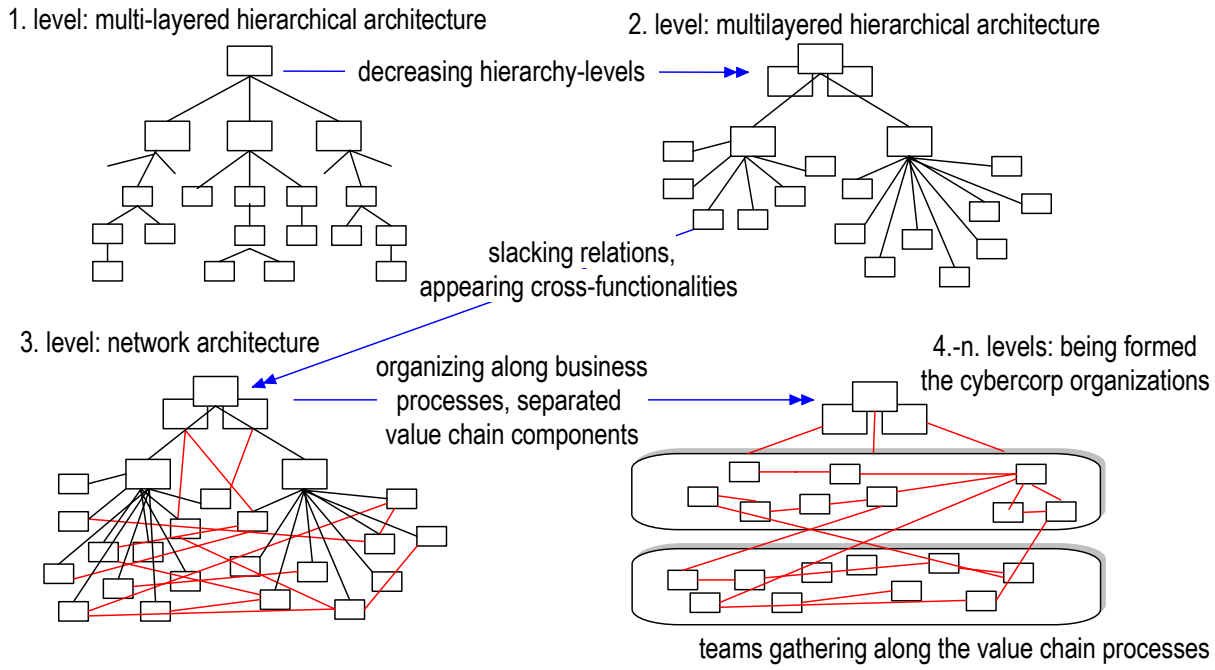


Figure 6-2. The process of the organizational architecture's change

The New Strategic Initiative

Although the strategic value of IT and the expenses of operating are increasing in many companies, the CEOs (Chief Executive Officers) still *waste* billions of Dollars *for migrating to the new technologies* in the hope that they can get at competitive advantages. Businesses also seek techniques to manage the complexity of systems as they increase in scope and scale. In particular they recognize the need to solve recurring architectural problems, such as physical distribution, concurrency, replication, security, load balancing and fault tolerance. In most enterprises the information technology is already in ordinary use for supporting the day-to-day corporate work; most of the applications had been developed several years ago, still they are working and satisfy the user's demand. Looking ahead and intending to deploy up to date and intelligent solutions serious problems have arisen! What to do with the legacy systems or with the independently working subsystems the so-called island-systems? Must we throw them away and buy expensive new technology and applications to replace them? Or what do we have to do, if we use a new solution to satisfy the special needs? How the old and the new applications and technologies will or can cooperate? What kind of strategy do we have to follow in order to satisfy the continuously growing user's requirements, and to manage the existing IT capital and the business well? The answer lies behind the *Enterprise Application and Interoperability Integration*, which has became the key-task of the IT specialist in order to keep business continuity, to *protect earlier investments*, to maximize flexibility and to survive changes in technology [14] (See Figure 6-3).

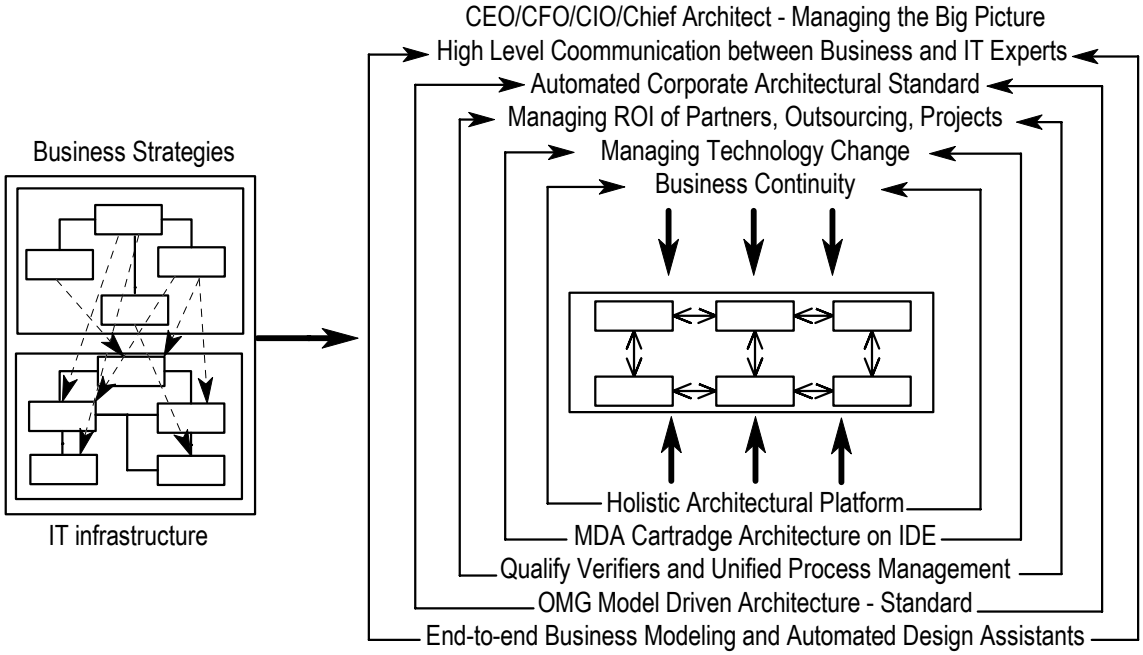


Figure 6-3. From Divergence to Convergent Architecture [5]

Business and Information Strategy

The strategic management of the enterprises focuses on getting *competitive advantages*. For the computer based decision-making activity the managers use efficient methods, tools and techniques, by which they can provide optimal solutions for the organization. But for operating an effective IS and giving relevant information to the leaders and especially to the top management it is necessary to understand the importance of *the value chain* of the business activity.

This means, that

(1) there are stressed components, as
   - getting and using information similarly to the other resources,
   - execution the business processes realizing the strategic goals,
   - other components, as the channels for product distribution, marketing segments, suppliers, customers etc.

(2) the management makes decisions in contact with the definition of the business strategy in aware of this knowledge.

In the last Year the Software Productivity Group published a report about the corporate IT strategies and objectives. As a result of the survey the most important user's requirements are
– to build systems that support customers' need,
– to improve application's quality,
– to do more work investing fewer recourses in,
– to reduce the time-period of the application development process and
– to exploit the ability of the new technologies for competitive advantage.

For today the application development solutions have matured to the point where the user's demands can be handled as requirements for a distributed enterprise computing. It should be remarked, that the IT executives must face the issues of Internet technology as the highest strategic concern. The increasing need for web applications stimulates the IT specialists to work out effective solutions for portability and connectivity of software systems, for the use of the net technology internally (Intranet), and for building systems capable of interoperating with legacy data and processes. The platform diversity is already the rule, and it is already fact that the applications are able to communicate with any server, any client, any language, and across any protocol by providing a clear and easy path to multi-tiered application development and deployment across the enterprise and beyond. In the last few years the enterprise-scale business expectations dictate that the newly developed distributed systems have to be secure and maintainable over a long time period. As it is not effective to locate business rules from maintenance and security standpoint in the form of application logic on every desktop, the developers have to found solutions for handling *complex application logic*. For getting the benefits of application partitioning, the components must communicate with each other even in heterogeneous and legacy distributed environment in order to satisfy *key requirements* of the corporate users, namely *the demand for integrating or supporting the legacy applications with newer development efforts.*

Answer to the Challenges

The development process themselves is only one factor, and there are other important aspects and components we have to take into consideration. This means, that the selection of the best fitting tools or a set of tools, the simplicity, the ease of use and the ability to deliver are the key success factors of a development process. As the traditional application-development concept causes deformed models of business domain and as it can not handle the project-risks

– because of thinking in terms of functions rather than processes,
– because of the definitive, prescribed steps of the development process, and
– because of the separated data and functional system-features etc.,

the system-analysts and designers give preferences to the object-oriented technology (OT). The primary reasons to migrate are (1) the dramatically higher productivity derived from the main features of OT such as polymorphism, encapsulation, the reuse capability of different object-oriented model-elements (classes, objects or components), and (2) the shortening project life cycle! In order to fulfill the expectations the developers must consider not only the actual development and delivery scenarios, but also the necessity of managing and supporting the software product. That is they need effective supporting software suites for designing and building multi-tiered distributed client/server applications that can be tailored to the today's rapidly changing computing environment.

These suites must include additional capabilities related to the earlier used engineering tools, as

- they follow the most up-to-date paradigms, such as object-orientation, modeling concept, component-based development (OO, MDA, UML, CBD),
- they combine tools for developing a sophisticated 4GL or 5GL capability for GUI to allow programmers to mix and match underlying databases, operating systems and protocols on a standard way (middleware standards),
- they include comprehensive support for working with existing code libraries (reusability),
- they make the Rapid Application Development (RAD) possible,
- they allow to create servers as well as clients in a distributed enterprise environment, and
- they give intelligent solutions for separation of clients, servers and data and for providing interoperation on different platforms (EAI, SOA).

Enterprise Integration

The above mentioned and similar problems urged the analysts and programmers to bring new concepts and solutions into existence in order to save the previous investments utilize the existing resources, make possible the data transfer among different type of applications and computing environments. The managers are forced to invest in the computing technology, to use the latest software products and IT solutions and urge the specialists responsible for the application development to create effective, well adaptable and intelligent solutions in order to satisfy the increasing user's demand. As the different packaged applications within the enterprise (legacy systems) cause overlapping functionality and duplicated information and moreover use multiple resources to solve similar problems, it has become necessary to integrate these separated islands across the enterprise. But there are other aspects as well: the demand for using business-to-business integration adds a new dimension of the complexity. The enterprise architecture makes possible to design well integrated systems with knitting the preexisting islands together. This is more effective way to satisfy user's requirements, rather than to develop new enterprise applications and/or components. But under the pressure of necessity on reaching low production cost, high quality of enterprise-centric computing, and the software industry have to face the more and more increasing challenges. The engineers must integrate the existing and the easy changeable newly developed applications, they need to ensure the interoperability of the different software systems running on different platforms. The integration problem must now address not only to the disparate systems and data formats, but also to the differences between the enterprise's systems and the B2B message formats [8]. The interorganization cooperation from the standpoint of the computer systems is fluid, the partnerships undergo continuous change therefore the companies are forced to virtually merge their island systems by extranets.

The Enterprise Application Integration

The Enterprise Application Integration is a definitely designed concept of the end of the 20th Century. The EAI is a conceptual IT category, which unites the methods, techniques and tools, which integrates applications within the enterprise environment in real-time. In order to benefit from the integration of the legacy systems and the new application, the CEO and the CIO have to utilize the advantages of the EAI technology. But the specialist can bring the most out of a certain technology, if there are standards used by the majority of the engineers and companies.

Having the enterprise integration in sight and focusing on applications, it is important both to restrict and to extend the general definition of integration. In my sense the Gartner's definition seems to be the most appropriate as follows [3]: *The enterprise integration is an emerging category of products that provide messaging, data transformation, process flow and other capabilities to simplify the integration of the enterprise resource planning procedures, the legacy systems and the other applications.*

In other worlds the enterprise application integration is the creation of new strategic business solutions by combining functionality of the existing applications, the commercial packaged applications

and the new code using common middleware [15]. In this sense, the integration is becoming a core enabler of business agility. Though integration technology was originally created as a burden of coding interfaces between systems, the nature of integration problems has changed a great extend in the last decade. Today, integration is not a technical issue anymore; it is not only an efficient tool to solve the communication problems between different subsystems. The focus of integration solutions is already much more business oriented, therefore the integration technology provides

– the enabling infrastructure for the different enterprises,
– the serving applications for employees and customers,
– the enabling a unified view of (a) the customer-customer relationship management, and (b) the call center operations,
– the optimizing business processes and managing them real time and last but not least
– the implementing packaged industry and compliance solutions.

The enterprise integration is a complex flow *from* discovering and analyzing a problem *through* designing the system *to* implementing the appropriate technology. In order to specify the main target of developing process and the managing information systems correctly it is necessary to see, that

– the new and old (traditional or legacy),
– the custom and off-the-shelf and even
– the internal and external systems.

has to be able to communicate, cooperate and interoperate each other. This also means that the enterprises need to define the exact goals of integration otherwise; they cannot meet their business requirements. Without specifying the aims, it is impossible to improve the integration process effectively. Studying the publications written in the theme of enterprise integration it should be stated, that it is a complex activity that uses the most up to date IT technologies for supporting problem solving. During the last several years the application integration has been driven by a number of emerging development projects that have included

– the need to expose the existing information to the Web,
– the need to participate in electronic marketplaces,
– the necessity for integrating supply chain, and
– the enabling the existing enterprise systems to share information and common processes.

Concepts and Solutions

In order to satisfy the new era's business requirements and realize the enterprise integration needs the researchers are stimulated to develop effective, well-fitted, tailorable application development solutions. This means that it is an urgent need to specify

– new *strategy* for providing companies with tools necessary to integrate the different subsystems and technologies, and to connect them with the customers and partners,
– *paradigm* which makes possible to create the most faithful abstraction of the reality,
– effective *methods* to model the problem and the business domain from various views,
– *standards* that make possible to connect and interoperate systems running on different platforms and
– *tools*, which help the developers to do their best on the fastest way.

In the last years some successful paradigms have been followed, methodologies were developed and used, and different standards and effective supporting tools came to existence. The key components are the object and service orientation, the unified modeling language and the model driven architecture framework.

