Preface

The SEFBIS Journal, the professional publication of the SEFBIS Community of John von Neumann Computer Society is published annually to serve a kind of publicity for researchers, trainers, practitioners working on business applications of ICT. The SEFBIS organization is a Forum, a special working group within the JvN CS, Hungary. Members are from many origins: universities, research institutes, smaller and larger businesses, doctoral programs and they diverge also in age group. Our mission is to disseminate knowledge and experiences around business applications and build a bridge between the business and the ICT community. We do believe that our activities, research papers, published case studies can support the development and operating of these socio-technical systems.

Millions of dollars are spent to ICT systems every day for planning, for deployment, for maintenance. Today more and more people –mainly responsible leaders– ask: where is the benefit of these applications? Does any quantifiable return on these large investments exist? Finally does IT really matter, when business competitiveness is the question? Answers are under investigation; a selection, the best English-language papers are found in this SEFBIS'2013 issue. Contributions are covering different, important areas like

- eBusiness solutions in Japan as a plenary presentation,
- new approach to information systems development as another plenary speech from Canada,
- planning and implementing ERP systems, especially at Hungarian enterprises,
- various business solutions utilizing ICT systems and architectures,
- solutions for the public sector in Austria, etc.

We do hope this issue will serve not only the contributors to disseminate research results but also will support development of young PhD students starting their research career. Conferences should always give floor to free chatting about new ideas, methods, working projects and besides the printed form after a blind-reviewing process gives a merit to authors in the worldwide scientific network.

The Conference program and abstracts of papers are also available at the website of the GIKOF/SEFBIS Community, the Special Interest Group of JvN CS: http://gikof.njszt.hu. That offers possibilities to contact the authors and their hosting institutes, research communities. Articles of the SEFBIS Journal are also referred at the EBSCO online scientific database.

Wishing you a useful reading of this issue,

Peter Dobay
Chair of the SEFBIS SIG of JvN CS

Retrospection to a Decade

The dynamic changes in economy, the ever-growing needs at the labor market, the increased ICT professionalism expectations require that the education of ICT professionals should fit continuously to the changed conditions, and also to the internal and international needs. The SEFBIS (Scientific and Educational Forum on Business Information Systems), the Special Interest Group of the John von Neumann Computer Society SIG of JvN CS) is a community of the ICT professionals interested in business applications. The members of SEFBIS are professionals from the field of research, education, information development and of those specialists who use the ICT results as a tool in their work. The participants of Forum meetings discuss the actual problems of BIS, namely they deal with new research results, solutions, they represent case studies, and also talk over the problems that are needed to solve. There are different aims: first to discuss the research results and experiences on BIS and secondly to form a bridge between the teachers responsible for training of ICT professionals, the developers and the users.

SEFBIS Forum that was founded in 2000 organized its conference already 10 times in 2013. The ISBIS (International Symposium on Business Information Systems) is not only a domestic forum, but invites professionals from all over the world. The experiences of the last decade prove that the program, the topics of the conferences with opportunity to meet personally are in focus of the colleagues, and the discussions about the relevant issues conduce to the cooperation and result more effective work of experts on BIS.

But let us stop for a moment, look back to the previous Decade, check our plans and performed programs, evaluate our results, make a summary in order to go ahead more successfully in the future! The conference in 2013 should be a milestone as we change our strategy. The host of the conference has been the Széchenyi University until now, the venue was Győr, the highly developed city in north part of Trans-Danubia. The Board of SEFBIS decided: the conference will migrate from the 2014, it will be organized yearly in another Hungarian city.

Venue	Number of Participants	Number of Presentations	Number of Sections, Round-table Meetings
2003	43	18	3+4
2004	57	25	4+1
2005 ISBIS	51	27	5
2006	49	22	6+1
2007	54	38	6
2009 ISBIS/OGIK + Confenis	100 22 countries.	78	3 parallel track 13 sections
2010 Pécs	58	45	8+2
2011	50	33	5
2012	56	29	5
2013	55	30	Plenary section + 4 sections +round-table meeting

We believe that the different venues can generate more interests in the event, and the differences stem from the always new hosts and places can make this conference series more interesting. To make an overview on our past conferences (see the table above) we can state that already the first conference was important for the professionals, and although with changing strength in number of participants and presentations these conferences produced a successful series. The figures in the table show not only the success of that series but they reflect also the continuous and stable need for

those events. Taking into consideration that not only the organization and performing work but also the professional tasks: reviewing the papers, composing the conference program, managing the discussions have been done by volunteer activity of the colleagues, we can be proud of our results!

Not to report on all conferences in details it is worth to highlight some of them!

After two successful conferences, the SEFBIS Board decided to extend the event to international field and invites colleagues from foreign countries. 2005 was the first Year when the Organizing Committee sent the Call for Paper for ISBIS conference: International Symposium on BIS. There was great interest on the event that was held in a very exclusive environment at the top of the hill in Hotel Conference in Győr. Although it was successful, we noticed that many of Hungarian colleagues kept back from the conference because the official language was English. This was a good lesson, and we learned that it is more useful in the future to declare the conferences as a two languages event: English and Hungarian.

In 2008 we applied to the IFIP [1] Enterprise Information System Technical Committee for the right of organizing the CONFENIS [2] 2009 International conference. This opportunity was a great acknowledgment for our Community! Seeing that to organize and manage such conference is not only a challenge but also responsibility, and it needs a lot of preparation work, the SEFBIS Board concentrated with all of its energy to that event. Consequently, the ISBIS'2008 conference was postponed to 2009 as a co-conference of Confenis. After a yearly hard work the program became very much successful, we had speakers from all continents, from altogether 22 countries. The foreign participants commended the conference, they noticed that there is a serious professional background in Hungary and that the IT specialists proceed their work on high value. Looking back to our conference series it was also a good decision to move the ISBIS'2010 conference to Pécs because this city became the Cultural Capital of Europe in that Year.

The conferences are not only excellent forums for the professionals and IT specialists but it is a good opportunity for the young people especially for PhD students for introducing themselves and to discuss their research results. The support of young professionals is a very important mission of the SEFBIS SIG; we organize forums regularly for them and we award the best works.

This Jubilee is a good chance to thank all the institutes, businesses and last but not least the many volunteer colleagues who did a lot for resulting our aims and efforts efficient. Let's list the most active supporting institutes!

- Board of John von Neumann Computer Society,
- Members of SEFBIS Forum and the County Frame Győr-Moson Sopron in JvN CS,
- BIS Departments of Széchenyi University, Budapest Corvinus University, Pécs University of Sciences,
- Foundations Alexander and Cultura Oeconomia,
- Corvinno Technological Transfer Centre.

We believe that all the activity, the conferences, the events organized, the SEFBIS/GIKOF Journals published by SEFBIS SIG are needed also in the future in order to make the professionals in BIS and even the results acknowledged not only by the users but also by the IT specialists who are working in many other fields of ICT!

Mária Raffai
Former Chair of SEFBIS during 10 Years
Chief Editor of SEFBIS Journal

[1] IFIP: International Federation on Information Processing (www.ifip.org)
[2] CONFENIS: International Conference on Research and Practical Issues of Enterprise Information Systems

Report on the 10th Jubilee ISBIS/OGIK Conference Győr, 8-9th of November, 2013

PÉTER DOBAY

Aims and form of the annual professional Conference of the SEFBIS (Scientific and Educational Forum for Business Information Systems), the Special Interest Group of NJSzT are followed our traditions and opened towards new solutions. For some years we have tried to re-format the conference, like organizing a full-English conference (ISBIS'2005; with less participants), or co-organizing with an international community (IFIP CONFENIS' 2009) and also we tried to „Go to countryside" (to Pécs in 2010, with nearly 80 participants). In Spring, 2013 we declared the usual scope in the Call-for Papers: new research results, business ICT applications and achievements of PhD students, and, especially, the results of the EU-sponsored 2-3 years long TAMOP projects. With this latest topic we could generate three special sessions with participants from Pannon University (Veszprém), University of Pécs and from the Budapest Corvinus University. The Program Committee got more than 40 papers. After a double-blind review process the members of the PC have accepted 30 articles for the Presenting at the Jubilee Conference.

On 8th of November the Conference was opened by MARIA RAFFAI, Chair of Program Committee who addressed a welcome and a remembering speech to approximately 40 participants. She expressed gratitude to volunteers of GIKOF/SEFBIS whose efforts had made it possible to organize the former conferences and to publish our special Journal both in Hungarian and in English. She summarized the introducing of this new research and application field to higher education and doctoral schools as a main result of GIKOF SIG. FERENC ERDŐS greeted the participants on behalf of the hosting Széchenyi University, then ISTVÁN ALFÖLDI, general director of the John von Neumann Computer Society expressed his tribute to the continuous work of GIKOF/SEFBIS wishing a successful another decade of activity.

We could enjoy plenary lectures on both days of the Conference: our distinguished guest from Japan, Professor UCHIKI TETSUYA opened the first section with a lecture titled „*The Features of Information Systems as Word-Of-Mouth Activities at the E-commerce Sites in Japan*". The research focused differences of webpresence of Japanese and Chinese elite restaurants with analyzing texts and other comments of special forums and blogs. ZOLTAN SZABÓ and PÉTER FEHÉR (BCE) presented a widespreading survey on ICT applications of Hungarian enterprises (*A Hope – Analysing Enterprise IT Practices in Hungary*). Results showed a bitter pill: 39% do not raise ICT spending, operation costs reach 50-60% instead development, rate of outsourcing is slowing and appr. 44% have no any plans to recruit new staff. a message from the post-crisis period: 16% of Hungarian companies have no plans for new ICT investment.

The central topic at the Conference appeared in two sections „Business Solutions I. – II." as follows:

- Kia, Farhad – Gábor, Jeney –János, Levendovszky: "Minimum Probability of Loss Trading Strategy for Mean Reverting Portfolios"

- Attila Horváth: "Unclouded Security – Security Aspects of Cloud Service Providers"
- László, Duma – András, Nemeslaki: "ICT Driven Urban Mining: Technology Innovation and Social Construction of Aluminum Recycling in Hungary"
- Katalin, Hartung: "Carbon Dynamics Simulation. Ever Going to Stop Increasing?"

Before lunchtime Erzsébet Csibe, regional representative of Pearson Editing Ltd. welcomed the Conference and offered some books as gift for young presenters. Afternoon we continued presentations on Business Applications:

- F. Kiss – A. Caplinskas – G. Dzemyda – A. Lupeikiene.: „New Directions on Simulation-Based Decision Making for Production –PEN Model"
- Péter, Kristóf: „Operating Strategy and Technology Innovation at IT STartups"
- Péter, Fehér: „Practicing IT-Controlling at Hungarian Companies"
- Viktor, Nagy: „ERP and Quality Management"
- Krisztián, Eretnek – Botond, Bertók: „Optimizing Transactions of an e-Payment Provider Using P-Graph Solver"
- Gábor, Kusper: „Digital Ownership and the Active Databank"
- Ádám Horváth – Katalin, Hartung: „Challenges to EU Critical Infrastructures"

Thanks to researchers of Pannon University (Veszprém) and Széchenyi University (Győr) we could have a robust „Industrial Application" section:

- Márton, Frits Márton – Botond, Bertók: „Time-Constraint Process Synthesis to Solve Scheduling Problems"
- Zsolt, Kosztyán T.: „Cost- and Time-Saving Procedures with Matrix – Project Planning for Maintenance"
- Anikó Németh – Zsolt, Kosztyán T.: „Lean Project Planning for Maintenance Processes"
- Ferenc, Erdős: „Using the TAM-modell for Special IT Investments"
- Viktor, Spilák – Zsolt, Kosztyán T.: „Effect of Organizational Culture and Leadership Style to Information Security Level"

The section of Business Information Systems had a mixed portfolio:

- András, Nemeslaki: „Higher Education in Public Information Systems"
- Bálint, Molnár: „*Big Data and NoSQL"*
- Anna, Medve – Attila, Magyar – Katalin, Tömördi: „Objective-Oriented Modelling of Business Processes"
- Marianna, Török: „Challenges and Trends in IT-Supported Knowledge Management""
- Roland, Schmuck: „*Online Business Models"*

The first day was closed with Ferenc KISS'S presentation about the PRAXIS "marketplace" portal supporting university-industry relations with a practical placement database.

The second day started with a plenary speech of Professor BOB TRAVICA (University of Manitoba, Canada), „From Diamonds to Skyfall: Reframing Technology to Augment Mind and Organization". He explained new aspects of organizational solutions of information systems. Following Professor A. Min Tjoa (Technische Universität Wien) had an interesting lecture on using public, city-based databases („Open government data") for complex knowledge mining. The day continued with introducing research work of two university-based projects:

a/ Lectures based on TÁMOP-4.2.2.C-11/1/KONV-2012-0005, University of Pécs, "Well-being in the Information Society" used complex text-mining methods for different applications:

- Balázs, Kovács: „Events Based Price Estimation Using Textmining of News Portals"
- Gallusz, Abaligeti: „Solving Cash-flow Matching with Open-Source Tools"
- Ferenc, Kruzslicz: „Duo-mining of Texts – Analysing Educational Requirements"
- Miklós, Hornyák: „A New Type Innovation Paradigm: The MeeGo Case"

b/ The project of the Budapest Corvinus University (Doctoral School on Business Information Systems) presented research results as:

- Dóra, Őri: „Analysing Enterprise Architecture Models to Detect Misalignment Symptoms"
- András, Gábor – Andrea, Kő– Katalon, Ternai: „Semantic Business Process Management – Challenges and Opportunities in Compliance Checking"

- Gabriella, Baksa-Haskó: „Teaching Informatics in Business Higher Education"
- László, Halmi: „Data-based Decisions in Healthcare, Optimizing Preventive Activities"
- Attila, Forgács – László, Mohácsi: „Business Calculations with Parallel Processing"

Closing the Conference Péter DOBAY (PTE) and András GÁBOR (BCE) reported workings and the result of an EU project named TÁMOP 4.1.3. The program aimed re-newing competence-based teaching and learning requirements. The Hungarian government accepted this EU-initiative in 2012 and according to this program practically all higher education accreditation processes would have to be reformatted in content and in form, too, by 2015. The SEFBIS community had good comments on how the ICT graduate and post-graduate programs could be changed to fulfil new requirements.

Reframing Information and Communication Technologies to augment Mind and Organization

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ABSTRACT

In North America, information/communication technologies (ICT) have come a long way from high appreciation to being considered everyday commodity. Although ICT has become widely spread and indispensable, it is hard to see them in aggregate productivity statistics or as precious competitive weapons. Challenges of managing ICT have proliferated in organizations and in other contexts. Practical problems are complemented by the difficulties that challenge the disciplines focused on investigating and managing ICT, such as Management Information Systems (MIS). It is argued that deep theoretical problems of these disciplines refer to missing to establish a clear research area and technical vocabulary. Assuming that the academic and practical need for the systems disciplines is still extant, the argument suggests that advancing their theoretical grounding can improve their contribution to investigating and managing ICT. The Informing View of Organization (IVO) is proposed as a venue for such advancing. Interdisciplinary based, IVO modifies some fundamental system concepts and introduces a new perspective for viewing organization. Main IVO aspects and their implications for research and management are presented.

Historical Trajectory

Computer-based information and communication technologies (ICT) have come a long way in North America that for the most part has been on the lead in computing trends. From the military and federal government sectors in the 1950s, ICT spread to business (1960s), local governments and universities (1970s), and to schools and homes (1980s). All along the way, ICT have been viewed as the symbol and instrument of progress. Governments promoted paper reduction policies, data processing units emerged in companies, new executive management roles surfaced (Chief Information Officer, Chief Technology Officer), consultants touted ICT as "strategic weapon," and public discourse embraced ideas of "information age." Continually, the computer software and hardware industry was releasing new products, covering yet more of functional areas inside and outside organizations. The era of relentless progress and its enthusiastic believers culminated with the global expansion of mobile telephony and the Internet by the end of the last millennium. Technological trends bred electronic metamorphoses across various walks of life: eCommerce, eGovernment, eLearning, eEverything… Electronic markets and supply chains propelled national economies toward the globalization by the end of the 20th century.

Many countries at that time, including Hungary, were engaged in major economic and social transformations. Since beliefs in computer-driven progress had also been globalized, national governments rushed in creating policies on ICT-readiness. But the faith was already undermined at the center. An argument that computers did not contribute to the office work productivity was paired with placing ICT in line with everyday commodities available in consumer markets. Evidence on practical challenges surrounding ICT management was growing. It included the failures in adopting enterprise resource planning systems, investment strain companies had to carry in sustaining technological progress, poor design of information systems (IS) alienating users, losses due to systems' downtime and security breaches, big scale corporate frauds relying on systematic falsifying of accounting data, erosion of employee and customer privacy, and disturbances in global economy caused by non-regulated, international, electronic trading of financial instruments. The initial undermining of faith in ICT has spread elsewhere. ICT have not been associated with rescue strategies in recent frequent and prolonged recessions. Rather, economic troubles have prompted further reduction of ICT expenditures, as managers keep treating ICT as a cost rather than profit center.

Although many MIS scholars see ICT as the cornerstone of the field, many of these challenges have rather been sidetracked in the mainstream MIS research. Typically, interests of the discipline follow the development of products created by the ICT industry, which are greeted with overwhelming enthusiasm. Rather than having its own research agenda shaped through interaction between theoretical and practical drivers, MIS has kept chasing "a silver bullet." Zeal for new technology is not bad in itself. However, such zeal impedes proper research if it is not balanced with cost concerns (as those discussed above). Research without stable agenda suffers attention deficit that discards viable research topics just because a new technology surfaces (or for that matter, it has not surfaced yet). Theoretically, zealous chasing of "the next big thing" leaves no time for securing theoretical foundations of the field, as the following discussion will show.

In summary, ICT have achieved a broad applicability in nearly all walks of life and have been treated as an indicator and engine of economic and social progress, first in North America and then internationally. However, practical challenges to ICT amounted over time, eroding the old glory.

Theoretical Problems in MIS

The overwhelming focus on new ICT, which characterizes the mainstream MIS in North America, has forestalled defining the fundamental vocabulary of the field in clear and ontologically inspiring terms. Instead, the field has rested on simplified conceptualizaitons of information, human user, use context, and—paradoxically—even of ICT. Let us start with ICT.

In spite of the overwhelming concentration on ICT, this allegedly core phenomenon has usually been subjected to a black box approach. ICT have rarely been conceptualized in specific terms, differentiated from IS, or investigated analytically (e.g., user interface vs. particular functions). Typically, rich conceptualizing is supplanted by sheer naming (e.g., ERP system, e-exchange, Facebook), and analytical operationalizing gives way to proxy measures (e.g., ICT investment, ICT usage). This overly abstract level of analysis has been criticized by some authors calling for a deeper theorizing of technology.

Any theorizing has ontology roots, even if implicit and metaphorical in character, as is the case with the silver bullet metaphor. (The term "ontology" belongs to the standard philosophical vocabulary and is unrelated to its current uses in computing, such as in "Web ontology.") ICT is usually viewed as nearly a magical force making inherent impacts on individuals and social contexts. Intricacies of such an impact are neglected. For the authors who do acknowledge informing impacts, however, ICT are the direct source of information (or of information, knowledge and data altogether). But the magical character is still implied because intricacies of the cognitive work on human side are bypassed. A pragmatic metaphor for this approach can be that of kitchen faucet: the faucet "provides" information (data, knowledge) when the user opens it—more or

less, as needed—in order to "get information" [9]. Intricate details of the faucet itself, the content provided, and of its reception by the human actor do remain outside the picture.

Which notions of information are behind the simplified approach to ICT? The notions are not much advanced beyond administrative lingo and everyday talk. Nowadays, the term "information" is used and overused for labeling any symbolic content created, recorded, or communicated. Most of contemporary languages are capable of signifying different symbolic contents precisely (e.g., question, answer, advice, help, instruction, description, explanation, customer address, sales figures, purchasing order, etc.) or generally (details, documentation, records). However, "information provider" of today usually surrenders to the lazy man's choice and stamps "information" over any and all of these. This situation has been characterized as "infomantra," which one can confront with the INIS principle—"It's Not Information, Stupid!" [7]. INIS exposes communication problems in the infomantra discourse:

- The client may not know what the "provider" implies under "information," and
- the assumed information may not inform whatsoever, thereby canceling its own defining characteristic.

MIS has not been spared of the infomantra. Some scholars have tried to differentiate between data and information by using the notions of organization and meaningfulness. Information is assumed to be higher on both criteria than data. However, these criteria have never been formalized and therefore arbitrary choices supplanted scientific scrutiny. In addition, the notion of meaningfulness has never been pinned to the client, where it naturally belongs. Rather, the "provider" assesses the meaningfulness, after which the client finally comes to act by "interpreting information" to understand its meaning. The relationship between assumed "meaningfulness" and the final meaning has not been theorized either. Ultimately, MIS has missed the opportunity to overcome common, ambiguous conceptualizations of information.

The reified ontology of information frames this essentially cognitive phenomenon as a physical object under absolute control of the "information provider." Information ontology has to do with ontology of the ICT user. Deeper analysis of the literature reveals a tacit assumption of *lean human agency*—one that is deprived of cognitive and action capabilities [9]. As the user's role is reduced to a mere "reception" of the "information provided," it follows that perception, knowledge and other cognitive entities and processes are out of the research scope. Action aspects are equally marginalized (with exceptions one can detect in research on group support systems). Overall, such a user resembles the passive consumer featuring in models of consumerism.

Finally, the organizational context has been addressed in MIS research at various levels (group, firm, community). But a clear, broader research agenda suitable to the IS perspective, which would create guidance for inclusion/exclusion of behavioural and social aspects of investigation, is missing. Instead, fashion, arbitrariness, and convenience have prevailed. Correlational methodology, coupled with proxy measurement of ICT, has additionally reduced the value of research results. An example is the practice of making causal claims about ICT impacts on organization based on non-parametric correlations between cultural or structural dimensions and proxy measures of ICT.