Object Orientation vs Service Orientation

The object-oriented paradigm (OO) has become a dominant force for today in the computing world. According to a recent survey conducted by International Data Corporation already more than 87% of the development organizations are expected to use object technology as the basis for their distributed development strategy. The object technology (OT) is a powerful modeling paradigm with important mechanisms for handling complexity, any process design and redesign that deals with a sophisticated

problem domain, such as business, can benefit immensely from such a modeling approach. It makes possible to design applications in the context of the objects, which can be later reused partially or wholly. The innovations and extensions added to OT in the last few years (handling of interfaces, the paradigm of delegation and distribution) and also the other capabilities manifesting in the increased productivity, quality and adaptivity, gave great advantages of OT.

The substance of service orientation (SOA) lies in the decomposing process; namely the whole thing is separated into specialized, autonomously existing parts yet not isolated from each other. While these individual, self govern parts have their relative independence from each other, they can communicate, send messages and interact with each other and their outlets can be distributed. The main goal of the service-oriented architecture is in the decomposition relates to the business logic and the representation of a model where the automation logic is separated into smaller units of the logic. These distributable units are called services. In the computing environment, the automation solutions consist of services that encapsulate tasks or entire process logic. A service is a unit of work done by a service provider to achieve desired results for a service consumer. Both provider and consumer are roles played by software agents on behalf of their owners. SOA is an architectural style whose goal is to achieve loose coupling among interacting software agents.

In the service-oriented architecture, the services can be use by other services or programs with taking care of each other. The service description consists of the name and the location of the service and the data exchange requirements, and helps to avoid interaction problems. The third core component is the message. That illustrates the basic service-oriented architecture in which a service consumer sends a request message to a service provider, and then as a reaction the service provider returns a response message to the service consumer. The request and subsequent response connections are defined in some way that is understandable to both the consumer and provider (see Figure 6-4).

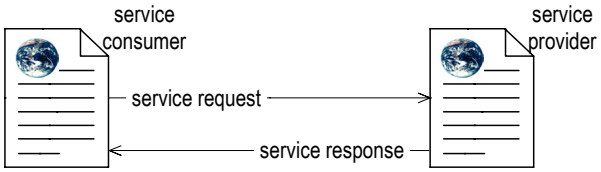


Figure 6-4. Service request and response

Making comparison with the object-oriented (OO) paradigm it can be seen, that the idea of SOA departs significantly from the OO, which suggests handling data (attributes) and data processing (operations) together. The fundamentally important focus of SOA is the interfacing (if the interfaces do not work, then the system does not work) with the aim of achieving *loose coupling* among interacting software agents. These targets can be realized by specifying interface characteristics in accordance with system behavior. However, as remote interfaces are the lowest parts of most distributed applications it is quite difficult to implement them correctly across different platforms and languages. It makes sense to reuse a few generic interfaces for all applications instead of building new ones for each application.

The Unified Modeling Language

The models are always written in a language which might be plain English or another spoken language, a modeling or a programming language etc. The modeling tools help to create technology-neutral designs that are then transformed into specifications. A well-defined language has a well-defined form; this is the *syntax,* and a well-defined meaning and rule for using language elements and symbols. This latter is called *semantics* of the language.

The Unified Modeling Language (UML) is one of the languages supported by the software industry as a standard modeling notation [13]. It is a widely accepted human-readable graphical/textual notation for visualizing and specifying the technology-independent business domain and for mapping the processes. The UML includes (1) *model elements:* fundamental modeling concepts and semantics, (2) *notations:* visual rendering of model elements and (3) *guidelines:* idioms of usage within

the trade [1]. The UML was first accepted in 1997 as an OMG modeling standard primarily for analyzing and designing software and to be an industry-wide breakthrough for visual modeling (see Figure 6-5). After a deep reviewing process a new version of the language the UML 2.0 was developed and accepted in 2004.

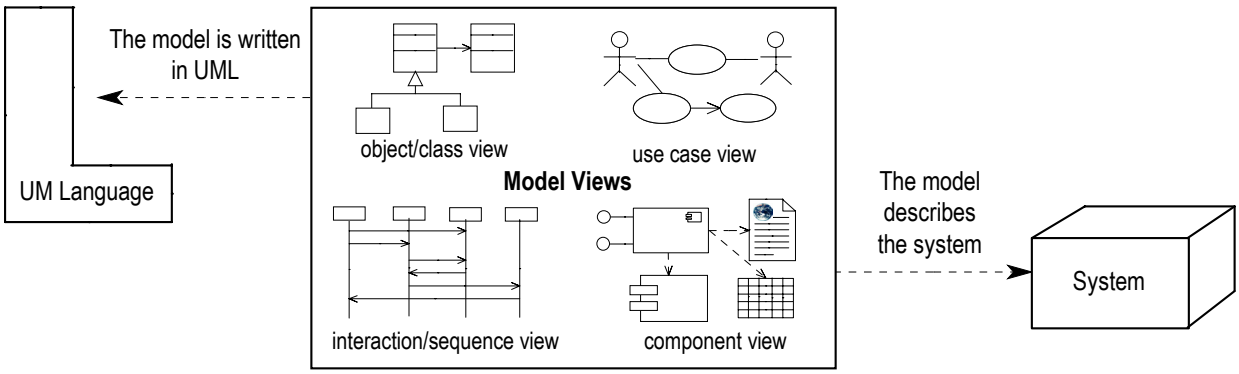


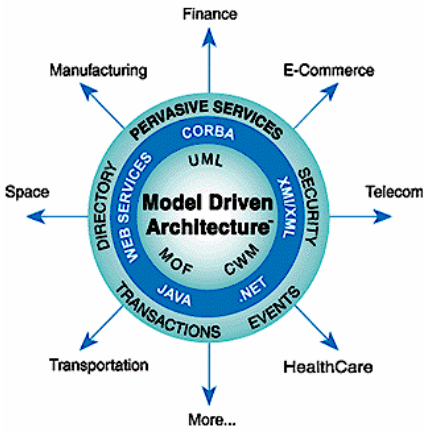
Figure 6-5. Different views modeled in UML

The modeling language offers the following [6]:

- Expressive enough to specify system complexity, which includes both static and dynamic view of the system.
- Generally applicable, but not application specific languages like for example the 4GLs.
- Suitable for n-tier application development including three-tier, two-tier and single-tier applications.
- Suitable for distributed applications. Transformation tools should take care of building the bridges between various nodes.
- Seamlessness between the model and the implementation.
- Support for managing large models for instance by supporting an aspect-oriented manner of modeling.

Model Dirven Architecture

In order to solve the user's problems, to answer to the challenges the leading companies are pressed to work out and define a general framework for solution. The OMG (Object Management Group) Task Force elaborated and accepted the MDA (Model Driven Architecture) standard. *The Model Driven Architecture is an innovative approach to construct enterprise architecture by abstracting and visualizing business requirements in the form of platform- and implementation technology independent models, separates implementation details from business functions* [5], and gives chance for Rapid Enterprise Integration (REI). Once interfaces are identified and implementation technologies are selected, models are transformed into platform-specific software architectures [12]. As a new software architecture principle the MDA follows, incorporates or supports most industry standards. It enhances the capability of the software architecture to be flexible, extensible and adaptable to new technologies or standards, and to abstract business application components in the early stages of EAI initiatives. Most importantly, MDA enables business experts and software engineers to focus on business risks, issues and concerns, ensuring the effective use of existing and evolving technologies.



The architecture of the MDA shows the hiarerchical relation between the standards and the services. The Pervasive Services provide directory, security, distributed event handling, transactionality, persistence and other services required for running applications on any platform through MDA generated bridges. These services are necessary to support distributed computing, both within an enterprise and among many companies over the Internet. In the MDA there are defined four Pervasive Services, the *directory*, the *transaction*, the *security* and the *distributed event* and *notification* services. The *interface definition* describes how the base model is implemented on different middleware platforms, how the implementations are completed, and what the application developer decides to support.

Comparing the MDA to the traditional development process the MDA is apparent that the answer to the challenges of today's highly networked, constantly changing system environment is to provide an architecture that assures:

- *portability,* increasing the application re-use and reducing the cost and complexity of application development now and in the future;
- *cross-platform interoperability,* using rigorous methods in order to guarantee the standards, based on multiple implementation technologies, implement identical business functions;
- *platform independence,* reducing the time, outlays and complexity associated with re-targeting applications for different platforms;
- *domain specificity,* through domain-specific models that enable rapid implementation of new, industry-specific applications over diverse platforms; and last but not least
- *productivity,* allowing developers, designers, software engineers and system administrators to use languages and concepts they are comfortable with, while making possible seamless communication and integration across the project members.

The functional description of every standard of MDA is technology independent, and the architecture is capable of producing *interoperating implementations on multiple platforms.* This allows defining the *business functionality and behaviour* as a PIM, and then to produce PSMs and implementation models on whatever platforms the participants require.

The Project Concept

The project brings people and tools together to produce a pre-defined set of results in a special time period, where the people can be "laid off'" after closing the contract, and can return to their permanent job, or to another project. In order to understand the special nature of SwDPs we have to point to some essential features. It is obvious, that the success of a SwDP manifests itself in the quality and the usability of the software product. As most of the SwD projects are failed, that means they can not reach their goals, can not fulfill the user's requirements it is necessary to deal with the specialties (see Figure 6-6).

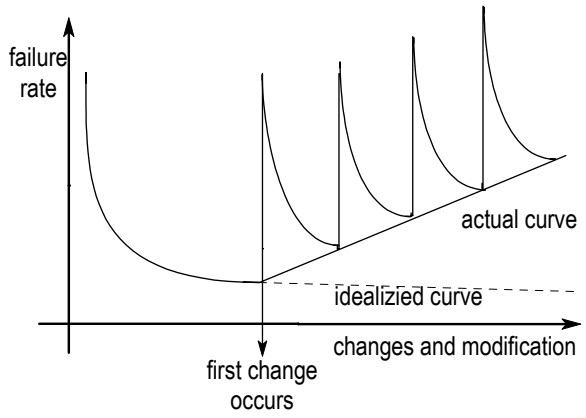


Figure 6-6. The software failure rate curve

The analysts prove that the reason of these faults is behind the complexity of the computerized systems. From the many years of experiences the analyzers say, that the most frequent symptoms of project failures are the following:

- unstable problem-definition, ill-defined goals and contracts
- lack of metrics and controllable purposes, poor communication with the user
- lack or insufficiency of PM and/or inexperienced project manager, of expertise and practice
- poor project plan, unrealistic expectations and deadlines, lack of risk-management
- frequent change requests, ineffective or missing change control and change management

– lack of a fitting system-development methodology
– difficulties in technical realization and so on.

Independently from the differences in project's target the planning and managing process of SwDPs is based on the project-triangle, which is used to plan and manage the projects to achieve the desired result (see Figure 6-7), namely

– *time utilization* (time↔results),
– *resource utilization* (time↔resources) and
– *resource allocation* (results↔resources).

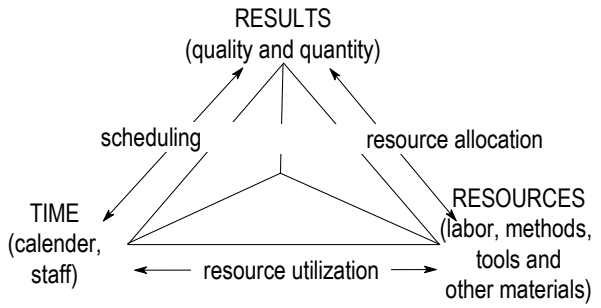


Figure 6-7. The project triangle

There are of course many similarities in project-management to other type of projects but it is necessary to emphasize the main differences as well. Focusing on tasks, the responsibilities, the attitude of the project members, the iterative-cyclic feature of the process, and the need of the fruitful cooperation we can see that the SwDP's life cycle should fit to the software development process. Having the SwDPS' barriers in sight it is important to point *to risk and change management* and also to the *monitoring and review* process.

Managing Risks and Changes

Once the project schedule was developed, the project manager must identify all the *risk factors* that could adversely affect the schedule. A plan for minimizing each of the major risks must be developed. This plan includes a set of situations, the business impact analysis and tasks, which defines what to do in the cases, when despite of the best efforts for minimizing risks the problem still occurs. Risk analysis and contingency planning will be ongoing activities for the project manager over the whole project life cycle. Beside the uncertain effects the project has to count with *changes* in different factors, circumstances, in availability, quality and service level of the resources, with problems by using the selected methods and tools. The project manager is responsible for fitting the project activity to these changes. Fitting to the changing conditions different alternatives of software components the so-called versions coming into existence, which have to be manageable. The up-to-date supporting tools are able to maintain and administrate the different versions automatically and serve for great help in change management.

Monitoring and Review

By the objectives the projects produce the expected result within time and cost budgets, while at the same time the organization's guidelines and standards are conformed with. The critical aspects of the project control are therefore:

– a well-defined set of measurable and controllable targets and reporting points,
– a project-plan which defines the anticipated progress and resource utilization,
– reports from the project at the appropriate milestones,
– reviews of performance of the project team against the project-plan.

In the reviewing process the person responsible for *Software Quality Assurance* (SQA) plays key role and has important tasks during the whole project life cycle and beyond. He guarantees that the new software system is the right abstraction of the business processes; and it realizes the organization's goals. The software quality assurance process is supported with excellent evaluation methods, with well defined software quality models (e.g. Boehm's, McCall-Cavano models) and also with SQ standards (e.g. DoD2167). These include exact directions for reviewing the software product and give prescriptions how to control that the given artifact in one iteration is correct and/or executable, verified and valid or not [11]. This is the main reason, why we have to focus on the. There are many effective solutions such as:

– The *inspection* leads to good control of the project and product status, and it might also give valuable information for the future. It involves well-defined

inspection roles, such as the moderator, the recorder, the inspectors and the engineers, and it is based on meetings.
– The *walkthrough method* is a kind of informal review, where some participants revise a segment of the model, and the others make comments on style, technique, possible errors, violation of standards and other problems.
– In test evaluation process the engineers define the software metrics, and then they compare the testing results to these metrics. The testers usually look at the metrics of completeness and the reliability of the software.

The evaluation document plays definite role in closing the SwDP successfully, and it is the base of the installation and deployment.

Conclusions

Summarizing all the aspects of today's business requirements and the information engineering process or better to say information technology we have to state that *it is necessary to change the developer's and even the managers' mind and style*. As the user's requirements and the information technology has been going through considerable changes, as serious value of information assets has accumulated in the last decades the IT specialists are required to save the existing IT and to give solutions for integrating the legacy systems to new applications. The newly developed intelligent solutions and the standards make possible the enterprise integration and satisfy all demands such as:

– technology-independent representation of the business on high level of abstraction and on an interface-based implementation,
– smooth and rapid integration of yesterday's and the tomorrow's architectures on intra- and inter-business boundaries (across deployment technologies),
– reduced time-period and costs throughout the application life-cycle taking advantages of reusability of models, codes, training and people,
– two level of modeling (PIM, PSM) and more views in each level,
– protecting the earlier investments and increasing return on new technology investments,
– scalability, robustness and security via generated code by stable model-based approach,
– improving application quality

If a development process and the product architecture are based on the new concepts, then it is much easier to integrate applications and facilities across the middleware boundaries. The EAI domain facilities defined in the MDA and in SOA will produce much wider interoperability by always being available on a domain's preferred platform, and on multiple platforms, whenever there is a need for it.

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Abbreviations

4GL, 5GL.....4th, 5th Generation Language
B2B .....Business to Business
CBD .....Component Based Development
CEO .....Chief Executive Officer
CIO.....Chief Information Officer
EAI..... Enterprise Application Integration
GUI..... Graphical User Interface
ICT..... Info-communication Technology
IMS..... Information Management System
IS..... Information System
IT ..... Information Technology
MDA ..... Model Driven Architecture
OMG..... Object management Group
OO..... Object-Oriented
OT ..... Object Technology
PM..... Project Management
RAD..... Rapid Application Development
REI ..... Rapid Enterprise Integration
SOA..... Service Oriented Architecture
SQ ..... Software Quality
SQA..... SQ Assurance
SwDP ..... Software Development Projects
UML..... Unified Modeling Language

Contribution of Process Modeling to the Efficient Business Adaptation

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ABSTRACT

The business operation comes true through the execution of processes. The efficiency and capability of any enterprise depend on the suitability of its processes. Despite of the outstanding importance of processes, their modeling and engineering is unsatisfactory. I will show the concept, technique and importance of the modeling supporting the conscious engineering (design) of processes.

Process

The everyday use of the concept of process is:

- a series of actions, developments, or changes that happen naturally
- a series of actions that someone does in order to achieve a particular result.

In the business the second meaning can be applied. An enterprise is an artificial creation: it is established in order to realise goals. In this environment the process means the fulfilment of the goal.

In systems approach the process is a subsystem of the business system, so it is also a system. As a system, its boundary is to be determined at first and then the system itself can be defined. The definition of a system is performed by the collaboration of subsystems until reaching such subsystems, which are operable and which are not to be defined (which can be handled as black boxes: they give defined responses to given stimuli and this behavioral knowledge is enough for us from operational aspect of the system).

In this approach the *process* is a rule harmonized set of *activities* consuming and transforming *resources* for the sake of implementation of a *goal*. The goal is the desired state of resources, generally the manufactured product. Rules define and constrain the execution of the process. The process, when executed, has effects, the most important one is the product itself. Beside the product there are numbers of other effects (economical, quality assurance, user satisfaction etc.).

A *business process* is a chain of processes, which is to be executed for the sake of a sold product or in order to operate and control the whole enterprise. The definition of a process is rooted in its goal. The goal is a requirement formulated for the sake of effective and efficient adaptation of the system. An enterprise must adapt to its environment at least on three nested layers (see Figure 7-1). These are (from inside to outside):

- Direct adaptation: the sold product must fulfill the requirements prescribed.
- Operative adaptation: the aggregate effect of all business processes in a given period must match to the expectation formulated by owners in the business plan (mainly profit-and-loss and cash-flow expectations, but other objectives relating to the market, quality, strategic advance etc. can also be set).

Strategic adaptation: the enterprise must be prepared to exploit or handle forecasted significant changes in the environment, by possessing suitable products and business processes which guarantee the effective and efficient direct and operational matching to the changed conditions in the future.

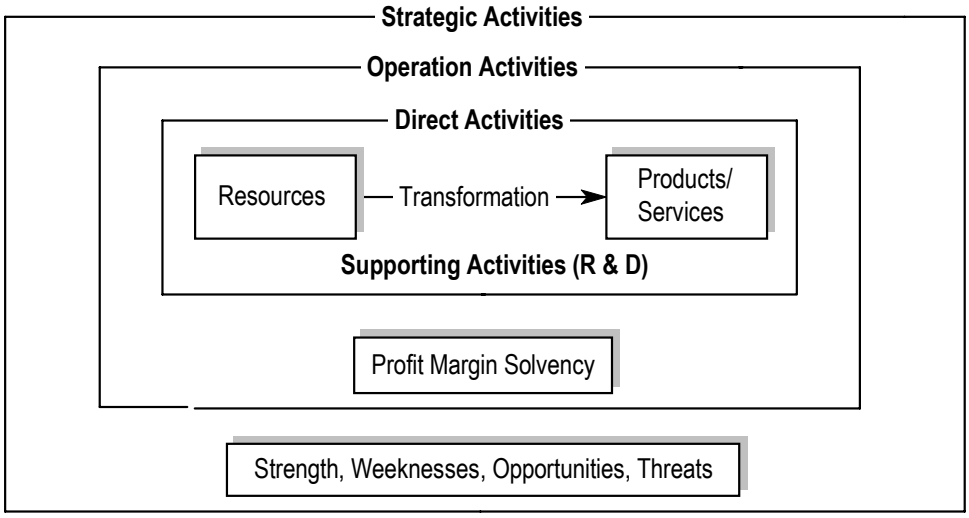

Figure 7-1. Levels of adaptation (based on [4])

Process Categories

Porter gave a generally accepted advice to the categorization of business processes [6] ; [7] . The value-chain is composed of primary and support activities, which finally produce the firm's profit margin (see Figure 7-2)

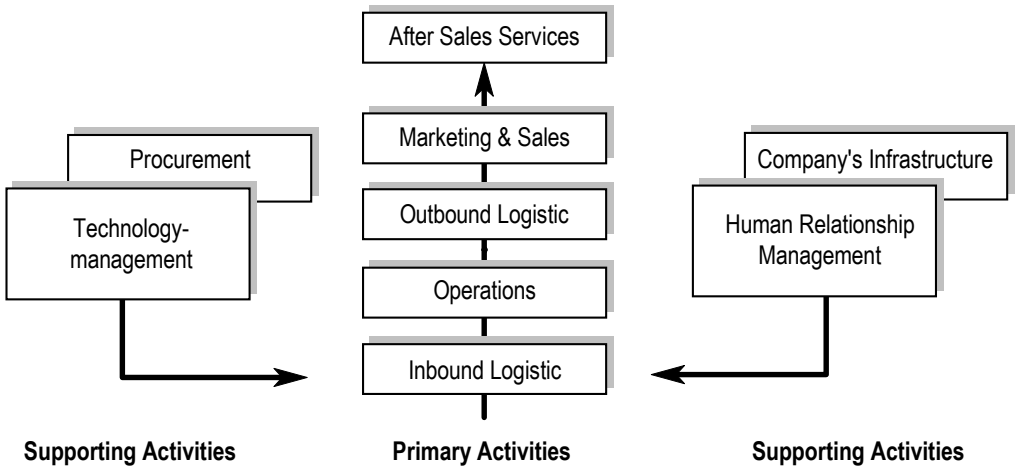

Figure 7-2. Porter's business process definition

The value chain contains different type of activities:

Primary activities

– Inbound logistics: the activities of receiving, storing, handling and distributing the inputs required to produce the product or service, as well as controlling inventories
– Operations: the process of transforming the inputs in some way so that they take on greater value for the ultimate consumer. This would cover making components, testing them, assembling them into a product, and packaging that product
– Outbound logistics: storing the firm's final product and distributing it to the next link in the total value chain.
– Marketing and sales: making customers aware of the product and ensuring that it is available
– Service: all the activities that enhance or maintain the value of the product such as installation, advice, repairs, spares etc.

Support activities
- Procurement: the administrative activity of ordering the inputs to the primary activities
- Technology development: the activity of researching and developing the processes through which inputs are transformed into outputs.
- Human resource management: the activity of recruiting, training, motivating and rewarding the people necessary for the primary activities
- Management systems: the activity of planning, financing and controlling the primary activities.

The Process Classification Framework of APQC (American Productivity & Quality Center) issued in 2004 use the following main categories [1] :

Operating Processes
- Develop Vision and Summary
- Design and Develop Products and Services
- Market and Sell Products and Services
- Deliver Products and Services
- Manage Customer Service

Management and Support Processes
- Develop and Manage Human Capital
- Manage Information Technology and Knowledge
- Manage Financial Resources
- Acquire, Construct, and Manage Property
- Manage Environmental Health and Safety
- Manage External Relationships
- Manage Improvement and Change

Process Hierarchy

These classifications yield taxonomy (process-sub process trees or hierarchies). They give only a name and an attached interpretation. In addition to this they contain hidden implementation and information processing schemes. They do not provide enough support to the evaluation of the effectiveness and efficiency of the business adaptation.

The BPMN Process Model

If we analyze only the running of the process in sequences and depending on conditions then the process chart can be applied to represent the process. At higher levels shown processes must be expanded on detailed process charts. This means a huge amount of process charts nested corresponding to the process hierarchy. The maintenance of this set of charts (and descriptions) is very laborious when some charts have to be modified. The process chart is generally used only for the abstract level introduction of processes. Though in the quality assurance manuals processes are “defined” this way, the abstract process charts can be considered to be a correct definition only with a high degree of benevolence from the auditors, but in reality these are merely sketches.

More accurate representation of the process can achieved through the business process model of BPMN (Business Process Model Notation; [2]). Some CASE (Computer-aided Software Engineering) tools support this modeling (e.g. SystemArchitect from Telelogic) but the activity diagram of UML (Unified Modeling Language) is also developed similar to this. By this way of modeling not only the conditional sequences of activities can be shown, but also the objects created can be represented attached to the state transitions. The BPMN model is suitable for the documentation of the process execution because the CASE-tool provides the expansion of process steps in charts and the common repository assures the integrity of the names and definitions after modification. This technique is applicable to documentation but not to design.

The Constructive Process Definition

Let us return to the definition of the business process formulated above:
- A *business process* is a chain of processes, which is to be executed for the sake of a sold product or in order to operate and control the whole enterprise.
- A *process* is a *rule*-harmonized set of *activities* distributed in space and scheduled in time and consuming and transforming *resources* for the sake of implementation of a *goal*.

A process is a designed collaboration. The process achieves the goal via execution. A process can have many executions. The process execution generates effect. This effect is to be compared to the goal. The process is effective when it has resulted in the expected effect: it has produced that result, which was set by the goal. The goals are means to attain more complex goals.

The distribution of the execution in space is due to the consequence of specialization of skills, functional division of labour, the layout of machines, the storage location of material etc. The division into sequences in time is due to the asynchronous execution: external events can trigger some sequences. The process as a system is not created and executed automatically by it. It must be designed; the capability of execution is to be created and it has to be operated.

Each step of the process is to be executed in a determined place. The prerequisites must be fulfilled on the place of execution: there must be known what, how, from what, and by means of what to produce, and where to transmit the product. The step is to be scheduled into the flow of execution. All these need an *activity control* [5] which

- controls the materials handling (supply and transfer)
- follows the state transitions of prerequisites
- offers the start of steps whose prerequisites are fulfilled on the given place
- communicates the content of the step to be started
- wait for the signaling of the termination of the step.

This control framework waits for human actions:

- the material handling is to be executed by someone
- somebody must launch a step which can be started
- somebody has to signal to the system that the step is finished.

The execution of the process is in general an interaction between people and machines. The activity control is provided by the business assisting computer system.

The activity control that regulates the execution of the process and built-in its design is called feedforward control in cybernetics. The feedforward control is suitable only if it is prepared to the variety of stimuli and states in the environment and it is capable of handling all these situations. One of the basic principles of cybernetics, the law of requisite variety (from Ashby) is applied this way to the engineering of processes.

There is another type of control: the so-called feedback control. Its scheme is as follows. A requirement is formulated upon the final outcome of the process (this is the target). After the execution of the process the effective outcome (the effect) is compared to the target. If the deviation is significant a corrective action has to be launched in order to diminish this difference in the future. This corrective intervention can be either a more disciplined execution of the same process, or the change of the target (by formulating more feasible requirements), or the reengineering of the process itself.

The feedback control works with effects. Effects are generated during the execution of the process. The display of the deviation from the expected effect is an information-processing task. Finding, developing and launching the corrective intervention are human activities.

Up to now we have dealt with the control framework of the process. Any process, however, has an intrinsic *genetically coded core*: the concept of achieving the goal. This is the *build-up design* of the product, which is the primary goal of the process.

This build-up design defines

- where, with what capacity need, and how long processing time the process step is to be executed
- what are prerequisites for the process step (prerequisites are mainly “products” to be defined)
- what to do with the product after producing it
- how to supervise the process step
- what to do when the process comes to halt
- what effects are to be considered.

This chain of definition continues until the prerequisite is to be purchased. A prerequisite to be purchased is produced by the process of procurement.

The product is the prerequisite of the selling process. The result of the selling process is the sold product, which means that the produced product is transferred to the customer and the enterprise is waiting for payment from the customer.

By this derivation the Porter’s value-chain definition is constructed.

The Model of Process Construction

This model is a complete system model. It must be more than a simple textual description, a set of process charts or even the BPMN business process model.

We need a UML-based modeling well proven in the world of object oriented systems development. UML (Unified Modeling Language) is a standard modeling language for software development [3] . It is a language for visualising, specifying, constructing, and documenting the artifacts of a software-intensive system. The UML-based modeling is supported by lot of CASE-tools. Though UML based modeling can be performed even manually, but the iterative and incrementally completed modeling of big systems cannot be imagined without computerised support (common repository, automatic drawing and refreshing, automatic documentation).

The process is a description representing the design of a state-transition network that has one or more final states and one initial state. In everyday use the "process" is the execution of this state transition. This is, however, only a process step, an activity, a procedure. In our constructive approach the process is meant the whole network together with all the states.

States can be described by concepts, relations between concepts and characteristics of concepts. The initial and final states have to be recognized in reality (caught in the so-called domain model). Such realizable objects must be produced that are originated from objects of the business environment. The domain model is a class model. The class is an abstract grouping of similar objects (we call these objects as the occurrences or instances of the class). The relations between classes apply to those between their instances. The attributes (characteristics) of classes define what characteristics the objects possess. Relations in some cases can be classes.

The genetically coded core of the process is the way of how the initial state getting to the final state through state transitions and intermediary states. A process must be executable: the classes and relations in the domain model must be created, they must be instantiated and via eventually artificially created intermediate classes such state transitions and intermediary states are to be defined which lead to the final state. And meanwhile we have to take into consideration the variety existing in the business reality (according to the law of requisite variety). This means that exceptions and error branches must be handled.

This creative work can be assisted by the collective wisdom accumulated in the literature, the knowledge. There are best practices, schemes, patterns which can give ideas. There are intrinsic sequences. There are methodical advices.

The modeling starts with listing of main phases of the business process (this is the intrinsic sequence).