The lack of distinct theoretical vocabulary is consistent with a loosely defined subject area. In particular, MIS has never differentiated itself decisively from parent disciplines, such as accounting information systems, computer science, and decision sciences. Some MIS programs have followed a technological path and taught subjects close to applied computer science. The latest step in this direction is so called design science. Others have focused their teaching and research more on management and behavioural aspects. More often than not, the coverage of management and behavioural issues has usually varied with interests of individual researchers.

Theory problems of MIS congregate in the fact that no major theory has been generated and that the field's recognition in other management disciplines and applied management is below expecta-

tions. Some authors in the MIS community have addressed the challenges [cf. 4]. A notable step was a discussion about research rigor vs. relevance. Briefly, if raising research rigor was time-consuming (length of empirical research, time for the review preceding publication of results), how could the time expenses be reconciled with a need to promptly respond to contemporary problems in practice? It appears that a tacit assumption of securing quality academic research via methodological rigor clouded an equally important question of increasing rigor regarding the subject area and vocabulary. The debate subsided without clear resolutions, giving way to isolated calls for identifying foundation, and leaving various clients of MIS unsatisfied [3].

In summary, theoretical challenges to MIS and similar academic areas refer to a lack of distinct theoretical vocabulary and lean ontology pertaining to concepts of ICT, user, information, data, and knowledge. The subject area is loosely defined and recognition in other management disciplines and practicing management is below expectations.

Coping with Problems

A premise behind this discussion is that there is a legitimate academic area for IS-focused research. Not only are computers everywhere and will be in the foreseeable future (technology evolution implying), but their deployment in social contexts necessitates focused research attention that delivers results relevant for both social science and social practice. However, a change addressing the demonstrated weaknesses is required. The informing View of organization (IVO) will be presented as a step in a change process [9]. As indicated in Figure 1, the nexus of the framework features *informing agents*. Informing agents are technological and cognitive in character. The technological agents refer to ICT. The cognitive agents refer to data, meaning (as a synonym or substitute for the term "information"), knowledge, and wisdom. IVO presumes that these "hard" and "soft" agents are equally important for research. Informing agents are inextricably connected with human mind and the social context. Moreover, they make a difference in cognizing and in behaviour of people as well as in the organizational context.

The innermost orbit belongs to IS issues that are usually studied in the MIS field. IS are situated in the organizational context that is slanted toward the IS perspective, which is presented in the second inner orbit. These can be understood as the intersection between traditional organizational aspects (structure, culture, politics, process) and informing agents. Resulting aspect are informing structure (or infostructure, for short), informing culture (infoculture) and so on. The term "informing" signifies the involvement of informing agents.

Figure 1. The Informing View of Organization Framework [Travica, 2014]

IVO advances defining of knowledge, ICT, data, information and of their relationships, based on ideas from different literatures. Data are symbols created for communication purposes (numbers, letters, images), and they can exist in various states of organization (word, sentence, table, sorted list, graph, report, book, Web site pages, etc.). The role of IS is to organize and transform data. Data become information or meaning when they are processed in human mind by knowledge in one's memory (or wisdom, which may involve ad hoc reasoning with no much reliance on previous knowledge). To be sure, knowledge is active even before meaning is inferred because it drives one's perception since it filters the data intake. This data

intake and interpretation to meaning is the basic informing process. It can be represented as follows:

Data → IS [Organizes & processes data] → User [Perceives data, interprets it by knowledge, & infers Meaning/Information.

Note that this conceptualization is congruent with Langefors's (1966/1973, [5]) formula: I = i(D K t), where I=information, i=data interpretation process, D=data, K=knowledge, and t=interpretation time.It follows from these assumptions that information is a cognitive phenomenon, not an external thing that can be "provided" or "gotten." Meaning inferred (or information learned) impacts on knowledge (adds to it, modifies it, erases). Consequences of these definitions are manifold. For instance, no information/meaning can be created without knowledge; only data can be externally provided and they remain data if relevant knowledge is missing on the client side; a difference in knowledge causes different information inferred.

It is apparent form this discussion that IVO conceives the user as active human agency whose knowledge plays a key role in informing. Put another way, IVO shifts user ontology from lean agency to rich agency. Cognitive aspects obtain a prominent role. Based on the literatures of cognitive psychology, behavioural decision making, individual psychology and theory of learning, IVO conceives the user as a cognitive microcosm. The term *homo informaticus* is supposed to mark this particular side of human nature, as discussed below.

IVO further eliminates ambiguities discussed above by differentiating between ICT (note the plural form) and IS. The same kind of ICT (e.g., operating system as part of systems software) can participate in different IS. The perspective of IS supplies a more analytical look with consequences for IS use and management. Following the tradition of systems analysis and design, user interface is differentiated from system functionality; data at the entry, storage, processing and output steps are considered the core of an IS; and procedures of handling system parts are also a part of an IS. Each of these analytical aspects warrants a particular attention when it comes to system design, adoption, use, and management. The usual abstract approach fails to detect differing effects pertaining to different system parts. For example, users may exhibit stronger adoption attitudes for system outputs than for user interface. Such a finding has important management implications that may be buried in abstract investigations of ICT acceptance.

Organization, the final core concept in IVO, is conceived at the intersection of informing agents and organizational aspects. This is the orbit of genuine IVO aspects presented in Figure 1. There is mutual influence between IVO aspects and organizational aspects. For instance, infoculture is shaped by larger organizational; an example is cultural beliefs and practices of a gradual approach to adopting innovations in an organization. These characteristics can mold relevant beliefs and behaviours toward innovation of IS, which pertain to the domain of infoculture. But it may also happen that changes in infoculture, which coincide with a new IS, make an impact on organizational culture. An example is extending organizational communication in time and space via mobile telephones (infoculture) that modifies assumptions about the separation between business and private spheres (organizational culture). Since IVO aspects present both organization and system related phenomena, it follows that investigating IVO aspects can be more relevant than merely correlating ICT measures with organizational dimensions (or juxtaposing ICT and organization in qualitative research).

The following discussion will address each IVO aspect. One should note that these build on a considerable literature, which will not be listed here due to space limitations. The interested reader may find it in [9].

Homo Informaticus

The term "homo informaticus" is intended to associate to other prominent philosophical views of human agency, such as homo economicus, homo politicus, and homo symbolicus. Homo informaticus has significant capabilities and certain limitations. In particular, the scope if homo informaticus consists of the cognitive processes of perceiving, thinking, feeling, learning and memorizing, along with the corresponding phenomena of percept, thought, emotion, and memory that is the seat of cognitive information agents (knowledge, meaning, and

wisdom). This rich human agency masters knowledge and infers meaning from data, rather than being a passive receiver/consumer. The user actively approaches an IS by continuously evaluating it. Interaction with IS brings to the fore the user's perception, knowledge-driven processing of data, and task-focused thinking processes.

This apparently more complex approach puts IS designers and managers before harder tests. The laconic "information provision" is no longer a credible option since meaning (information) emerges via intricate processes on the human side when the human interacts with IS. The business value of IS now depends on the effects on the user side rather than on vendor's or manager's assumptions. Finally, it is important to note that homo informaticus implies broader ontological horizons, beyond technology imperative and even socio-technical approach. For example, cognitive ontology that IVO devised on a relevant literature [e.g., 10] can yield insights into opaque facets of IS adoption and use in the cases of strong affective arousal. An example is interacting with an IS that is too complex to comprehend, when the user compensates for ambiguity by constructing a mental model of the system's workings (with possibly varying success). The user's behaviour is further shaped by the mental model rather than the physical system.

Groupomatics

Groupomatics is the segment of IVO that moves attention to group cognition. Building on IS and small group research, IVO charts a larger picture featuring group brainstorming, problem solving, transactive memory, and group mind. This shift from investigating fashionable behavioural dimensions in conjunction with group support systems sharpens the focus on phenomena that are directly relevant to the IS perspective. Indeed, research on trust (one of recently fashionable topics) in the context of distributed group system supported teams consistently finds that trust attitudes are indifferent of IS use. The group context invites various ontologies of IS, from technological imperative (as in studies of brainstorming), to socio-technical (studies of group decision support system appropriation and of facilitation during system use). Web-based group support systems with mobile devices map a new frontier in groupomatics research.

Infostructure

Infostructure is the IVO aspect that refers to stable relationships between data segments and the arrangements of ICT, which both complement social structure. This part of IVO adjusts theory of organization structure to IS interest. IVO introduces several dimensions of infostructure, such as infohierarchy (hierarchical access to data and ICT), infocentralization (the degree of centralizing decisions about this access), infoformalization, and few others. The infostructure approach helps to explain the role of IS in creation, maintenance, and change of social structure. Hierarchy or centralization starts by assigning the access privileges to a new IS in an enterprise. Social structure rests on once defined infostructure, and its change begins with modifications in infostructure. While this has always been the case, today it is true more than ever because of a high dependence of organizations on various IS.

Infoculture

Infoculture refers to stable beliefs, behaviours, and artifacts related to informing agents. An example is the assumptions about the role of IS; for instance, IS should serve business vs. IS should move business. Another example is standard practices of managing business documents; for instance, in one company the representations of newly created professional knowledge are created regularly and based on clear codification rules, while another company does not maintain such knowledge practices. Drawing on a sizeable literature in conceptualizing infoculture, IVO has made several contributions. One is that the idealistic aspects of culture (beliefs) and the materialistic aspects (behaviours, and artifacts) are brought into balance. In contrast, the mainstream research on the relationship between IS and organizational culture has typically emphasized the idealistic side. The advantage of the IVO adaptation is in including the *practices* related to IS into the scope of research as. These practices are constitutive of primary reality in organizations and thus relevant from the management perspective.

The second contribution of the infoculture approach is that it accounts for the level of ICT in an organization. For example, a highly automated management of documents represents a different infoculture than the one in which computer-based IS are mixed with paper-based techniques. Differences between these infocultures surface in organizational processes and performance. Furthermore, IVO supplies research tools for studying infoculture [8], [9]. Overall, the infoculture approach helps to part with the oft-used approach of correlating characteristics of an IS with dimensions of a national culture, and to advance research toward a perspective more germane to IS.

Infopolitics

Infopolitics is the next IVO segment which captures an intersection between informing agents and the political side of organization. Infopolitics is founded on inspiring leads from the IS literature, resource view of power that originated in organization theory, and structuration theory [1], [2]. Infopolitics refers to social power, agendas, and fight/flight behaviours related to informing agents. Examples are the control of access to databases, management of meaning by manipulating reported data, and fights between groups in organizations over IS design. IVO presumes that informing agents are as important sources of power as physical and financial assets. Particularly important is infopower, a special case of social power. One of infopower forms is knowledge-based power, which has been known for long in organization theory. IVO broadens theorizing of power related to knowledge and other informing agents by deploying structuration theory.