There are three types of processes:

Primary process
- Sale: Undertaking (product or value-adding service during sale) and Fulfillment
- Outbound logistics: Preparation and Distribution
- Production: Preparation and Fulfillment
- Specification of purchasing needs

After sale services, development and other support activities
- Production: Preparation and Fulfillment
- Specification of purchasing needs

Purchasing
- Preparation and initiation
- Reception and acknowledgment

A context use case diagram is drawn to main phases of the process (Figure 7-3). Its use cases are expanded into detailed use cases in one or more levels until a task to be performed by an actor (human or machine) in one instant and at one place. A use case is in practice a scenario (eventually completed with pre-conditions, exceptions and alternative scenarios). In the first round it is enough to handle the basic activities (basic flow of events).

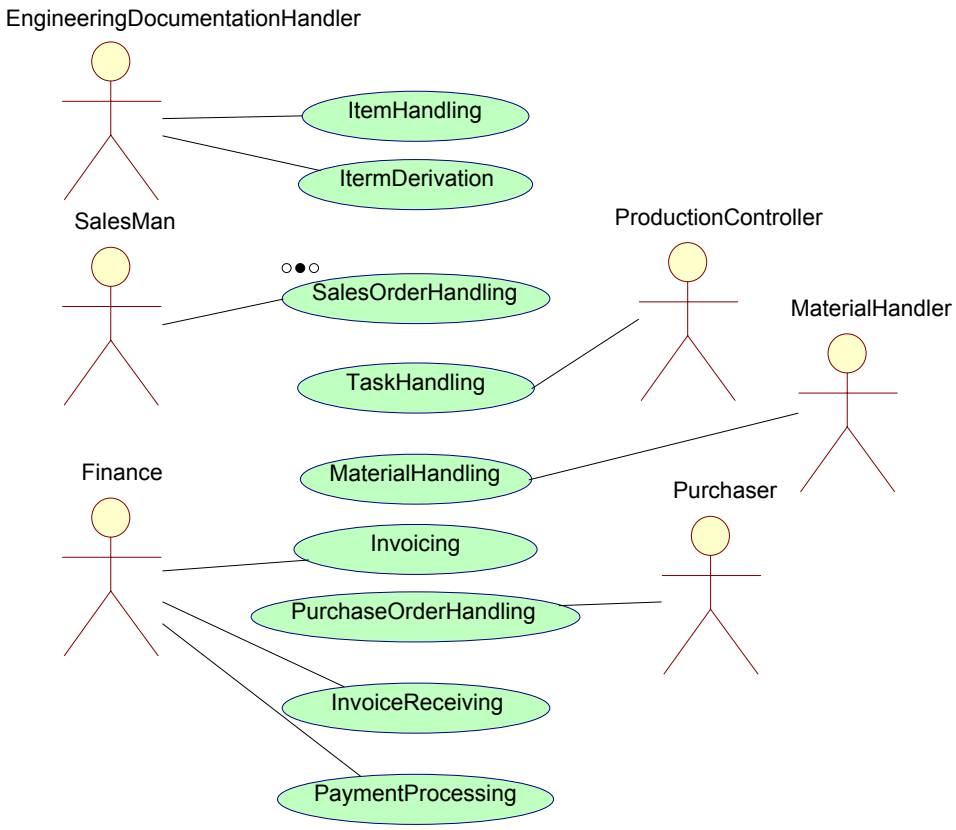

Figure 7-3. Context use case diagram

Then we try to realize the execution of the scenario via an appropriate collaboration. The starting point in designing this collaboration is a so-called analysis model (Figure 7-4), which is a special form of the class diagram. This collaboration is imagined between problem domain objects and objects introduced by us in order to solve the task. The actor of the use case communicates with the control object (named based on the name of use case) via a boundary object. This will be the control class, which performs the tasks specified in the scenario of the use case by using and updating the entity classes.

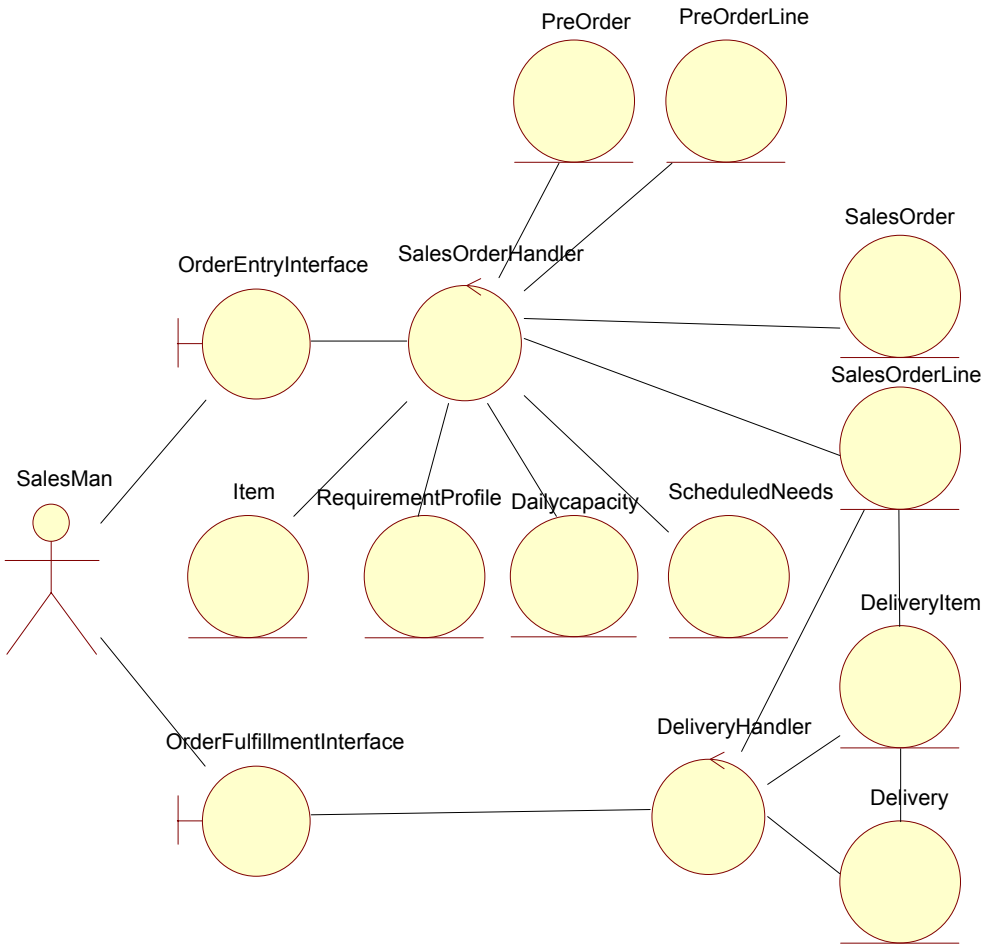

Figure 7-4. Analysis model of Sales Order Handling

The realization is modeled on a sequence diagram in the form of interactions between objects (class instances). The sequence diagram shows (Figure 7-5) how the collaboration among objects is performed. Starting from the upper left corner the focus is moving from object to object as the use case takes place and messages are sent from one object to another. Due to the incoming message the focus is transmitted to the receiving object, which has to execute an operation, which its class is prepared to execute. Outgoing messages from the focus represent a need for execution of an activity. This activity is to be accomplished by the receiving object. The steps of the use case reflect what kind of interaction is between the actor and the system. Focuses in the sequence diagram show how long the object must be active in order to perform the task: what kind of services it requires after the fulfillment of which it can accomplish its tasks, it can produce its outcome (result or product) and it can send back the response to the object demanding some service from it. The BPMN process model is usable for the representation of the process steps in these focuses, because now not only the running of the process steps, but the states are also accurately defined (objects and attributes).

It can occur that during the drawing of the sequence diagram we observe that new objects are to be introduced. In this case the analysis model of the use case is to be completed with the classes of these objects. The attributes of classes are defined based on the domain model, the variety or the data needed for the decisions.

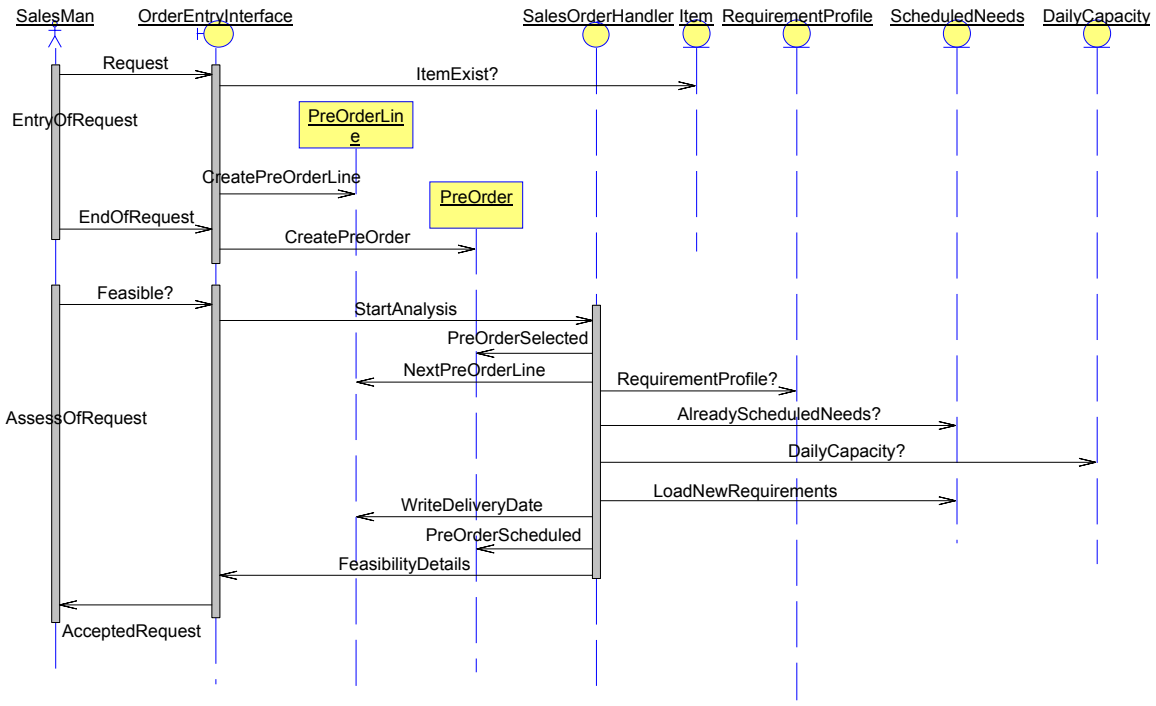

Figure 7-5. Sequence diagram (detail)

It can occur that during the drawing of the sequence diagram we note that the scenario in the use case is incomplete. Then the use case description is modified.

For the sake of handling the variety alternative flows are introduced in use cases that are to be designed and documented as above.

Effect Handling

Effects are generated during the execution of the process at level of direct adaptation. The control loops of operative and strategic adaptation work only with effects. The effects are generated for the sake of feedback control or simply for reporting something. During the engineering of the process the effect generation is to be allocated to one of process steps.

The effect handling is a pure data-processing task. In the case of feedback control we get a comparison between the expected (target) and realized effects. A decision-maker evaluates this deviation. He/she will make the decision to intervention.

The Benefits of Process Modeling

The constructive process modeling is a labourintensive task. We have however to keep in mind that an enterprise mobilizes continuously a huge amount of resources during its operation. The unorganized processes cause continuously waste, which appears in higher expenditures and opportunity costs. If we compared the continuously generated waste to the single project expenditure of creating a thorough constructive model we might soon realize that the process modeling is one of the most economical investments.

The benefits of modeling appear in several forms:

– The model of the current situation emphasize those lacks, imperfections, complications which cause undefined situations so a pressure to improvisation. The improvisation is always due to a halt. In this case there is no time for preparation of a suitable action. The wasted time cannot be got back; the unfinished work can be recovered only by extra expenditures.

– The model of the current situation can give idea for some reorganization of the process, for small

improvements. By drawing one or more modified process models, the effects can be compared and a cost-benefit analysis can be done.

– The dissatisfaction with the current model can lead to advising a radical change in the system of processes (BPR, Business Process Reengineering). This appears often in the form of the realization of a new approach intensively using information technology. By comparing the effects of the current and modified models a cost-benefit analysis can be accomplished.
– Our processes can always be published in their up-to-date version (e.g. on intranet). In exceptional situations the managers can get prompt support what to do. The training of newly hired people will be easier. The quality assurance instructions can be accurately defined. Any procedures and regulations can be easily produced.

To sum up: the process modeling makes the operation well-grounded, helps in generating improvement ideas, in evaluating the value of these improvements, that is in making the operation more effective and efficient.

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The ICT Effect on Payment Systems

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ABSTRACT

It is almost a commonplace that the price of time is growing continuously in our globalized world. This is particularly true for the financial sector. The development of the information and telecommunication technology has revolutionized commerce, customer and partner relationships and payment as well. The science of electronic payment is a multidisciplinary area. It requires extensive economic, legal and banking knowledge besides the most obvious technological aspects, containing transaction sciences, database-theory, cryptography, networking, etc. In this lecture and study the author intends to show the development of the means of electronic payment by comparing the "regular" account based methods – macro payment – (remittance, credit cards, e-cheque, etc.) with the new media – micro payment – (digital cash, e-wallet, smartcards, etc.). Through presenting the pros and cons of the single methods and the two main groups (macro- and micro payment methods) it will come out clearly, that the new methods are far more superior in the field of technology, security and usability. The change is influenced by many interests and counter-interests. This lecture (and study) tries to look backstage and explain why the new technologies cannot sweep away the traditional means so easily.

Preface

The boom of ICT usage in the financial sector reached Hungary in the '90s, and since then the Hungarian financial sector began to fall into line with the international standards. Although Hungarian consumers are said to be conservative and reluctant concerning financial services, the spread of the new channels can be esteemed as a true success. The study contains a short lookout on the Hungarian situation, presenting the methods available and expectations in our homeland.

Digital payment

To truly understand the significance of digital payment, electronic commerce has to be examined first. The business-to-business (B2B) and business-to-consumer (B2C) electronic commercial transactions made it possible and necessary, to convey the other, financial side of the transactions digitally.

To give an exact definition, electronic commerce is a commercial transaction, where physical or information-based goods or services are traded between distant partners using an electronic channel. The first primitive forms of e-commerce meant only that the orders were transmitted through an electronic channel (phone, fax, e-mail, etc.), but nowadays only those transactions are meant where *orders and payment and even delivery if the type of goods make it possible, are settled digitally*.

This also means that the means of payment are strictly defined by the goods traded. In B2B transactions, where usually large amounts are traded it does not have such a significance. Statutory laws mostly define which payment methods are allowed among business partners. Mostly, at least in Hungary account transfer is the only way. The situation is more interesting in B2C relations. Most cases only small amounts are traded and the buyer may choose from more payment methods, so the price of the goods traded decides, which one will be used.