Giddens's [1], [2] structuration theory is premised on unifying opposed philosophies of structure and action. The former focuses on forces of status quo that constrain, while the latter concentrates on forces of change that procreate new social realities. Structuration theory seeks a reconciliation of these philosophies. Although Giddens's theory did not address IS, some IS scholars deployed it in research. IVO extend those attempts. According to the structural view, IS can be viewed as a complement to an institutional setting that channels users' behaviour. Contrary, the action view suggests that IS are shaped by user action. Invoking structuration theory in order to overcome this dualism, informing agents can be framed as *allocative resources*.

When Subject A allocates certain informing agents, A engages in action and (in Giddens's terms) exercises *autonomy*. A's action results in reproduction of structure by confirming A's power and the institutional baggage embedded in the resources. Therefore, A's autonomy appears as *domination* on the side of Subject B that depends on the resources. When accepting the resources, B also engages in action. The acceptance can range from total to none (and seeking of alternatives). Between these extremes, B may also take on procreative action that modifies intended uses of the resources. The scope of B's acceptance determines the extent to which social structure or domination materializes. Therefore, the dominated Subject B also exercises certain autonomy, which creates dependence on A's side. This dialectical reasoning complies with the view of user as homo informaticus (rich agency) and yields broad prospects for study of infopolitics in the IS life cycle or in knowledge management.

Infoprocesses

In recent years, the process view of organization and management has evolved through several approaches, such as business process reengineering, business process management, and quality management methodologies (lean, value stream mapping, etc.). In the IS area, the process approach has been associated with the change management coinciding with system adoption and use and with enterprise resource planning systems. Although process thinking fits with any type of IS, this natural connection between process and system thinking has not been exploited up to its full potential. IVO expands applications of the process approach by introducing the concept of infoprocesses.

The infoprocess concept involves three levels of analysis (Figure 2.). One is the data level that refers to entry, storage, and transformation steps through which business data are moved as the corresponding business process unfolds. This is the traditional area of interest in system analysis and design. The other two levels of infoprocess analysis have already been touched on. As

Figure 2 shows, the top level belongs to processes of individual cognition (e.g., learning resulting in knowledge). The middle layer belongs to the mediator between cognitive processes and data processes—the pervasive, continuously running process of converting data to meaning.

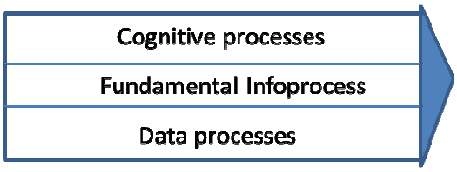

Figure 2. Levels of infoprocess analysis

The infoprocess approach defines the area of larger businesses processes pertaining directly to the IS perspective. Within the IVO framework, infoprocess has the role of connective tissue as depicted in Figure 3. One can assess infoprocesses in terms of design and performance ([9]). Understanding these aspects is a condition for understanding organizational performance, as indicated in Figure 3 and discussed below in connection with infoeconomics. The infoprocess perspective is also crucial in understanding organizational designs and in particular innovative ones, such as the virtual organization and mobile enterprise.

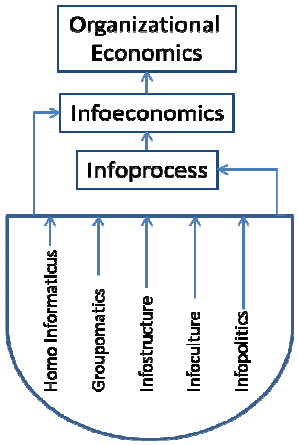

Figure 3. Infoprocess and other IVO aspects

Infoeconomics

Infoeconomics, the last IVO aspect, refers to costs, benefits, and other aspects of informing agents related to organizational economics or performance. An example of costs is accounting for informing costs, which can be broken down to times for knowledge recall and for interpretation of data, plus technology cost. An example of benefits is the speeding up of an infoprocess with help of IS, which reduces process costs and consequently the cost rubric in the balance sheet. The perspective of infoeconomics advances the inquiry into the economic value of IS and the aforementioned controversies. The infoprocess stance serves as a prominent mirror of infoeconomics and organizational economics (Figure 3). A well-optimized infoprocess at the data level keeps the cycle time and cost on the benchmark and delivers customer value (quality, utility/price ratios, delivery time, and so on). Other IVO aspects also make infoeconomic difference by affecting infoprocesses and infoeconomics. An example from the area of infopolitics is the inverse relationship between the struggle over knowledge on one side, and the efficiency of decision making processes and profit ratios, on the other [6].

A more detailed discussion on the relationships between IVO aspects from the research and management angles appears elsewhere [9]. It should be noted in the concluding remark that IVO suits qualitative and possibly quantitative research with explanatory and theory building outcomes. In addition, IVO equips managers and professionals with potent lenses for understanding IS, in particular, and informing agents, in general.

Summary

In North America, ICT have evolved from an indicator and engine of economic and social progress to broad applicability that is paired with questioning of ICT contributions to productivity and strategy gains. Theoretical challenges complicate the picture: MIS and similar academic areas are lacking a genuine theoretical vocabulary and a more resourceful ontology of ICT, user, information, data, and knowledge. The field's subject area remains loosely defined and its academic recognition is questionable. While omnipresence of IS necessitates IS-focused academic research that is theoretically and practically relevant, the MIS field needs to overcome demonstrated weaknesses. IVO (Informing View of Organization) is a framework in-

spired by interdisciplinary ideas and intended to contribute to that end. By broadening ontological horizons, IVO advances the formalization of core concepts and their relationships. The concept of homo informaticus represents progress from a user-passive consumer to rich agency of user as knowledge holder and system evaluator. IVO aspects of infoprocesses, infoculture, infoeconomics and others help to explain and manage organizational performance. Overall, IVO should serve for advancing research and management of IS, or research and management of organization from the IS perspective.

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Carbon dynamics: Ever going to stop increasing?

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ABSTRACT

The purpose of the study was to mimic carbon dynamics in the atmosphere and to simulate the change of carbon under different versions of the base model. The simulation contains namely three stocks the CO_2 in atmosphere, - in biosphere and - emission from fossil fuels. The assumption is that ocean carbon uptake and outflow cannot be directly influenced by policy makers. There are factors influencing carbon in- and outflow which are the rate of respiration, the decomposition, the area of forests, the net primary production, the deforestation, the assumed growth rate of fossil fuel demand and the saturation of consumption. The study unveils the dynamic of this process by applying system thinking and uses AnyLogic 6.9.0 version software for modelling system dynamics. The model originally elaborated by Hartmut [6]. The software facilitates to forecast the change of carbon if fossil fuel consumption will saturate and if deforestation will be stopped. The overall aim was to create a simulation to see the sensitivity of the ecosystem and try to eliminate climate change due to the escalation of carbon. The results of this analysis can be used to identify the necessary changes to stop carbon growth in the atmosphere. The anticipated outcome of this simulation is to set up the original model and to create three versions of the base model. The findings may be useful for decision makers in the field of sustainability, biomass power plants operators or for energy and environment strategy managers.

Introduction

Carbon dioxide is considered to be the most relevant influential factor for global warming and climate change which resulted from human activities. The concentration of carbon dioxide in the atmosphere is rapidly increasing year by year, past year average increase was 2 ppm/yr (parts per million per year). Currently the CO_2 level was 395.15 ppm in august 2013 [13, 16]. If the growth dynamic do not change or develop more dynamically, the world is going to face serious consequences as 50 million years back when the earth was ice-free until the CO_2 level dropped below 450 ppm. The safety limit of the carbon concentration in the atmosphere is 350 ppm. If we exceed the level 450-500 ppm that would induce significant stress on our biodiversity, lead to the extinction of several species, global warming, change the global ecosystem and increase the number of natural hazards. Unfortunately 350 ppm was already exceeded in the year of 1988 [5, 14]. The process is only reversible by prompt policy changes.

It has been proved that the increase of carbon dioxide in the atmosphere was in the same speed with the combustion and use of fossil fuel energies starting from the industrialization. Also the beginning of the industrial sized deforestation in 1970 has triggered the increased carbon dioxide concentration in the air. Forest is one of the largest carbon sink, along with the atmosphere and ocean. Any change or disruption in the system will reduce the size of the carbon sinks. Consequently if the use of traditional source of energies and deforestation is not going to be eliminated, then the options for mitigating probable climate change is limited [3,7,9].

Before policy making one should understand that ecosystem is a highly complex system where each individual part is in relation with the whole complexity. It is not possible to change an element without measuring its impact and observe its consequences. A system is defined by Meadows [12 pp.188] as “an interconnected set of elements that is coherently organized in a way that achieves something (function or purpose)”. A behaviour of a system can be predicted by knowing the elements

of the system. Interconnection between each element is responsible to supply the necessary information which is determined by the general function of the system. Function is a higher level state which has a dramatic affect when being modified. Therefore model creation facilitates the process to observe system behaviour over time with the help of graphs. Modeling system behaviour will help us understand whether the system is approaching a goal or a limit, and see the dynamic of the process [12].

The first section is going to guide the reader through the verbal model that is going to explain the details and content of the base model including parameters and applied data. The second section is introducing three different versions of the base model and interpreting the findings. The third section will follow with recommendations from an economic perspective and see the financial consequences of the current.

Model Description

Hartmut [6 pp.346, 7] findings have provided the basis for our simulation. In the original model the author was trying to model the CO_2 dynamics in the atmosphere after 1850 when the equilibrium state was being disturbed. The added value beyond regenerating Hartmut model is to extend it with different versions assuming optimistic and pessimistic situations by modifying or adding new parameters and find an ideal path to stabilize carbon dioxide concentration. During model development AnyLogic software was used which required the exact definition of equations and data. Hence a thorough and critical review of the base model had to be conducted.

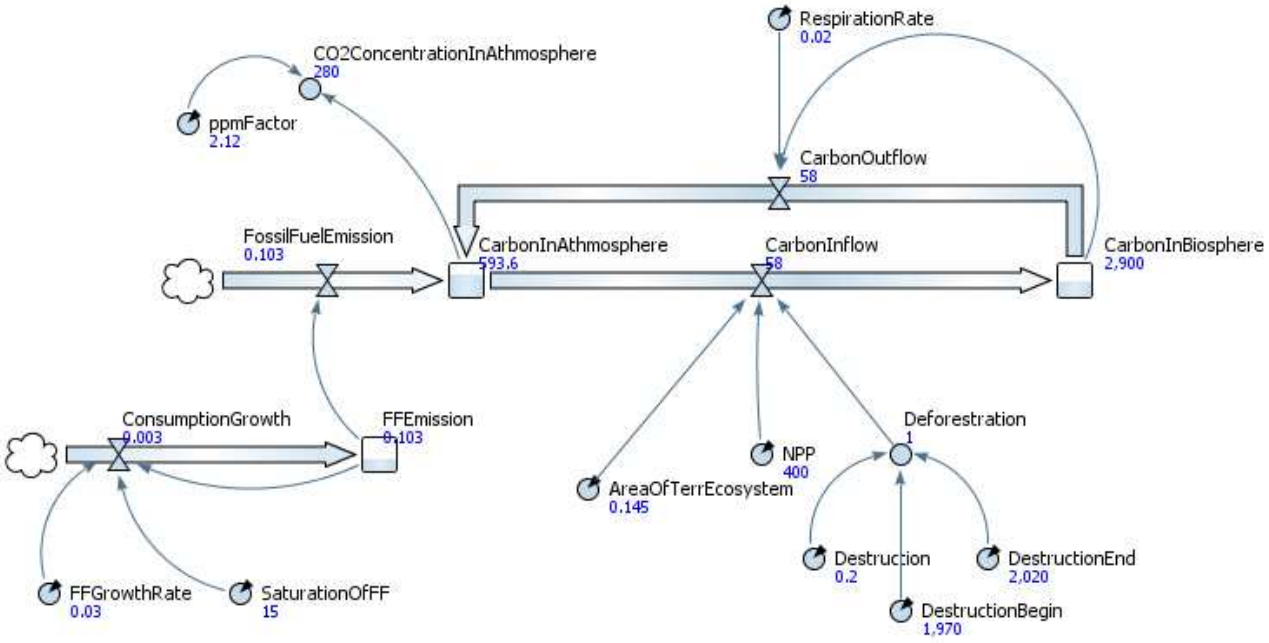

Figure 1. Base model interpreting carbon dynamics at the first stage of model development

The model contains two main carbon stocks. Namely one stock represents carbon level in the atmosphere and the other stock represents the carbon in biosphere (See Figure 1.). These two stocks are interrelated, both are influencing one another. There will be parameters effecting and determining this relation, so called the flow of carbon uptake and intake. It is known that humanity's carbon dioxide is being sequestered by three sinks: the atmosphere (50%), the biosphere (26%) and the ocean (24%) [4, 9]. The original model made by Hartmut [6] has neglected carbon intake by the ocean to simplify the model and he assumed it is a relatively small amount. The model will disregard

ocean as a carbon sink at this stage of the model development. The assumption is that ocean carbon uptake and outflow cannot be directly influenced by policy makers, therefore a simplified model will be used now since at other carbon sinks there are more tools to influence carbon sequestration. Furthermore the next research question of the author will be to model the change in carbon uptake particularly of forest and crop land under different agro-strategies proving that biomass plants are not carbon neutral.

Le Quéré [9] and Canadell [3] have found that the carbon sinks sequestration capacity is deteriorating due to the negative response to climate change and variability. Between 1959 and 2008 there were 43% more carbon remaining in the air than before [9]. The ocean pH content before the industrialization was 8.179 and currently it is 8.104. It has decreased by 0.075 which results in the acidification of oceans and if pH level reaches 7.824 as a prognosis said by 2100, it will danger the existence of coral reefs and alters the ecosystem of the ocean [2, 15]. If the acceleration of carbon in atmosphere would stop, that would consequently solve the acidification of the ocean. The carbon in biosphere at the equilibrium state (before industrialization) was 2,900 ppm which is being determined by the total terrestrial area of the ecosystem, 0.145 Gkm2 (giga km2) and the net primary production which is 400 Gt C (gigaton of carbon) showing the amount of net carbon dioxide taken in by plants minus the respiration (McGraw-Hill, 1982). This equation was disturbed by deforestation starting in 1970 and the assumption of the base model is that it will be stopped in 2020. It is changing with a rate of 0.02% per year. This parameter has a negative feedback loop for the system. It has explained the carbon tied in the biosphere through photosynthesis. The carbon outflow from biosphere occurs during the respiration of the ecosystem (plants, animals), and the decomposition of organic matters. It is estimated on a rate of 0.02 per year. It is depending on the rate of carbon in the biosphere, consequently there is a link between the flow and the stock. The following equation expresses the carbon in biosphere in relation of time.

Carbon in Biosphere/dt=Area of Ecosystem*NPP*Deforestation-Respiration rate*Carbon in Biosphere

The other large stock is carbon in atmosphere. There is one carbon outflow, the sequestration of biosphere and there are two carbon inflows: carbon from respiration, decomposition and carbon from the combustion of fossil fuels. The historical CO_2 equilibrium was 280 ppm in the atmosphere until 1850, when burning fossil fuel overbalanced the equilibrium state [8]. If rate of burning coal, oil, and natural gas would be less intensive; the CO_2 concentration may not change so dramatically in the air. The following equation expresses the carbon in atmosphere in relation of time.

Carbon in Atmosphere/dt=Fossil fuel emission +Respiration rate*Carbon in Biosphere-Area of Ecosystem*NPP*Deforestation

There is an auxiliary, so called CO_2 concentration in atmosphere, which is starting from the carbon in atmosphere stock with the purpose merely to express carbon in the air in ppm. It is calculated so that the carbon in the atmosphere is divided by 2.12 Gt C CO_2 ppm.

The last complex dynamic subsystem describes the carbon emission of fossil fuel during combustion. It assumes a 0.1 Gt carbon emission per year and calculates with a 0.03% growth per year. The model hypothetically defines saturation in fossil fuel consumption at a rate of 15 Gt C per year. The expectation is that it will result in a logistic curve at the fossil fuel emission stock, where the function starts at a given rate, while growing up until a certain rate and will stay unchanged. This dynamic system is going to influence the atmosphere. The following equation expresses the carbon in atmosphere in relation of time.

Carbon emission of Fossil Fuel/dt=Fossil Fuel growth rate*Fossil fuel emission *(1-(Fossil fuel emission)/(saturation in consumption))

According to Le Quéré [9] and Canadell [3] 91% of CO_2 is originated from burning fossil fuels and cement and 9% comes from the different land use strategies. The model is calculating with both of the large emitting factor. In order to mitigate possible

impact the model is going to help us to foreseen the future changes under different versions of the base model. For the sake of simplicity minor events are going to be neglected in the model. For instance the emissions resulting from human activities are not considered as a carbon flow, as it represents only a few percent.

Versions and Results

This section's purpose is to run the base model in Anylogic software, then execute several alterations on parameters and interpret the results. There is going to be one plus three versions. The null version will be the base model created by Hartmut [6, 7]. The first version is going to modify the future consumption of fossil fuel parameters. The second version will examine different deforestation and afforestation strategies. The third version develops suggestions for energy and forest policies that stabilize CO2 concentration in the atmosphere.

Null Version

Looking at the base model output table (see Figure 2.) it corresponds with the historical trends of carbon increase. The model was run between the period of 1850 and 2052. The atmospheric carbon has increased from 280 ppm to 684 ppm. It is observable on the yellow diagrams (Figure 2.) that starting from the equilibrium state carbon begins to increase heavily in the atmosphere due to the logistic curve of fossil fuel carbon emission. The carbon uptake of the biosphere is being negatively affected by the deforestation and net primary production rate relative to the forest area. It results in a negative slope. The rate of respiration is depending on the area of the terrestrial ecosystem. Therefore the respiration rate is going to decrease hence more carbon remains in the atmosphere. If the model is running until the consumption of fossil fuel saturate at a rate of 15 Gt C, it is going to happen in year 2365. By that time the Carbon in biosphere will settle down at a new equilibrium point. However in contrast the carbon concentration in the air is steadily increasing.

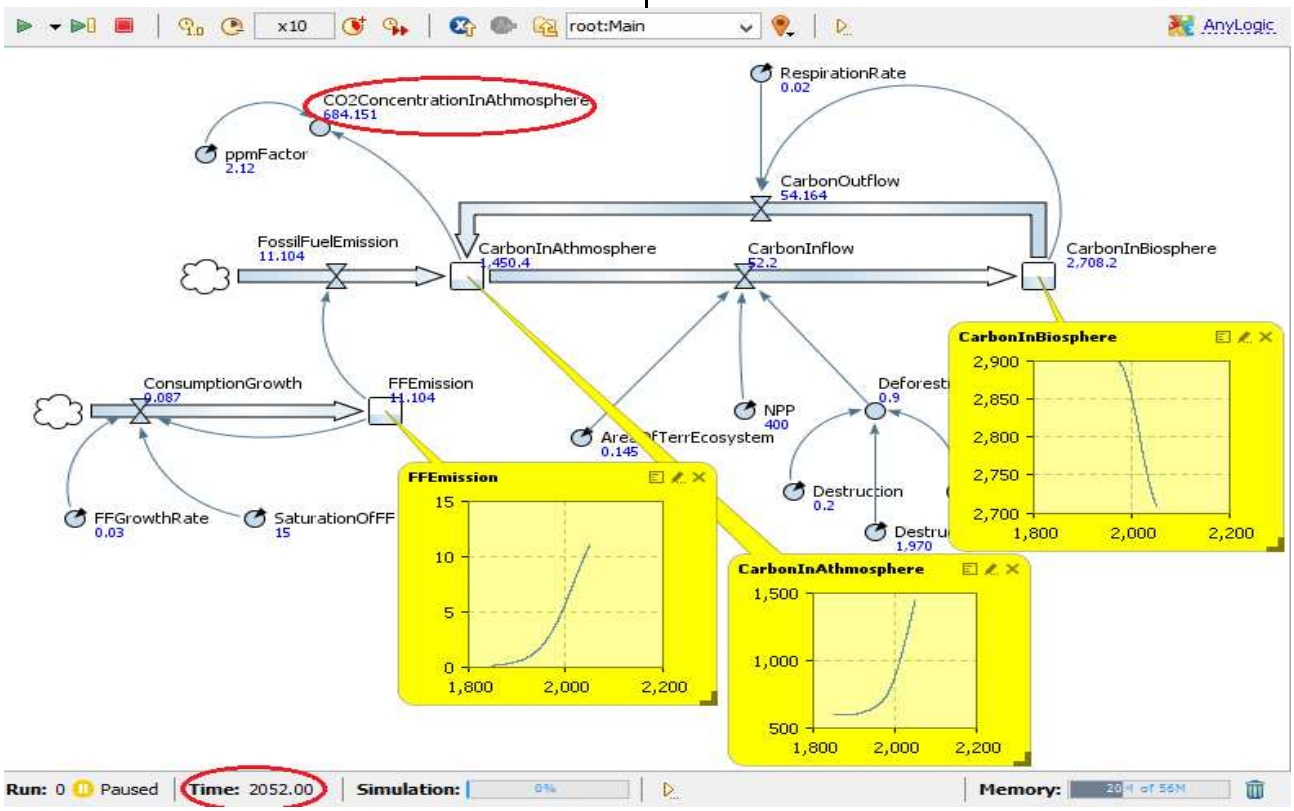

Figure 2.: Null version output table

First Version

The first version illustrates the possible outcomes if the decision makers are going to realize the harmful effect of fossil fuels and willing to act towards sustainability. In the model input parameters will be changed around the base model which serves as a reference point to see the change effect on the outcome.

First of all the model parameter, the saturation of fossil fuel consumption, is going to be modified to 5, 10, 15, and 20 GtC/yr at ceteris paribus. According to my expectations, the atmosphere carbon content was increasing with a slower rate (see Table 1.).

Table 1. Showing carbon content at different saturation levels

Year	Saturation level (GtC)	Carbon content (ppm)
2052	5	544
2052	10	632
2052	*15 base scen.*	*684*
2052	20	726

If another parameter, growth of fossil fuel consumption will be altered to 0.02, 0.03 and 0.04 % per year at ceteris paribus. The comparison table shows the accumulation of carbon concentration in the air, but the growth rate is a stronger influential on carbon emission than saturation in consumption (see Table 2.) The best strategy would be if fossil fuels are saturating at a rate of 5 Gt C and there would be a 0.02 growth rate. If it happens, it would result in 455 ppm in 2052 which is still high, but would induce lower emission than currently.