There two main groups of electronic payment methods, macro- and micro payment. The main difference between them is the aspect mentioned above: what kind of goods can be traded economically by the use of them. Electronic commerce, even its more sophisticated mobile-based type, mostly limits itself to the trade of physical goods. Even from this group only the ones with a greater value appear in the supply of e-shops. The most wanted goods are books, CD-s, consumer electronics and computer parts and concerning services are travel booking, ticket buying, and financial services. Digital contents are commonly free or can be reached by long term subscription. These rarely latch on directly to electronic commerce; the means are to be searched among the characteristics of payment infrastructure. (There are some success-stories, like the Apple Music Shop, but this service is also chained to a physical good, namely the "iPod" mp3-player.)

The trade of such low-priced goods – mainly electronic content – and the coupling economic, social environment is known as micro-commerce. From a technological point of view transactions based on electronic (phone, fax, internet) and mobile channels, or on digital television belong to micro commerce. These transactions have a strong connection to micro-payment infrastructures, which make possible the economical money transfer even in case of goods with a marginal value. Transactions under a few dollars value belong to micro payment, but the value of a sole transaction can be as low as a few cents.

Micro and macro payment have to be divided, because the commonly used payment methods – in most cases it is the credit card – cannot be used in case of micro transactions. This can be lead back to three main problems: ordinary infrastructure has high costs; high risks, and requires more time to fulfil a transaction. It is not worth using a credit card in case of certain transactions even in "real" commerce, if the profit rate is very low, because the costs of the payment transaction may exceed this rate. (For example in Hungary one cannot pay with a credit card at lots of computer parts stores, these stores would rather take the risk of a remittance.) On the Internet or other electronic channels, where profit margins are commonly lower this statement is double true.

The most important perquisite of micro payment is that revenues should exceed costs even at very small transactions. This means that the most important parameters of such systems are the low merchant commission, minimal risk and very short transaction time. If all these perquisites are fulfilled, low priced goods can be traded economically even at a small scale [17], [9].

The previous observations clearly show that micro-commerce and micro-payment provide an economical solution for the digital content providers, especially in case of certain information goods (text, music, video, software, databases, etc.). In the physical world micro payment infrastructures do not basically change the business model, only the payment methods; which show a tight relationship with cash and cash-based transactions, looking through the perquisites of an ideal micro-payment system.

Although it may seem that this kind of payment is usable only in case of digital service providers, it is quite straightforward, that if a payment method is very similar to cash payment, it can be used everywhere. No one says that a method created for micro payment, cannot be used in transactions representing a larger value. As these methods are technologically superior, more secure, cheaper and need less time it is an interesting question why they cannot take over the whole electronic payment business.

Payment Systems

The main difference between macro and micro commerce lies in the diverse payment methods. This chapter shows a possible classification of payment systems, and a detailed presentation of the most popular, rivalling methods.

Like ordinary payment methods, electronic solutions can also be divided into two main groups: cash-like and account-based (not necessarily bank-account) models. The table below includes all the important solutions based on computer, mobile instruments, intelligent cards, interactive television,

etc. The other dimension is a more technological point of view: the digital usage of credit cards, accounts or digital money has an over ten years past, the intelligent cards has just begun to spread because of the growing inadequacy of the present methods.

	Cash-like systems	Account-based systems
Ordinary instruments	*Digital cash* stored on computer Stored on HDD Stored on a trusted client	*Credit card;* E-cheque *Account charge via Internet* *Credit-debit model* Internet and Telecom company based
Intelligent cards	*Electronic wallet (e-wallet)*	*Intelligent card based model with an account background*

Table 8-1. Classification of ePayment systems

The frequently used methods, with a detailed description in the following, are printed in italics in the table. As written above, credit cards and money transfer order through the internet, can be used only in transactions of larger value, the others are really appropriate for payment per pages/bytes.

Macro-Payment

Macro payment systems were not designed basically for the World Wide Web or electronic devices, but they can be well adapted for such usage, moreover the most widespread electronic payment systems belong to this group. These systems are inappropriate to economically managing transactions of minor value. The infrastructural costs of building up such a system are huge from the operators' (mainly banks or other financial institutions) side; the connection of single end points is versatile and easy, but the costs of a connection is again relatively high. The processing time of transactions is relatively long; it reflects the speed of the prevailing inter-bank clearing system. In the following the credit card based payment system is presented in detail, as this is the most common and widespread electronic payment method, and is used by on-line shops, digital content and service providers everywhere.

Credit Card

Bankcards and credit cards are pretty old instruments; they have been present in the international money business since the late 1950s and since the beginning of the 1990s in Hungary. Credit-, debit- and charge cards all belong to this group, although only credit and some charge cards are welcome in e- commerce. Merchants absolve themselves so from the risk of accepting uncovered cards and the costs of the obligatory on-line authorization of the debit cards. At present the number of credit card payments aggregate 92-95% of all electronic financial transactions [7].

In case of a card transaction the most important factor is security, therefore most merchants try to simulate the presence of the card, as if the customer would really use a POS-terminal. Such a simulation needs the name of the card owner, the card number, the date of expiration and a control code from the back side of the card. If all these data add up, the merchant can almost be sure, that the card is present at the transaction, but it is not verifiable whether the card owner really uses it. Lots of card owners are afraid, that the identification data of their card can get to unauthorized hands. Financial institutions try to protect their clients with unique card constructions since electronic transactions have become more popular. Virtual cards, single use card numbers make possible to mask the true identification data of the credit cards and carry out single transactions with limited value and risk. These substitute data cannot be abused since they can get positive authorization only once.

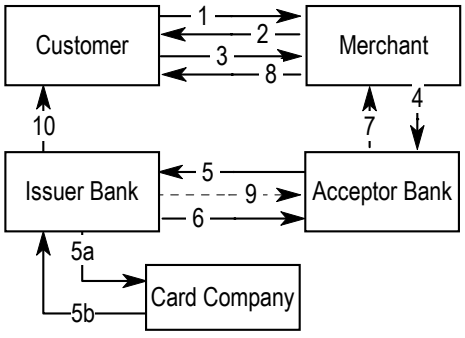

Figure 8-1. Credit Card Operation

The merchant transfers the data given one way or another to its bank (acceptor bank) and this launches an authorization request towards the bank of the card owner (issuer bank). In the authorization centre of the international card company the authenticity of the card is being verified and the issuer bank verifies whether the appropriate financial collateral is present. After that the issuer bank blocks the value of the transaction on the customers account and reports back to the acceptor bank. After reporting back to the merchant this considers the transaction as executable. The real financial accounting happens only at the end of the day thorough the inter-bank clearing system [6].

Looking at the figure and the description above, one can see what a complex row of transactions begins with a credit card payment. These transactions are costly and time-consuming, not to speak of the cryptographic methods, security protocols and regular authorization which are needed to protect the sensitive data travelling through the web.

The costs are high because of the risks, the popularity and the monopolistic nature of this service. The merchants have to pay a license fee to the card companies for the right to accept certain types of cards, and a truly high (3-7%) turnover commission, which is divided between the issuer and the acceptor bank (www.bankforum.hu).

All in all, it is observable how complex and costly is the maintenance of such a payment system. Besides the organizational, logistics and security problems, such a payment method makes it really uneconomical to transact under a certain scale and value. The world changes although there is more and more demand for micro transactions, even the credit card companies see that and search for a solution. The usage of intelligent cards would solve a lot of these problems, so nowadays the card issuers fight with all their strength to spread this new medium on the market.

Smartcards

The new form of bankcards, which uses an intelligent chip instead of a magnet stripe, will be much more appropriate for electronic transactions. This was a prime point of their development. The two leading card companies, VISA and EC/MC both announced an ultimatum, in which they declare that they share none of the responsibility or losses with the issuers, the do not change technology and release intelligent cards instead of the striped ones. In case of EC/MC the closing date for this action was the 1st January 2005. and one year later in case of VISA. If one looks at the calendar it is quite apparent, that the mass release of the new cards is overdue, but some banks already have products based on chipcards, and more will follow, in the end this new technology will completely turn the customs of card usage upside down.

Smartcards –a.k.a. intelligent card, IC card (Intetgated Circuit Card), chipcard, microprocessor card, etc.– is the multifunctional identification and value-holder tool of the future according to many. Physically it is an identical bit of plastic with the ordinary cards, but this one holds a “micro computer”.

The “brain” of the smartcard is a chip, which contains a CPU, ROM, RAM, operation system. It is programmable, and can fulfil more functions (bankcard, cryptographic algorithms, identification, digital signature, storage of health or other sensitive personal data, etc.), written on completely separated memory areas [16]. Not to forget, that almost everyone in the developed countries already have a chip card. The SIM-cards in mobile telephones are compatible with the EMV[4] standards, and so financial applications could be used easily on these chips (www.emvco.com). The combination of smartcards and mobile devices holds enormous possibilities, but the detailed examination of this issue is not part of the study.

Through a chipcard the identification of a customer is more assured, with a mobile device or a card reader connected to a PC the card can be read and charged in the reality, like at a POS-terminal in a store. The smartcard can really store and modify the value, the account balance data; it does not only represent a bank account.

[4] EMV: The international standard of smartcards and electronic commerce created by Europay, Mastercard and VISA and its coordinating organization (EMVCo.)

In the memory area of the card the account balance can be stored and can be refreshed in every transaction on-line. An on-line authorization with bank is needed much rarely, once in every ten or twenty transactions for example and in the meantime the owner can pay with the card without these costly and time consuming processes.

Because of the higher security the commission fees are much lower and as the smartcard does not require such a complex authorization process, the transaction time is shorter. To sum it up a smartcard is a materialized form of value more than any other means, as it can literally store value, it is similar to cash and a real wallet, that is why it is frequently called e-wallet. In a wallet coins and notes can be stored, but in case of an e-wallet, the denomination of these coins can be decided freely. If the smallest amount can be defined as one cent or even a fragent of a cent, and that makes both macro- and micro payments possible. This medium can be a bridge between the two groups in table 1 as it is appropriate for both usage. Smartcards can also be a representation of ones digital personality through the storage of identifications and personal data. This device will truly reform life if it becomes widespread.

Micro Payment

Micro payment systems make transactions of minor value economical, but it is not prohibited to carry out macro transactions through these systems as well. It is peculiar to these systems that they rarely require the ordinary financial, banking infrastructure, or in most cases they do not require it at all. The means of distribution are quite profane: pre-paid accounts, scratch-cards, etc. These methods imitate the characteristics of cash circulation, the commissions are low, transaction time is almost real time, and there is only a minimal risk.

Micro payment systems can be divided to two main groups: Credit-debit system and Digital cash system (Ordinary digital cash and eWallet). There are many more sub-categories of these, so only the most important methods are detailed in the following.

The Credit-Debit Model

The basic idea behind this system, that an account is managed by a trusted third party, also called payment service provider (PSP). This third party can be completely independent, but sometimes it is more practical if the internet service provider or the telecom company acts as a PSP, this kind of firms has an extensive clientele strongly tied to them and this makes building up the trust needed and act this new part easier.

The PSP enters the payment transactions and so users have to avail the traditional banking infrastructure less frequently, namely only when the user wishes to charge up his account at the PSP. Purchases and other transactions can be carried out then only using the account at the PSP. With this system the financial data are safe, and a number of small or large transactions accumulate on the account, and financial settlement happens only periodically. Therefore micro transactions can be concluded economically, so to say through a “batch process”.

As its name shows this system can be credit or debit based. Transaction costs are much lower than in case of credit cards and abuse is negligible.

In case of *credit basis* the PSP provides a line of credit for the client, and the account has to be settled periodically or when reaching a certain amount. This model works only in countries with a stable and developed payment culture and discipline and only in case of wealthy clients.

The *debit basis* is more secure for everyone; nevertheless it is less beneficial for the clients. The system works just like pre-paid mobile phones, the user has to pay an arbitrary sum in advance, the minimum amount is usually set. After that the user can carry out transactions freely until there is a positive account, and can add a desirable sum any time to his account.

Looking at a transaction, there are three parties in business relation: a merchant, a customer and a PSP. In some cases the model can shrink to a two-party relation, the PSP and the merchant can be the same, merchants often build up such a model for their business in smaller scale.

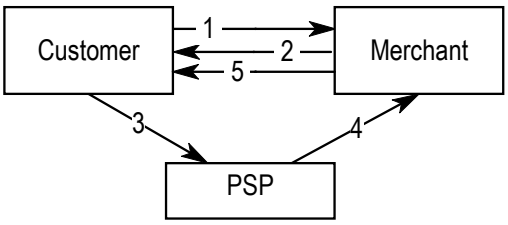

Figure 8-2. The Credit-Debit Model

At the beginning of the transaction the merchant re-routes the customer to the financial system of the PSP, where the appropriate sum is transferred to the account of the merchant. After the merchant gets a positive feedback, the purchase can be fulfilled. This method is also very positive from the privacy point of view. The PSP does not see the wares purchased and the merchant does not get any financial data about the customer.

Traditional Digital Cash

Digital cash, as its name shows, possesses the attributes of coins and banknotes, namely the transaction can be fully anonym, and the beneficiary of the payment has no claim towards the paying party after the transaction. Digital cash represents a real monetary value, it has a value on its own and can fulfil the four basic economic functions of money: medium of circulation, payment, saving and measure of value. Value is represented by identifiable data packages, so called tokens or coins, which are stored on the computer of the user. The tokens can be stored simply on the hard disk drive, protected by strong cryptographic means, or on a trusted special hardware, so called e-wallet (smartcard). In this case there is a hardware based protection as well, and the card is only connected to a computer if its owner wishes to start a payment transaction. In the first case a wallet software has to be installed as well, and payment transactions can be carried out through that.

There are a number of solutions and electronic payment systems based on digital cash (for example DigiCash, eCash, MilliCent, eCoin, etc.), although none of them is really widespread and in mass usage. They are not really popular with neither the users nor the merchants. One reason for that is the complexity and the intransparency of these digital payment systems, other is that the payment service providers cannot really exploit the possibilities of this model – peer-to-peer payment transactions, creation of user or merchant specific coins, loyalty programs, anonymity, etc. There are strong counter-interests as well: banks and credit card companies fear for their markets and clients, the statutory monetary regulators look askance at the uncontrollable creation and flow of money.

These systems work on a debit basis, and are appropriate for handling transactions of minor value; this is only limited by the smallest denomination of the given system. Transaction commission fee is very small, the abuse is negligible, and the tokens are protected with cryptographic means against manipulation and with central logging against duplication and multiple spending. This last statement shows one of the biggest disadvantages of the system, namely there is a need for on-line authorization to work completely secure and efficient that is every token has to be administered and logged all the time. The other disadvantage of the system is the heterogeneous legal regulation of digital cash, there is a common policy neither in the EU nor in the USA. There is a non-compulsory EU-directive, and single regulations on state level, however on such a basis an international payment system cannot work.