Table 2. Showing carbon content at different growth levels

Year	Growth rate of FF (pct/yr)	Carbon content (ppm)
2052	0.02	479
2052	*0.03 base scen.*	*632*
2052	0.04	913

Second Version

The following version is looking at several deforestation strategies. Hypothetically the rate of deforestation will be modified to a better and worse version while the base model will function as a control output. The rates of cutting trees are going to be 0.15, 0.2 and 0.25 % per year. If the rate of deforestation will be lowered, a slight reduction would be experienced in carbon content (see Table 3-3) compared to the base model. Cutting more trees out is not an option to consider, but as a worst case version we can see that the carbon content will increase to 708 ppm.

Table 3. Showing carbon content at different rate of deforestation

Year	Rate of deforestation (pct/yr)	Carbon content (ppm)
2052	0.15	661
2052	*0.2 base scen.*	*686*
2052	0.25	708

The next step was to alter the end date of deforestation. If decision makers and politicians fail to change their forestry strategy on time and continue with the current rate of environment degradation, it is necessary to understand how much burden it means for the environment. If deforestation stops in 2025, it increases the level of carbon to 691 ppm, which is increasing slowly and constantly as the time is being postponed (see Table 4.).

Table 4. Showing carbon content at different end of deforestation

Year	End of deforestation (yr)	Carbon content (ppm)
2052	*2020 base scen.*	*686*
2052	2025	691
2052	2030	696

It is easy to realize that reducing the volume is more influential, then the end of deforestation. It is also necessary, but results only in a relatively small carbon increase in the atmosphere. Policy makers should go beyond and develop alternative strategies at the meantime to reduce carbon content.

Third Version

The last version is the combination of best practices. A hypothetical energy and forestry strategy is going to be investigated that aims to stabilize carbon dioxide in the atmosphere. First the strategies will be introduced then the outcome will be investigated. The first step would be to regenerate the lost biosphere and start to plant trees. Therefore the afforestation auxiliary was added to the model

similar to the deforestation equation (see red circle in Figure 2.). It is determined by the level of afforestation (parameter named as 'Planting'), by the beginning and end date of planting trees. As the decision makers will realize the negative effect of destroying forest, will stop cutting out further trees and will start regenerating the lost forest lands. Therefore the model takes 2020 as the year when afforestation starts and 2050 as the end of planting. The rate of afforestation is assumed to be twice as much than the rate of deforestation in order to increase the absorption capacity of the biosphere. It is 0.2% per year.

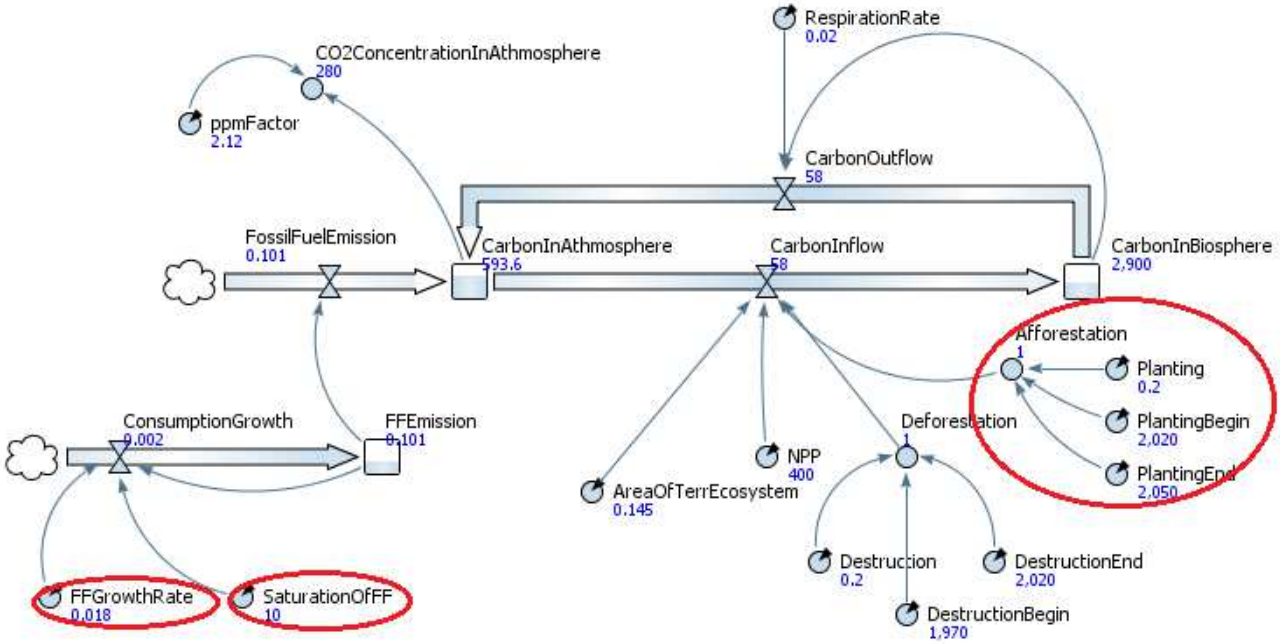

Figure 3.: Third version output table

The other option is to realize a more sustainable energy strategy. It is high time for decision makers to understand the harmful effect of fossil energies on one hand and to believe the finite availability of fossil energies. Energy consumption should be sourced from renewable energy rather than non renewables. There are numerous alternatives to cover energy needs which are less or nonpolluting. For example wind-, solar energy, hydro power plants, bioenergy and geothermal energy are all applicable and developed technologies available on the market. Therefore the growth rate of fossil fuels will be reduced to 0.018% per year, assuming that other non-emitting energy resources will replace the fossil energies. The saturation of consumption in fossil fuel therefore will happen earlier than the base model suggested. Now it is set to 10 Gt C (see red circle in Figure 3.).

After running the model several times following different strategies, it was observed that the most effective way to reduce atmospheric carbon is the slower growth rate of fossil fuels. With the above written parameters by 2050 there would be 456 ppm carbon dioxide in the air. The rate of carbon accumulation would be significantly reduced by proper policy making.

Recommandation

The earth has passed in 1988 the safety level of carbon content in the atmosphere neglecting the unforeseen negative consequences. As the human kind severely experiencing global warming, the acidification of ocean, the melting of ice-cap, extinction of species and the frequently occurring natural hazards, they tend to believe it is time to execute changes. These phenomena have impact not just on our natural environment, but also on our

economy and society. The economy is spending millions of dollars to correct and revise the traditional way of business models and old polluting technologies. The government is also responsible to insure the society and cover their losses in case of natural hazard and extreme climate events. Huge amount of money is spent on this respect. It is a common interest to warn off fossil fuel resource usage and carbon emission as much as possible. It seems to be plausible, but only with strict policy making. Otherwise if we reduce only a bit of the carbon emission it would still continue heating up [5, 10, and 14].

My recommendation is to act now, as the different versions have illustrated there is a lack of time and increasing carbon dioxide in the atmosphere. The target 450 ppm will be reached by 2050 in the third version as well, therefore forestry and energy strategy is not remedy for this problem. What has been accumulating since 1850 could not be removed from one day to another from the air. Recommendation is to replace fossil fuel resources with other non-renewable sources at the first place, such as solar, wind, geothermal, hydro, bio-energy…etc. There are some advanced technologies such as the concentrated solar, wave and tidal energy. Try to avoid traditional cars and support electric cars. Proper forestry and agricultural strategy should be favored by decision makers up [5, 10, and 14].

Nowadays governments are heavily investing in research and development to find out the best and fastest technology to reduce carbon in the air. It is a highly researched area whether carbon can be artificially drawn from the air. The technology is not there yet to offer a large scale option, but may in the future. There are pilot projects existing at a cost of $200/tC. To artificially remove 50 ppm carbon from the air would cost around $20 trillion [5, 17, and 18]. It is a rather capital intensive solution. There is an early application of carbon dioxide capture and storage (CCS) system as well. However afforestation strategy could offer a cheaper and natural way of carbon elimination. As my model illustrated in the second and third versions, this process is able to reduce the carbon content in the atmosphere in a way that the positive effect of carbon sequestration of soil is also increasing. It is being researched that bio-char with another name charcoal would be a potential matter to store carbon for several decades. Bio-char basically is the residue after burning biomass. Usually it is spread on the topsoil as a fertilizer and it generates richer soil content while capturing CO2. This solution would probably reduce 8 ppm or more in half century [5, 19, and 20].

Conclusion

The conclusion of the study is that carbon dioxide in the atmosphere is going to exceed the safety zone in the base scenario and go beyond 450 ppm which irreversibly change the ecosystem of the planet where the regeneration of forests for example are not feasible anymore. Trying several versions of the model by following different energy- and agro-strategies, the suitable parameters to reduce carbon are fossil fuel growth rate of 0.018%, saturation of fossil fuel consumption at 10 Gt C, and the afforestation starting at 2020 until 2050 with a rate of 0.2%. The study covers an important issue of this era. The investigation of carbon dynamics in the atmosphere and the simulation of carbon under different versions attract attention from several researchers. Answering the question in the title – Carbon dynamics: Ever going to stop increasing? – seemingly carbon dioxide is going to accumulate further. However the rate of intensification can be changed by strict policies and with prompt, environmental conscious society the process might even reverse at a given point of time.

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Goal-oriented Modeling of Business Processes for Design of Smart Grids Services

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ABSTRACT

We present a goal-oriented modeling methodology for business processes, and study its application for the conceptional design of smart systems' services framework for the deployment and management of renewable and efficient energy usages services. The modeling is based on reference models and standards related to smart grids. Models will be also useful for the development of smart grid services, communication with and training of customers. We acknowledge the financial support of this work by the Hungarian State and the European Union under the TÁMOP-4.2.2.A-11/1/ KONV-2012-0072 project.

Introduction

The Smart Grid is a complex system of systems, as well a network of information networks, for which a common understanding of its major building blocks and how they interrelate are broadly shared. Smart Grid [1] services are related to energy bulk and distribution enabled by information technologies, whose objectives are the consumption-oriented generation and the generation-oriented consumption. Smart grids evolve by collaborative work of many organizations among financial options of distributed energy generation and consumption, in order to promote energy efficiency with quality and security of supply and safety. Our focus is on goals and strategies of smart grid services, and on functional modelling them for effectiveness of their management at customer side.

In smart grids' technologies and services, the organizational changes are issued from interdependencies between energy providers and energy customers having specific technical systems as well as different social systems. To develop or to understand smart grid services developers need to model and analyze interactions between those systems, which are involved in exchanges of goods and services. Results for these objectives are realized by the ITU-T Working Group for smart grids architecture and services use cases [1] based on smart grid standard issued by collaboration of international companies and institutes [2]. European Community's Smart Grid Directives (2006/32/EC, 2009/72-73 EC) [3] regulate the dynamical interoperation for decentralized energy distribution networks cooperation for supporting consumption-oriented energy generation and generation oriented energy consumption, in order to promote energy efficiency.

Our research position is to provide support from modern software technologies for smart grids development and services implementations. We apply our industrial experienced BUSITEV Framework methodology for implementing a Smart Grids' Processes Framework Based on Smart Grid Standards and Reference Models. Those provide a starting point for developers and stakeholders of organizational changes related to smart grids' services. This paper focuses on these topics.

First, we present the BUSITEV framework for model-based integration of BUSiness and IT EVolutions [4], which is a methodology for generic frameworks for modelling of business goals and processes. Next, it follows the technically and business context of a smart grid. After this we present our research for the methodology application for implementation of a modelling framework for Smart Grids. Finally, we close with Results and Recommendations.

Methodology

The business information system's evolutions need to be integrated in technological and business plans with accentuate impact analysis and security policy [5]. During decades the informational systems have been considered the research domain for the dynamic changes of organizations [6], and the IT technologies which drive changes. Van De Wijngaert et al. [7] conclude that other factors influence decisions to apply the ultra-now type of new technology, but the opportunity to analyze and prepare a technology decision is very important factor, as well. The goal of BUSITEV framework is to support developers and decision makers in evolutionary modeling of changes.

User Requirements Notation Technologies

User Requirements Notations is a first standardization effort for user requirements engineering language that combines in one unified language goal models and scenarios from two parts: Goal-oriented Requirement Language (GRL) and Use Case Maps (UCM) [9]. URN-GRL and URN-UCM are viewed as complementary to notations of UML2.0 OMG methodologies [10]. The URN supporting tool is the Eclipse-based jUCMNav tool, which contains simulation engine for implementing traceability relationships between functional and quality requirements [9,11,and 12].

URN has concepts for the specification of stakeholders, goals, non-functional requirements, rationales, behaviour, structure, and scenarios in use case maps. Use case maps form the functional model which scenarios can be exported in UML interaction diagrams [13]. The unique combination of goals and scenarios found in URN enables not only to describe and analyze What, When, Who, Where, Why, and How aspects of business processes as relations to business objectives [14]. The URN allows reasoning about alternatives from intentional ambiguity and abstraction levels for scenario interactions, performance, and architecture [14-16].

- URN-GRL goal model consist of a goal tree, which elements can be connected to each other via contribution, correlation and decomposition types of relationships. The evaluation processes are bottom-up for quantitative, qualitative, as well as a mixed analysis. The GRL model's abstraction capabilities are shown in Figure 4-1.
- UCM functional model consist of the processing paths with responsibilities as events in a scenario with start point and end points, which allows visualizing structural and operational aspects in one functional model. The colors of the structural elements can be selected and fixed for the internal standard of an organization, as visual information in a business context view. The UCM model's abstraction capabilities are shown at Figure 4-2.
- jUCMNav tool is [11] is an open-source Eclipse plug-in that can handle URN's concepts for integrating functional with quality requirements. jUCMNav tool provides model transformations and generate reports, exports diagrams.

For more details on URN, GRL, UCM, jUCMNav see the publications available at the URN Virtual Library at [11-12].

The Role of BPM and MDE

Traditionally, software runs on a platform and the components are created by programming. When creating a software system this work does not mean significant costs. Problems and big costs arise when the business process and/or the IT services change due certain circumstances [5]. In order to manage the changes, determine the place of the requirements and changes, and manage the dependence of the elements of the system is required an enhanced traceability between the requirements and their execution.

MDE enables the scaling of change management by modeling and simulations in order to make decisions. Scalability of MDE process provides the tool-problem/tool-solution pairs with which experts can be involved in the processes that explore/verify the real root of the problem and validate the solutions. The methodology is based on MDE technologies, which support by model transformations the embedding of traceability in the elements of the model and the methods of model management. The modeling tools provide repository-based common

work with mechanisms similar to the program version managing systems in the hierarchical legal system of authority.

Based on the above we generalized the redesign of business models in order to involve the decision makers and strategy development [4, 8, and 13]. For this the development works elements are distributed on the technology line and are supported by several languages in order to harmonies the view points and involve the decision makers in the strategy design of change management.

Namely, tools and techniques are provided for business experts with URN technologies for the goal-oriented change management of business processes. When the change in the system means a new aspect, the multi-language approach is an appropriate tool for the distributed management of the viewpoints in order to coordinate the development work and integrate the results. When the change takes place because it is required that the system should follow the strategies of the business networks, it is feasible to involve the business analysts in the change of the system and adjust the changed function of the system to the new indicators in the system configuration process.

The BUSITEV model-driven framework of change management based on, supported by URN technologies, provides the integration of the changes in existing implementation models and/or rapid development with component technologies.

Our research context fixes the solution space as generic models from an initial development for a problem space. We obtain generic models by applying goal-orientation and classifying requirements on functional, non-functional, and extra-functional with traceability links between them. Generic goal models serve to identify the strategies for a problem space from selecting a set of possible solutions.

The identified strategies and the built goal graph help to architect functional requirements into business process model [4]. Thereby, we captured the behavioural and structural details of a strategy between problem space and solution space. Goal-orientation helps to capture goal graphs thus identify common problems and potential solution choices, as well as the forces that have to be considered. Documenting common solutions to the identified problem should be made with adequate tools forming reusable assets.

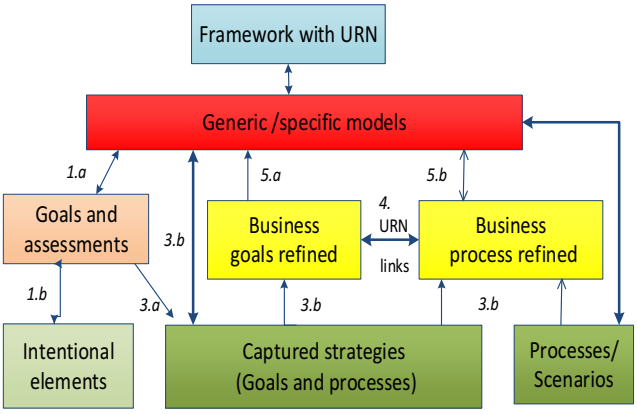

Figure 1.: Generic model of BUSITEV framework.

The framework creation and usage is shown in Fig. 1. The generic models form an input (1a) to iteration for goal-based engineering of intentions. The generic models give also the elements of a business process/scenarios intended to be built or actualized (5.a), (5.b). Given the generic models, goals and assessments are identified from intentions and analysis of problem space (1.b). These result in captured strategies, which form realizations as business processes or scenarios (3.a, 3b). Linking goals to realizations i.e. e. forming URN links from goal models to process models (4.), decision makers give nodes between problem space and solution space.

A repeated analysis is done during change management. URN links give traceability links for multi-model approach and for validation and simulation automation. Business goals and processes redefined can be added (3.b), (5.a), (5.b) as specific models into models repository of the framework. The framework supports model-transformations by jUCM Nav tool capabilities. These help to formalize business mechanisms as goals and scenarios, and to simulate and validate them with variations by involving business decision makers. This give an advanced conceptional design process that support business decision makers. Business analysts can use the framework themselves: selecting generic/specific models, assessing and defining strategies, and refinements for changed models, or defining of specific models.

Smart Grids viewpoints

The Smart Grid is a complex system of systems for which a common understanding of its major building blocks and how they interrelate are shared. At present there are many activities running in parallel which are related to the field of smart grid standardization, with some overlapping and duplication of activity and opportunities for learning from the work of others. The main initiatives are [1]: Smart Grids European Technology Platform; M 441 Smart metering mandate; OPEN meter project; NIST Smart Grid mandate; IEC Smart grid (SMB Strategic Group), IEEE Smart grid initiatives, ITU-T FG Smart Grid. The key of standardization is interoperability, which can be achieved through standardization of communications in terms of interfaces, signals, messages and workflows.

EU Platform Smart Grids

European Technology Platform (ETP) SmartGrids [1] was set up in 2005 to create a joint vision for the European networks of 2020 and beyond [17]. The platform includes representatives from industry, transmission and distribution system operators, research bodies and regulators. It has identified clear objectives and proposes an ambitious strategy to make a reality of this vision for the benefits of Europe and its electricity customers. The SmartGrids vision is about Europe's electricity networks that must be flexible, accessible, reliable, and economic.

ETP identified the services that Smart Grids are expected to offer to all electrical network users in Europe over time. The implementation of the services allowed by functionalities must be deployed and assessed at National level, taking also into account the initial status of networks and their "smartness".

Smart grids deployment will be a continuous learning process. For including residential customers in the energy efficiency improvement process smart metering systems are a key factor with the functionalities as defined in mandate M/441 and their requirements needed for implementation of services on smart grids. The acceptability of new services by the customers is considered a main concern. ETP recommends encouraging member states to address communication and education of member states citizens involving all types of customers: industrial, commercial and residential consumers. It believes it is necessary to ensure and maximize collaboration and coordination among the different stakeholder organizations.

NIST Smart Grid Model

The US view is that the Smart Grid concept for the electric power grid integrates digital computing, and communication technologies and services, with the power-delivery infrastructure, supporting sophisticated new energy-related applications. Some example new Smart Grid-enabled applications include real-time consumer control over energy usage; increased reliance on solar and other clean or renewable energy sources; controls for large-scale energy storage; mobile billing for charging electric vehicles; security for critical infrastructure protection and for privacy, and more.

US law, in the form of the 2007 Energy Independence and Security Act (EISA), assigned the National Institute of Standards and Technology, a division of the US Department of Commerce, to coordinate development of a framework of standards for Smart Grid [2] to propose use cases and architectures for the SG information networks and identified industry.

NIST has developed a conceptual architectural reference model a means to analyze use cases [19], identify interfaces for which interoperability standards are needed, and to facilitate development of a cyber security strategy. The NIST Smart Grid Conceptual Reference Model identifies seven domains: bulk generation, transmission, distribution, markets, operations, service provider, and customer. Devices and applications in each domain are network end points. The model identifies interfaces among domains and actors. Roles and activities are regulated from some international standards and regional directives.

Main stakeholders are Consumers (residential, commercial, and industrial), Electric transportation and utility stakeholders, Electricity and financial market traders, Information and communication

technologies Service Providers and Application developers, and others.

Applications and devices in the Customer domain include smart meters, appliances, thermostats, energy storage, electric vehicles, and distributed generation. *Applications and devices in the Transmission or Distribution domain* include phasor measurement units (PMUs) in a transmission line substation, substation controllers, distributed generation, and energy storage. *Applications and devices in the Operations domain* include SCADA systems and computers or display systems at the operation center. *Applications in the Operations, Market, and Service Provider domains* are similar to those in Web and business information processing.

ITU-T Reference Models

The ITU-T architectural view highlights the fact that Smart Grids are formations through ICT, and expands the NIST framework with communication domain, defining the SG architecture as formed from Energy and Service/Application planes according to their functionalities, and controlled and connected by Communication plane functionalities. ITU-T Focus Group on Smart Grid works for defining clear the common objectives of a Smart Grid, and to analyze *the information and communication technology (ICT) perspective* and identify *requirements and architectural considerations*.