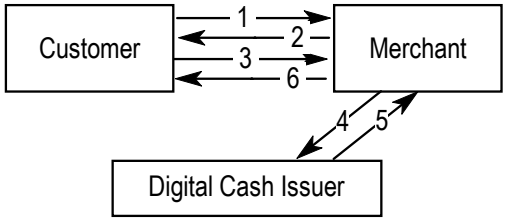

Figure 8-3. Traditional DigiCash Model

To carry out a transaction based on digital cash, the customer first have to change some real money to digital cash and after choosing the desired product or service they transfer the coins to the merchant. The merchant checks the coins in the database of the issuer, and fulfils the transaction. (The issuer and the merchant can be the same; in this case there is an off-line authorization.)

Although digital cash solves a lot of problems of the macro payment systems, its narrow prevalence and unique disadvantages prohibits it from being the revolutionary payment system of the future. Nevertheless digital cash is an excellent basis, only the storage and administration of the coins have to be developed, and e-wallet fulfils these claims.

E-Wallet

This new medium rises from the combination of smartcards and digital cash which combines the advantages of these solutions, without inheriting most of the disadvantages. As written above virtually any application can be installed on a chip of a smartcard, and most smartcards are not used for financial transactions, bus as a phone card, SIM-card, digital signature or entry cards.

From these functions the first and the third are noticeable. A phone card, although it is much simpler than a smartcard, stores value. This is a typical instance of the debit model; money is converted into units on the phone card, which can be used freely later. Digital cash is based on the same concept, naturally the balance of the card can increase and decrease as well, there can be more or less money "in it" as in an ordinary wallet. Digital signature is also interesting, because the user of the card can be identified surely even without a personal appearance.

This system has many advantages: it can work fully off-line, the card itself stores and administers value, it has a very strong hardware based cryptography which protects not only the card owner from losses but the value from the card owner as well. There is no need for central logging in this case. A chipcard-reader can be connected to any PCs as a simple and cheap hardware component. Because the off-line service the communications traffic is low; the way of the transaction is fast and simple; the costs are also low.

During the transaction only the customer and the merchant are in connection, it is just like paying with cash, the customer transfers the coins and gets the wares. The issuer is only needed if the card has to be charged up. This can be carried out by any ordinary means of macro payment.

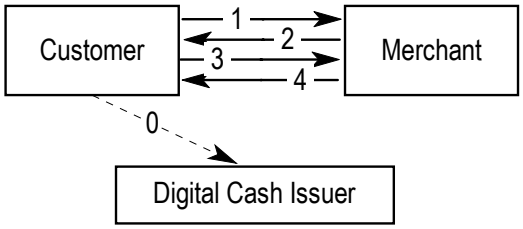

Figure 8-4. The E-Wallet model

Cost-Benefit Analysis

It is not easy to analyze the situation clearly from the cost-benefit point of view. The biggest difficulty is, that the range of the alternative technologies is very complex; there are a lot of rivalling solutions.

Looking at the costs the first and most important thing is, that the introduction of any electronic payment system requires an enormous initial investment. To create an infrastructure, which can serve thousands of clients and process millions of transactions per day is a very complex and costly task. Such a system cannot be developed incrementally, step by step. In the financial sector the competition is very hard, and becomes harder and harder. The ordinary services cannot be the drivers of competition; financial institutions have to create new services to differentiate themselves from the others on the market.

Constant innovation is not only a comparative advantage, but a source of constant risks as well. It is easy to loose the loyalty of users and clients, much easier than building it up. If a new service disappoints the users, because it is slow, insecure, has functional problems, etc., it has a negative effect on the reputation of the whole business. Therefore a new electronic payment system or function cannot be introduced for the users, before it is fully operational, with all its functions, modules, interfaces, etc. The data processing and storage capacities have to be enough to serve a large number of users, because if the service becomes successful, a large number of clients can sign in digitally in a short time, and they all desire full functionality and speed.

There are a lot of hardware and software components which have to be present everywhere to serve clients, for example ATMs and POS-terminals have to be changed or modified, etc. The creation of a fully functional payment infrastructure costs billions, and this huge amount has to be invested before a cent of revenue flows in. The success cannot be guaranteed and as profit margins are always very low in the digital sector the payback period can be extremely long even if the given system is a blockbuster. As written above credit card business has been present in the financial sector since the late 1950s and if we look at this business as a whole it began to become profitable only in the recent few years [8]. Accordingly it is not accidental, that the technology changes in the card business are just about to start albeit that the smartcard technology in its present form is more than ten years old.

The other thing is, that many of the new technologies do not require a bank or a financial institution to operate. This brings on legal questions, and the extreme resistance of the financial sector. The financial sector is a relatively closed world; if the monopoly breaks and a number of firms enter the market the profits will shrink and the competition becomes even more severe. In every country laws ordain a number of criteria, rules, etc. for anyone willing to take part in the financial business.

Certain payment and financial services can only be carried out by certain types of firms, all under strict control, reporting requirements, etc. With the new technologies this business can open up for anyone, there is no need for huge equity capital, rigid structures and physical presence to operate a digital payment system. Payment systems can be operated even at a small scale, specified for a merchant, or a chain, therefore the number of companies in the financial business will grow, and this large number is more difficult to control. As a number of the new systems are similar to cash turnover, lots of transactions can disappear from the eyes of the monetary authorities. The velocity of money circulation and the amount of money in circulation will be almost impossible to define; only estimations could help, but as the financial business will become more and more complex these estimates will become less and less accurate. This and the almost hysterical fear from money laundering connected to organized crime and terrorism is the strongest weapon in the hand of objection.

There are also benefits of the new technologies; most of them were mentioned above, in the detailed description. To sum it up, most of the new solutions are faster, simpler, more secure and appropriate for micro-transactions and can work off-line with less data traffic requirement. So technologically these solutions are absolutely superior. Considering the material benefits, it can be told, that despite the long payback period, a new technology with extended functionality and lower costs will be cheaper and more profitable in the long run. The sector is standing before a change of technology, and presumably one of the solutions mentioned above will replace the traditional card and account based on-line model.

According to the author, the concept of e-wallet is the most superior solution from the list analyzed above. In this case the value is physically represented by a card, which brings the change closer even to the conservative users, as nothing changes at first sight. The possibilities of a truly off-line operation, the multi-application ability and security make it ideal as the next generation e-payment model. Sadly that means that the financial monopoly will not be broken, as a smartcard based technology requires such a huge investment and cross-economic and cross-national standards again, that only banks can dispose of the appropriate capital to finance the change. Although it is unsure whether this is a problem. The resistance would be so strong otherwise, that it could better conserve the present system instead of moving toward a new one. That's the reality of business interests.

Summary

In this study the author attempted to outline the present situation and the possible outcomes of the digital payment industry. This study could only scratch the surface of this very complex area because of size restrictions. Nevertheless the author hopes it is now clearer what complex interests and forces move the world of finance, and why and how will the coming change of technology reform digital

payments, the most developing area of finance nowadays. The smartcard technology is already on the edge, the banks are changing the magnet-striped cards throughout Europe. But whether we exploit all the possibilities of this new technology and let the e-wallet concept reform the traditional account based payment, depends only on us, the users. In this hard competition only those businesses survive, which serve consumer demand maximally. It is the responsibility of the consumer, what this demand means.

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The Educational System of the Zrínyi Miklós National Defence University

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ABSTRACT

Information society is a society for continuous increase of knowledge. Knowledge is the most important source of welfare - the production of knowledge is the main aim of economy. The character of knowledge changes in the information society - it becomes multimedia-like, transdisciplinary, and practical. The means of information and communication technology (ICT) are widely used in our lives. They make possible, and, at the same time, they require the transformation of teaching and learning environment, and the use of modern tools of information and communication. Lifelong learning is becoming predominant, conventional education and training is replaced by learning management, conventional education establishments are replaced by the virtual environment of open learning and education. The international industry of teaching material providers and the virtual training network is coming into being, which will blend with global information supply. The new paradigm of education assisted by ICT is efficiency, that is, the time and cost-factors of providing an individual with instantly marketable knowledge. This paper aims to survey changes in the teaching and learning process, the possibilities of acquiring knowledge based on ICT, and to give an account on distance educational system of Zrínyi Miklós National Defence University, Hungary.

The New Learning Environment

As each new stage of the development of communication (speaking, writing, printing, electronic media, computer networks, information super highway) has had a simultaneous impact on each element of the teaching-learning process, such as means of communication, the medium of information transfer, the role of the teacher, teacher-student communication, teaching/learning methods, learning environment, students, therefore, the first essential stage in shaping the knowledge-based society is the acquisition by the citizens of the confident use of the new tools for accessing knowledge and the widespread development of computer literacy adapted to the different learning contexts and target groups. Shifts in focus to be expected in teaching and learning during the transition to the information society:

- Developing skills, competences, routines and attitudes instead of teaching facts, rules and ready-made solutions.
- Developing the ability and skills for lifelong learning instead of providing close, complete knowledge.
- Resource of knowledge is the integration of elements gained from various sources instead of school-, teacher- and teaching material-centered learning.
- Encouraging and orienting student's independent learning instead of teacher's predominance.
- Project-based learning in flexible timeframe instead of fixed curriculum and rigid time schedule.
- Encouraging learning as investment.
- Learning in various kinds of environment instead of learning in classroom.
- Independent learning and learning in small groups versus learning in classes.
- Learning in heterogeneous age groups versus learning in homogeneous age groups

– Inter-school learning groups at national, regional and global level as well versus intra-school learning groups.
– Creativity, criticism, innovation versus adjustment and conformism.
– Meeting standards instead of meeting teacher's requirements.
– Open, multi- and hypermedia learning environment instead of closed learning environment based on printed teaching material.

Developing students' professional skills will be emphasized instead of transmitting knowledge, which means reassessment of institutionalized education and challenging it at the same time. In the learning process certain skills will rise in value, such as communication and language skills, adaptation and cooperation skills, and capability of working in heterogeneous groups.

Competences

Highly professional activity requires accurate definition of necessary competences, that is, that of theoretical and practical contents. In terms of expectations of society, competence means the ability to perform tasks and roles defined by professional requirements. A competent individual permanently takes care of his self-education, uses newly acquired knowledge, and carries out responsible activity to cater for own professional development. In terms of the individual, competence means the basis for performing useful and high level activity according to the requirements of the given profession.

In our time professional competence cannot be considered to be a constant and perfect knowledge closed by a certain test, but it is more of a series of permanently changing and developing activities. Besides general and professional knowledge it is becoming more and more important to possess necessary basic and professional skills in information technology. Due to rapid growth of scientific and professional knowledge, society is becoming more and more the society of permanent self-education. he acquisition of methods of lifelong learning and the demand for making permanent self-education a specific way of life will become one of the basic criteria of the individual's future success. For the individual permanent learning and self-education will mean the following:

– Learning and self-education will become the requirement of career development and promotion.
– Learning and self-education will become investment to be considered.
– Due to competition created by learning dependence might change quickly.
– Besides self-fulfillment, learning also means identification oneself with the organization.
– Besides professional and language skills the importance of social and behavioral education will increase.

Because of global impact, more and more attention should be paid to the development of foreign language oral and written communications skills and that of situational awareness and ability of making decisions.

Hungarian Home Defence Force

Being a part of NATO, specialists of the Hungarian Home Defence Force[5] are required to possess complex, interdisciplinary knowledge. They are expected to prepare for meeting challenges such as, versatility in theoretical and practical aspects alike, creativity, permanent self-development, learning, taking advantages of ICT. Due to structural changes and rapid growth of ICT, system of ways, methodology and didactics of education is undergoing changes:

– Due to limits to expenditures of education and that of permissible loads on faculty members, difficulties in substituting for lecturers, the proportion of long-term courses is decreasing, while the role of distance learning and self-education is increasing. The latter requires the development and utilization of modern information carriers and means of educational technology, as well as providing teaching materials available via networking meeting users' needs. It is necessary to develop the network of tutoring.

[5]http://www.honvedelem.hu/news

– The role of guest lecturers from field units is increasing, especially in organizing and conducting practice during the learning process.
– Demand for individual training emerges, especially in the case of personnel holding command positions.
– It is important to establish the organizational, personnel and technical conditions of a mobile and flexible system of follow-on education and training where either the lecturers have to be made mobile or education and self-study have to be provided through virtual educational centers.
– Due to the development of ICT virtual learning environment is becoming more and more widespread.

The National Defence University[6]

The Zrínyi Miklós National Defence University (ZMNDU) – complying with the Act on Higher Education approved by the Parliament of the Hungarian Republic- has a primary objective of the preparation of specialists (both officers and civil servants) for the Ministry of Defence (MoD), its support institutes, the Defence Force, and the law enforcement and state security agencies. ZMNDU is the military/national defence institute of military higher education comprising an integral part of Hungarian higher education system (ZMNDU is under the direct supervision of the Minister of Defence). Within its training system the following fields are cultivated as state tasks:

– Higher military and national defence leadership training and professional training;
– University- or college-level basic officer training.
– University-level basic training for civil students.
– PhD training.
– General and professional further training courses.
– Different courses on demand.

The multicycle training system of ZMNDU in accordance with the Bologna Statement and the requirements of European Committee is based on basic (Bachelor, BSc) and postgraduate (Master MSc and doctorate PhD) training.

[6] http://www.zmne.hu

Bachelor Training (BSc)

The Bachelor training includes 1 semester general military training, 7 semesters (210 credits) on the military branches and/or 6 semesters (180 credits) on the civilian branches.

BSc branches
– Security and defence policy
– Military leadership
– Military and security technology engineering
– Military national security
– Border policy and leadership
– National security
– Correctional institution's leadership
– Defence administration
– Military and security technology engineering[7]
– Mechanical engineering[8]**
– Transport engineering**
– Financing and accountancy**

Master Training (MSc)
In the Master training the ZMNDU offers:
– 4 semesters, 120 credits on the civilian branches,
– 3 semesters, 90 credit on the military branches
– 4 semester, 120 credits on the Military and security technology engineering branch.

MSc branches
– Security and defence policy
– Military leadership
– Border policy and leadership
– Military logistics
– National security
– Correctional institution's leadership
– Disaster relief engineering
– Defence information technology system planner
– Defence administration
– Military and security technology engineering*

Doctorate Training (PhD)
In the doctorate training we offer 6 semesters (180 credits) with specialties of
– PhD Institute in military science;
– PhD Institute in military technical science.

[7] The * signed courses are launched by ZMNDU along with Budapest College of Technology

[8] The ** signed courses are launched by ZMNDU along with different civil branches

The purpose of the doctorate training is
– to provide the conditions for acquiring the knowledge and basic research skills required for doctorate degree,
– to provide for the supply of the scientific research personnel (as well as that of the training personnel).

The basic principles of the doctorate training are as follows:
– political and party neutrality
– a close interaction between scientific research and training,
– a balance between research and development,
– adherence to the progressive traditions of Hungarian military higher education and
– close co-operation with both domestic and other foreign organizations.

ZMNDU gives top priority to establishing codes of conduct, attitudes and aptitudes, which are necessary for an officer's career. Physical preparation, maintaining a healthy lifestyle, foreign language training and language examinations are also central to our philosophy. The high level of training at the faculties guarantees that our graduates – military and civil experts – will be capable for creative jobs, postgraduate training, and efficient performance. This training is designed to enable individuals to acquire professional and language qualifications, for NATO assignments and other international co-operative posts

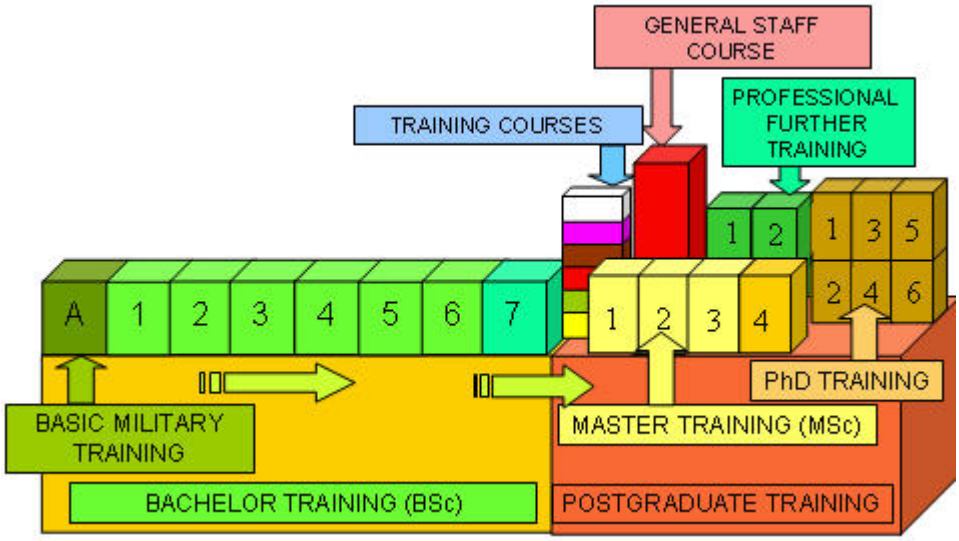

Figure 9-1. The multicycle training system of ZMNDU

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The Distance Learning System

The Figure 9-2 shows the distance education system meeting educational and training requirements of the Hungarian Home Defence Force.

Needs analysis is the responsibility of the MoD, and ZMNDU provides assistance in it with offering appropriate courses. When developing the education and training system, it is necessary that different educational levels build one on one after the other, follow-on more it is desirable to provide permeability between institutions and branches of the same level both nationally and internationally (it seems to be feasible to establish common standards for comparing educational programs, students' knowledge assessment, and for establishing its equivalency getting NATO member nations ' military educational specialists involved in the process). Educational and training requirements related to promotion system can be achieved by distance learning exclusively regarding diversity of training and the great number of participants.

In order to assure quality from the very beginning, specialist training of those involved in every field of distance learning (management, materials development and tutorial network) is supposed to be done simultaneously and in a coordinated way.

The most important managing task is to organize courses satisfying customer's needs, and to carry out related leadership and organizing activities, such as general educational management and marketing tasks. Another management task is full-scale course administration, providing students with teaching packs, and organizing maintaining contact between tutors and students. These responsibilities require general leadership skills, training administration skills, and basic skills in information technology. In case of computer-based

education, distance education activities (administration, location and access of materials, correspondence, sending and evaluation of assignments, bulletin board, chat etc.) are provided by the Internet accessible ORACLE iLearning learning management system. Besides admin staff, tutors and students are required to use this system.

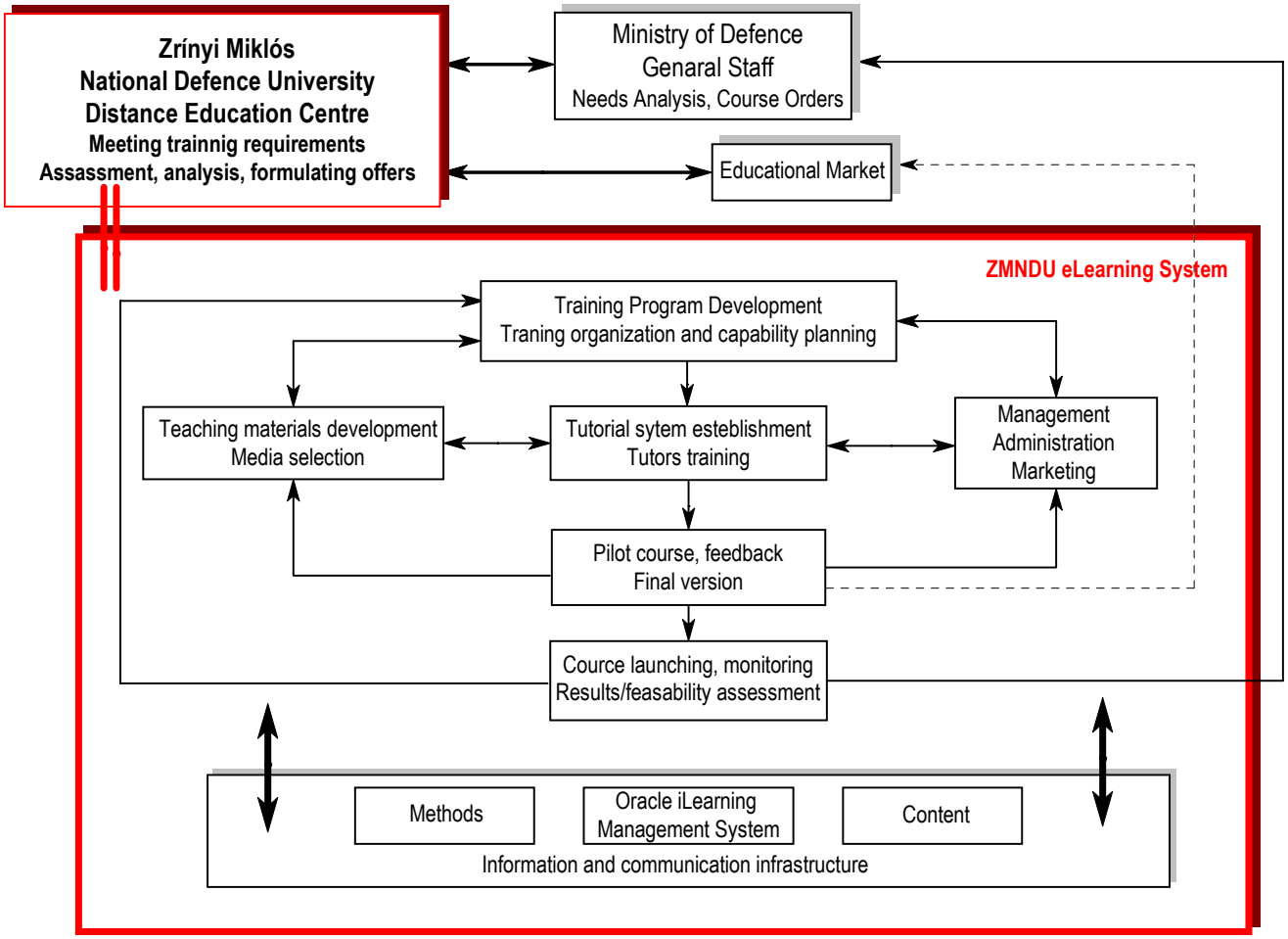

Figure 9-2. Scheme of ZMNDU distance education system

Teaching materials (content) development is one of the most sensitive issues of distance education as it determines students' qualifications level and the quality of the given course. Teaching material meant for distance learning is significantly different from the conventional one. Materials development for distance learning requires teachers and specialists possessing specific skills. Information carriers can be developed for teaching in conventional environment and for teaching via computer networks.

The Informational Infrastructure

The computer network of ZMNDU is a multi-server, multi-location, inter-cities long distance (WAN) network, which connects the local (LAN) networks of the individual locations with each other and the Internet (see Figure 9-3). The internal network of the university based on a HP NetServer LP3 with Novell Netware 5.0 network operational system. The WEB server of the university and the internet correspondence runs on RISC-6000 based IBM computers with AIX operational system. A separate RISC-6000 computer serves the OLIB system of the University Library. The distance education is served

by a RISC-6000 H-70 server computer. The Lotus Notes Teamwork Software is undergoing testing. Novell Groupwise 5.5 based server is used for forwarding internal information.

Tutor and mentor training have primary importance as the quality of their work has an enormous impact on students' motivation and achievement.

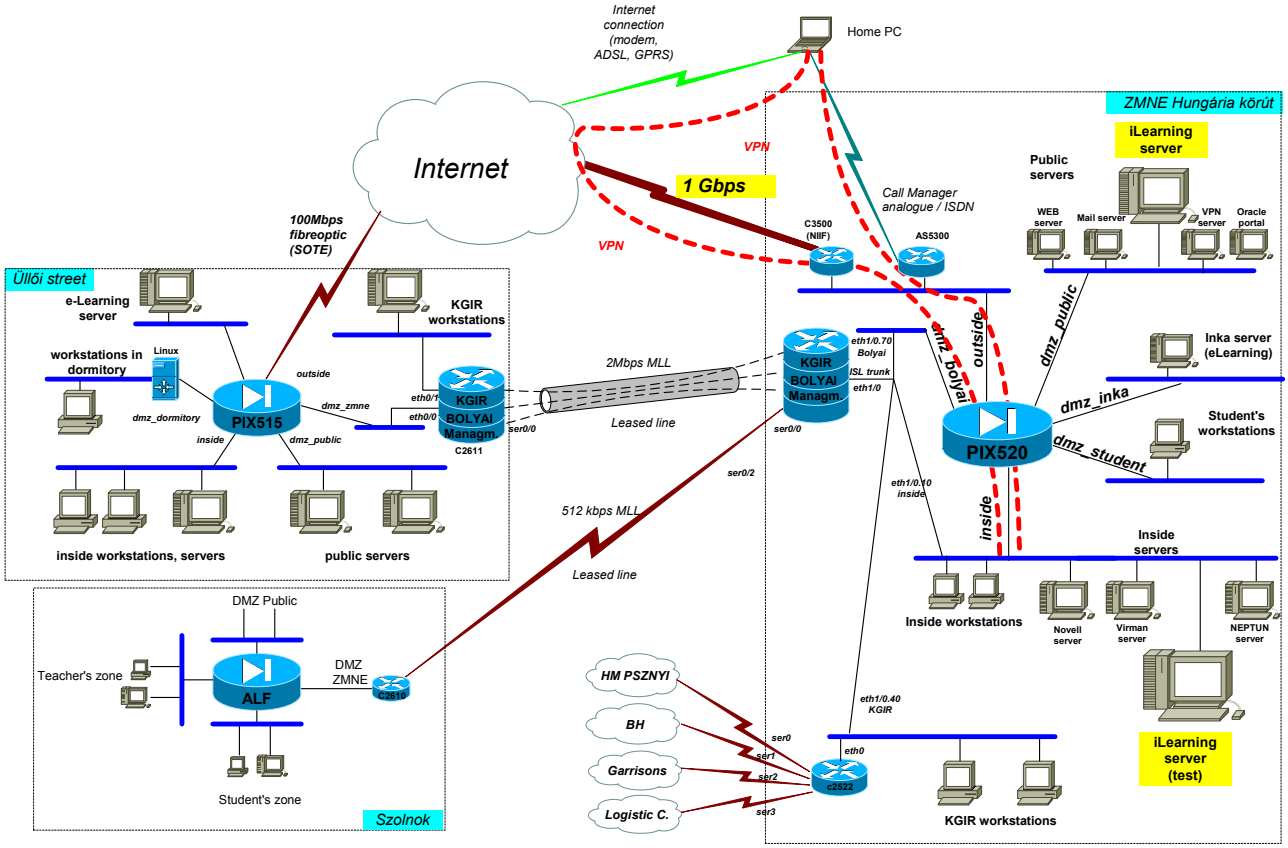

Figure 9-3. The computer network of ZMNDU

Distance education activities (administration, location and access of material, correspondence, sending and evaluation of assignments, bulletin board, chat etc) are provided by the internet accessible ORACLE iLearning system, which is an important element of the ORACLE E-Business Suite application complex. Applying the ORACLE iLearning in military higher education offers much wider perspectives than just the functions of a study supporting system: it enables the creation of an integrated e-based infrastructure together with other ORACLE programs already used by the Hungarian Army.

At present the Hungarian Defence Force has 32 computer laboratories (language laboratories), which are accessible through a central server.

The didactical possibilities of the centers are the following:

– Individual self-training.
– Collective work on the basis of the instructor decision.
– Both individual and collective education or supervision of a student,Projection of instructor monitor picture for students.

In the centers Internet access is also provided. This makes it possible for students living in different parts of the country to access the ORACLE iLearning system, and with this enables synchronized and asynchronized learning/teaching, online teamwork and information exchange.

The Distance Education Centre

The purpose of the Distance Education Center (DEC) is to ensure access to high-quality education and training materials that can be tailored to individual learner needs and made available whenever and wherever they are required, to accelerate development of cost-effective learning software in order to meet the education and training needs of the military. Objectives of the DEC:

- Develop guidelines needed for development and implementation of effective distributed learning.
- Establish a networked community of education and training personals.
- Stimulate collaborative developments by organization that share learning requirements.
- Identify technical challenges and initiate collaborative research and development programs to overcome those challenges.
- Accelerate the development of an open environment for ADL.

The DEC strategy:

- Maintain knowledge of emerging network-based technologies and their compatibilities.
- Facilitate development of common standards and guidelines.
- Promote widespread collaboration between ZMNDU, government, and army, which satisfies common needs.
- Enhance performance with next-generation learning technologies.
- Cover development and education costs.
- Create platform-independent-reusable content.
- Provide incentives for organizational and cultural change.

The following are inevitable in order to achieve goals (1) Large supply of instructional objects that can be easily found. (2) LMS, which assemble these objects into presentation that an individual can successfully use for learning. (3) Reliable communication between the LMS, objects and learners/users.

Teaching materials are supposed to meet requirements as accessibility, interoperability, reusability, durability and affordability. Within the distance learning system of ZMNDU, DEC carries out the activities in cooperation with ZMNDU educational and administrational organizational units:

- Encourages and assists with activities related to distance learning.
- Organizes, coordinates, assists and conducts training of personnel involved in distance learning.
- Assists in establishing the Internet-based, complex distance learning service.
- Provides information related to distance learning.
- Participates in developing distance learning projects, plans, measures and regulations of the university.
- Organizes conferences, exhibitions and workshops.
- Establishes national and international contacts.
- Coordinates distance learning marketing and PR activities.
- Publishes new research findings and experimental achievements, supports research into distance learning.

Summary

Modernization of the Hungarian Defence Force and transition to the all-volunteer force require permanent update of personnel knowledge and skills. Due to financial limitations, concentration of teaching staff and infrastructure, and demand for specialized military-professional knowledge, the proportion of conventional resident courses is expected to decrease significantly, while demand for organized conversion and follow-on training will highly increase. Conventional education is unable to meet that challenge, so it is inevitable for the Hungarian Home Defence Force to introduce and spread new educational methods, means and media. The distance learning system based on modern information and communication systems has proved to be efficient in a national and international environment alike. Its relevance, quality, well-balanced content, high cost effectiveness, and the possibility of flexible learning at home cater for acquiring and permanent updating of necessary knowledge and skills, and helps transform learning from being a necessity to becoming integral part of the way of life, becoming routine activity for everyone.

Summary Results of the 4th Conference on Business Information Systems on 10-11th November 2006

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The Conference on Business Information Systems organized by the GIKOF/SEFBIS Task Force Group of the János Neumann Computer Society (NJSzT Hungary), took place in Győr from Nov 10 to 11th. Beside discussing the newest scientific and technological results in the field of business information systems and exchanging experience in application of business information systems, monetary solutions the main purpose of the conference was to provide professors, industry leaders, PhD doctorates with opportunity to learn about the achievements of the new curricula system in higher education, with experience of colleagues in development, implementation and application of IS on this field. The event was hosted by the local Committee of NJSzT Győr-Moson-Sopron, the Széchenyi István University, and supported by the IFIP TC8 Information Systems Technical Committee WG 8.9.

Conference Opening

The conference was opened by László KÓCZY (Dean of Engineering Faculty), who addressed the audience, researchers, graduates and PhD students with a definite will, that information technology and applications are going to be the most important part of any industrial, business or even state administration development process. He also described in some words the significance of teaching and research in University of Győr, concerning applied information technologies, business information systems.

Followed István ALFÖLDI (Managing Director of NJSzT, also addressed the Conference highlighting the importance of general *information literacy* in the society. Hungary does not have premium rates either in availability of broadband access, nor in wide spreading use of up-to-date computer applications. He declared, the NJSzT and also middle- and higher education systems should feel responsibility to involve this *literacy* elements – will symbolized by the international ECDL licence standards – to be part of any curriculum, any personal competence development programmes.

Plenary Session

The plenary session was chaired by Mária RAFFAI (Editor in Chief and President of GIKOF/SEFBIS) expressed proudly: the 4th Conference could attract university and college lecturers, experienced businessmen and young researchers to get together in order to build a communication network, to run fruitful debates on the most frequently questioned computerized systems and applications.

The conference started with some keynote speakers. Gábor HOMONNAY (Chinoin Zrt.) read his actual, annual *Letters from Userland – Let's Think on Efficiency*, in a well-known sarcastic and chilly mode. He highlighted: more and more people understand, the user is responsible for his/her application. The real practice shows users are not prepared enough and properly for this role. Those waiting for clear algorithms to calculate *day-by-day efficiency* of complex information systems may soon be disappointed. *To-Quantify or Not-To-Quantify* – this is an ancient alternative for buyers and vendors of systems. Homonnay called attention to the ultimate argument: a business mission, a strategic business goal always has to have the highest priority, either being approved by a clear calculation, or not.

As usual, his presentation was followed by some questions from the audience, expressing opinions pro-and-con.

Pál ZSEBEDITS (E.ON IS Hungary Ltd.) spoke on quality management of IT services. He argued on measurable quality parameters only if a process oriented service activity is documented. The expert presented the E.ON solution in implementing an IT services quality measurement, monitoring and management system.

Csaba JANKÓ and co-authors gave us some useful hints on how AUDI Hungaria Motor Co. could implement a complex DMS. A high volume of daily documents (created, received, sent out) were transformed to electronic documents, with high level of not only efficiency, but security and privacy. As both of former speakers, he focused also on return on investment, a cost-benefit analysis of a complex IT investment.

As a foreign speaker, Imre PETKOVICS (University of Subotica, Serbia) presented a paper on a CRM system, focusing on bookkeeping and financial information to use. According to their investigations, CRM systems today should undertake complex roles of operative, analytical and decision support. This user-oriented BI level has to have experienced endusers (from order-management to market analysis) to understand and to leverage outputs of complex data mining and other intelligent software.

Session: Research Results

The first session chaired by László CZERNY started with the presentation of Andrea KŐ and Zoltán SZABÓ (Budapest Corvinus University). Their paper showed a report on a GUIDE FP6 international project, aiming auditing problems of KM systems and projects. As KM, the ICT audit is also a relatively new area of investigation, the standardization process (like the COBIT package) should be carefully studied and applied on different architectures. Researchers presented an evaluation framework for assessment of the development of knowledge management solutions. Nóra ÓVÁRI (PhD student, Pannon University) also presented on a KM model. She related to the Year 2000 and Year 2004 KPMG general surveys on KM projects in progress in Hungarian economy and correlated it to a new set a results, based on a 2005 questionnaire. Tamás HECKENAST (Széchenyi University) presented on data representation models, like tables, hierarchies, small multiples and even space-filling data organizations. He overviewed some visualisation methods on business applications and related data structures, and compared diverse navigation tools worked out for different structures.

Session: Applications, Business Solutions, Business Intelligence

The session chaired by Gábor HOMONNAY started with Peter FEHÉR–Zoltán SZABÓ (Budapest Corvinus University) presentation on IT services management. This important field is of a daily importance for management: how to select, to whom to believe, for how much to buy, to hire, to order… The lecture offered an overview on ITIL applications, presenting survey results within SMEs on level and management of ICT services. Some cases of state administration problems were also offered for study.

András MICSIK et al (Budapest Technical University, Corvinus University) came with a report on a PROMOCIO Project, aiming ICT project management methods uses and factors of success and failure. A new software package had been developed and they emphasized the need for a fitting application for a large number of special EU-originated tender projects. The software presented supports project managers to measure progress with a set of indicators, offers flexibility to modification. Typical EU-based tenders (like GVOP, HEFOP, etc.) can be supported with automatic generation of necessary reports and other documentation.

Klára PAPP (Budapest XVIII. District Council) presented the E-ssentia System managing the Council data asset for tendering and project management. The aim of development was to make public use of formerly collected data, to establish a (web-) interface for new and existing businesses to ease their start-up period and even continuous activity. Zsuzsanna VÖRÖS (MÁV Hungarian Railways) presented an interesting and instructive change management case according to the per-

sonal traffic division IT branch of MÁV. This branch had faced to a problem of being outsourced or insourced, with all strategic and operative problems of service level, staffing, assets to move and others.

Pál MILETICS (BUTE ITM) gave a report on an innovation project on mobile technologies. The solution is based on a message-service module, using SMS and other services of public mobile providers, and aims establishing interactive non-voice, media-specific services. Tünde RÓZSA and Miklós HERDON (University of Debrecen) presented a function-based ERP system measurement method. Hungarian SME-s are using ERP systems only in about 50%, thus the market is high, and belief of performance, methods to prove measurable parameters are extremely important. Functionality, reliability, costs and benefits to calculate return – these were the questioned segments of investigation.

Ferenc ERDŐS (Széchenyi University) provided a methodology for information infrastructure measurement especially focusing on SMEs. This sector produces about 50% of GDP in Hungary and their level of ICT applications is extremely important to grow. The researcher tried to find correlation between usual and special indicators related to these types of companies. József NÉMETH (Softime Ltd.) described some *shared applications* environments for SMEs. The x.tend ERP system presented offered either rich or thin client solutions, investigating data traffic problems of shared databases and performance of corporate networks.

Zoltán NAGY and János KOVÁCS (Széchenyi University) overviewed application possibilities of RFID solutions for logistics systems. The technology shows a rapid development but there are some drawbacks (like privacy problems) which make general use challenging in some cases. István FÜZESI and Miklós HERDON (University of Debrecen) continued this problem in food industry identification cases. Bio-terrorism and enhanced control of global food transfer make it absolutely necessary to identify all steps of producing and informative presentation of many data of a ready-made product also. Systems are thus very complex, and a special product – meat – does not make identification problems easier.

Session: Applications in Finance and Monetary Sector

This session having chaired by Péter DOBAY had a general conclusion that deep concerns had to be voiced about the overall arrangements for this sector as security and privacy issues, together with global actions, challenge at high level the applied ICT systems.

Milan HASZNICS (Budapest Technical University) presented a KM mapping technology project for a financial institute. Explicit-tacit knowledge mapping was executed on a base of business processes. The lecture offered some comparative evaluations on different presentation technologies like tables, graphs, trees, etc. Gábor NAGY (CVIB Bank Zrt.) spoke on risks, risk measurement, biases if measuring risks. He presented a new measure (expected shortfall) for sensibility of a portfolio and also evaluated the behaviour of a portfolio risk in time series.

Attila HORVÁTH (Budapest Technical University) investigated the Internet-based channels in financial CRM solutions. Electronic transactions often are evaluated as a win-win solution for both the customers and the banks. However, only 10% of Hungarian clients use e-banking services, or other web-based financial solutions. Role of new applications would be to develop this rate 10-15% annually, mainly with introducing new, challenging, easy-to-use and safe applications, and the parallel development of banking ICT infrastructure.

Gábor GYŐRFI (Budapest College of Finance) went on this topic with introducing security systems of web-based banking. Numbers of hacking and other threats make it absolutely a sound problem and customers' belief is the real value for banks. New technologies came with new threats as criminals use more and more developed tools to attack these global systems.

Plenary Discussion

The conference concluded with a plenary discussion involving all the conference speakers chaired by János KOMLÓS. A range of questions came from the floor seeking clarification of the *Bologna process,* and, especially the *business information systems* undergraduate programme. All large universities and some smaller colleges started in September 2006 with the new curriculum, but uniformity, competence levels, methods applied seemed to diverge. Participants agreed in joint seminars.

As Conclusions

Professional sessions of the conference brought together a number of experts in information systems design and implementation, and, of course, those teaching and training the young generation. We just hoped next year should come with a jubilee 5th conference, attracting more participants from home and abroad, and would represent sound opinion of a professional community on business information systems applications, a number of key themes.

Performed Decisions of NJSzT Scientific and Educational Forum on Business Information Systems in 2006

Decision No. 20/2006.
The SEFBIS Board in cooperation with the Consortium on Business Information Systems revised, discussed and corrected the curriculums on Business Information Systems that have not been accepted by the Hungarian Accreditation Committee.
Responsibles: Mária RAFFAI, András GÁBOR

Decision No. 21/2006.
The SEFBIS Board and the Editors of SEFBIS Journal made efforts to obtain sponsors for publishing the Journal.
Responsible: Péter DOBAY

Decision No. 22/2006.
Referring to the Bologna Process the members of SEFBIS and the Consortium on Business Information Systems forced to share all the educational recourses (curriculums, professors, teachers, trainers, books, lecture notes etc) and to ensure the cooperation between universities and business.
Responsibles: Mária RAFFAI, András GÁBOR

Decision No. 23/2006.
Organizing the 4th Conference on Information Systems on behalf of the Day of Hungarian Science.
Responsibles: Mária RAFFAI, Péter DOBAY

Decision No. 24/2006.
Cooperation with International Organizations, active participation in international Associations and Committees.
Responsibles: Mária RAFFAI, Péter DOBAY

Decision No. 25/2006.
Support the young scientists and doctorates to develop and publish their work and results.
Responsible: Mária RAFFAI

Decision No. 26/2006.
Reviewing and publishing the journal volumes of the Association twice a year (GIKOF Journal in Hungarian and SEFBIS Journal in English)
Responsible: the members of the Hungarian and the international Editorial Board

The 2nd IFIP International Conference on Research and Practical Issues on Enterprise Information Systems – Oct 14-16. 2007 Beijing, China

Preliminary Call for Papers

www.keylab-imie.org/confenis2007

IFIP TC8 International Conference on Research and Practical Issues of Enterprise Information Systems is a primary international event which provides an opportunity for enterprise information systems academicians and practitioners in the world to gather, exchange ideas, and present original research in their fields. Scientists and practitioners are invited to address the current research topics in the area or the research frontier at this unique international forum. Submissions from all areas of enterprise information systems/technology are invited. Prospective authors from AIS, ACM, IEEE, IFIP, and other societies with cross- disciplinary topics are welcome Topics of interest include, but are not limited to:

- Enterprise information systems' design, application, implementation, and impacts in a variety of sectors including manufacturing, service, healthcare, and government
- Enterprise information systems and e-logistics, global e-supply chain management, supplier relationship management (SRM), customer relationship management (CRM)
- Enterprise Resource Planning (ERP)
- Business process and workflow modeling, analysis, integration, monitoring, and management
- Enterprise modeling and integration, enterprise engineering
- Enterprise computing concepts for specific domains such as electronic and mobile commerce, vertical domains such as finance, telecommunications, automotive, aerospace, command and control, defense, healthcare, and government
- Inter-enterprise collaboration and virtual enterprises
- Enterprise architecture design and modeling, model-driven architecture (MDA), component-oriented architecture, service-oriented architecture (SOA), collaborative development and co-operative engineering
- Integration of (legacy) enterprise applications and information, integrated systems, e-factories, integrated manufacturing systems, industrial informatics
- Evolution and management of enterprise computing systems; future generation enterprise information systems
- Realization technologies for enterprise computing, including ontology and semantic web support, middleware standards and systems, such as CORBA and J2EE, modeling and description languages, such as XML, RDF, OWL, UML
- Enterprise computing tools
- Business intelligence and knowledge management in enterprise information systems
- Trust, security, and privacy issues in enterprise computing
- Quality assurance issues in enterprise computing
- Systems research, systems engineering and enterprise information systems
- Applications, case studies, and management issues

Submission Guidelines

1. Two types of submissions will be accepted: research papers and case studies.
   Research papers should describe original research that has not been accepted or submitted for publication elsewhere. *Case studies* should describe new insights gained from the application of enterprise information technology in practice. All papers must be in English and will be refereed.
4. Abstract submissions must be received by *April 23, 2007.*
5. Final paper submissions must be received by *May 20, 2007.*
6. Submissions will only be published in the conference proceedings if at least one of the authors attends the conference. CONFENIS 2007 proceedings will be published by Kluwer publisher. The selected best research papers will be considered for publishing in top-ranking information systems journals.

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