The general goals of a Smart Grid are to ensure a transparent, sustainable and environmental-friendly *system operation that is cost and energy efficient, secure and safe*. For this the common objectives of a Smart Grid are clear and listed such as: *Robustness* to provide continuous and stable electricity flows; *Secured operation* to enhance communication networks and information security of the electricity grid; *Compatibility* to support the integration of renewable electricity, improve demand response functions, and satisfy various electricity demands of consumers; *Economical energy usage*: The Smart Grid shall have the capacity of more effective electricity markets and electricity trades; *Integrated system* to highly integrate and share information and data of an electricity grid; *Optimization* to optimize assets, reduce costs and operate efficiently; *Green energy* to solve problems of energy security, energy saving, carbon dioxide emission and etc.

Smart grids from other viewpoints

The simplified structure of the electrical power distribution system can be characterized by producers who produce and consumers who consume electricity. The producers of traditional case produce electricity mostly from nuclear energy or fossil energy. In addition, system operators are responsible for the distribution of power, who are entitled to intervene in the operations of producers.

This conventional power distribution system changes considerably if generators based on reneable energy are connected to the network [18].

The primary difference is that the system operator intervenes in the quantity of energy produced from renewable sources only the most necessary cases, as the aim is the more efficient utilization of them. Furthermore renewable sources are only occasionally available (e.g. wind or sunshine). The production of energy from renewable sources not only feasible in industrial size, but so-called domestic power plants (few kW) that utilize solar or wind energy become increasingly popular. This way the producer side of the power distribution network is being decentralized, and more and more geographically dispersed producers enter the market.

This phenomenon has pros and cons. The main disadvantage is that from the system operation side it poses considerable problems for the previously mentioned reasons. Indisputable advantage of this phenomenon is that the network in case of damage to or loss of certain elements provide greater security for the operation side. This decentralized power structure has been developed in recent years, e.g. in Denmark [20].

In networks utilizing renewable sources there is another significant change: users who has only been active as cunsumers, now can also produce energy. When to produce and when to consume? It is determined based on the availability of renewable resources and by the system operator. In large scale, its typical forms are pumped hydro plants, but the number os heat storage, and hydrogen produc-

tion systems and plugin hybrid vehicles is also signifincantly increased. By the appearance of the above solutions, the previously energy consumer user can turn to be an energy producer and storage capacity in the network.

Energy Consumption

Currently the produced and stored energy can be sold on a market basis, according to the laws of supply and demand. This needs advanced networks involving smart grid and smart metering systems (See Figure 2.).

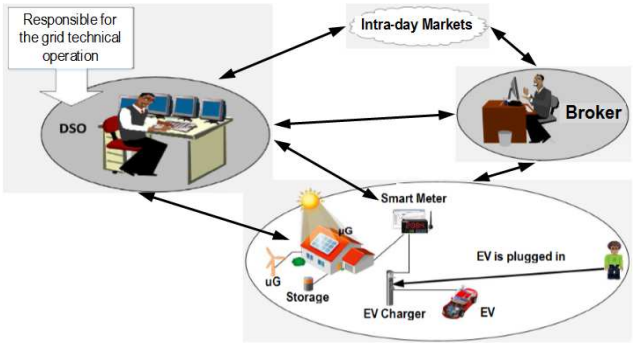

Figure 2.: Generic model of a smart grid system from the service providers point of view.

The supply of electric power remains the responsibility of the distributed system operator (DSO).If the system is safe, then produced or stored electrical energy may be sold or purchased. The system can also work in the opposite direction in certain cases, when the DSO asks the small domestic power plants for energy consumption or energy storage for the safe operation of the system. An essential tool of this operation is the smart metering system which allows the DSO to query the status of individual consumers, producers and storage capacity at specified time intervals (see Fig. 4. for Building Energy Management System processes supported by SG services below). Afterwards, he can decide – depending on the current production capacity and consumer demand - what instructions are given to low power clients. As production and consumption values of electricity networks change frequently, while maintaining strict safety standards, market-based trading may be possible. Depending on the availability of renewable sources the market price of electricity may vary several times within a day. This is the responsibility of the energy broker who decides on the purchasing or selling electrical energy.

Services and Applications

Technically, in a Smart Grid, advanced technologies as sensing and measurement, information and communication (ICTs), analytical and decision-making, and automatic control are integrated with energy and power technologies and infrastructure of electricity grids. Consumer acceptance and its real-time involvement to better manage their consumption – personally or by automated algorithms and policy makers – are the matter for SG services effectiveness. SG services deployment at National level is facilitated by detailed use cases from Reference Models for SG interoperability (RMSG). We apply BUSITEV methodology to implement a Smart Grid Services and Applications Modelling Framework (SGSerApModeF) for generic and specific models based on RMSG and on BUSITEV Framework.

EU Commission Task Force for Smart Grids starting from Community objectives for SGs has introduced 6 high-level services of SG and 33 functionalities which are detailed for their intra actions with SG infrastructure and actors. An important tool is the European standard M/441 a mandate for smart metering to improve information and services to customers and enable customers to better manage their consumption. Our focus is on functionalities defined for consumer- related services numbered 20.-33. that influence customer acceptance [1].

ITU-T Focus Group on Smart Grid (FGSG) highlights the ICT perspectives of a smart grid introducing more than 90 power-related and communication–related definitions and more than 60 abbreviations, for defining a smart grid *architecturally,* starting from the NIST Conceptual Reference Model [2]. FGSG defined 12 high level respectively 82 detailed level use cases [3]. Our focus is on the 16 detailed use cases of Customer domain.

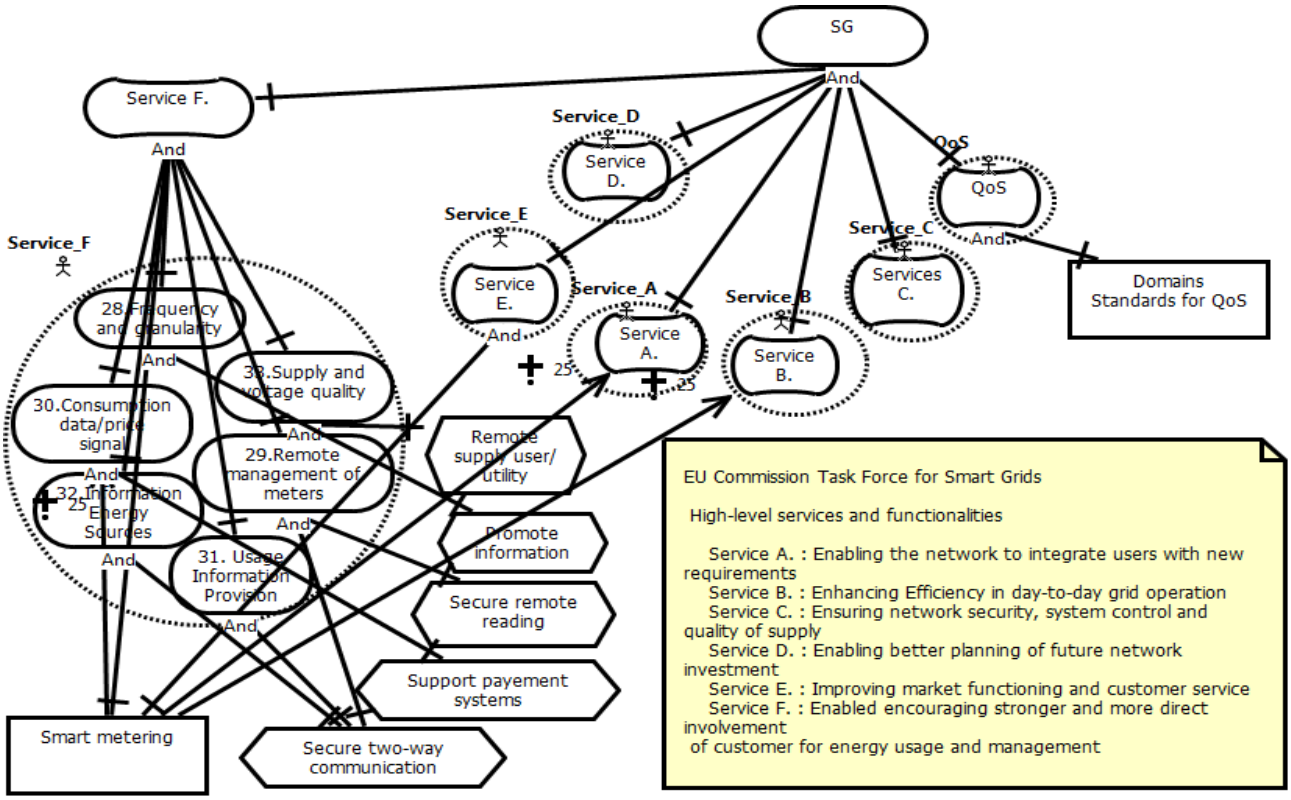

Figure 3.. GRL goal-oriented requirements specification of TFSG high level services and functionalities (F group)

Following we present our SGSAMF initiatives exemplified by SG services for building energy management cases.The primary generic model for the implementation of the Smart Grid Services and Applications Modelling Framework is for the European Community objectives for SG introduced in A.-F. Services Groups. Figure 3. shows a partial GRL model of goal-oriented requirements specification of EC TFSG high-level services and functionalities with detailed services for F group of high-level services modeled as actors, goals, soft goals decomposed on their realizations by tasks and resources. Relationships used are contributions, logical operators (And/Or). The content of this goal graph is captured from textual description of objectives and high-level services and functionalities, and detailed services for SGs by EC TFSG Studies Group 1 report at pages 6-19 in [1].

Generic Models for BEMS

The Customer system technically is formed by in-home displays (IHD), programmable communicating thermostats (PCT), direct load control devices (DLC), and web portals. *Information technologies* provide customers with the opportunity to manage their electricity consumption by providing them with data about their electricity consumption and costs through mobile devices, IHDs, and web portals. *Control technologies* provide customers with the opportunity to manage their electricity consumption through load control devices, such as PCTs.

AMI and smart meters are fundamental components which allow electricity consumption information to be captured, stored, and reported in intervals of 60 minutes or less to both utilities and their customers.

Security is required to ensure that the confidentiality, integrity, and availability of Smart Grid information, control systems, and related information systems are properly protected.

BEMS is a system technology for managing the building facility and component operation focused specially on energy improved by sensing, metering and controlling components based on ICT hardware and software technology [3].

Smart energy services in building domain are supported by introducing the smart grid infrastructure technology into building domain and it configuring for communication with the BEMS system technology. The in-building SG infrastructure includes detailed metering, detailed electricity control, Energy Service Interface (ESI), Distributed Energy Resource (DER) and electric vehicle (EV).

BEMS manages electric usage for building operation and maintenance by dynamic pricing information transfer to BEMS through ESI. BEMS monitors the building energy usage in detail and manages the operation of the building devices and facilities by detailed metering information transfer to BEMS through ESI. BEMS recognizes the amount of locally generated electric power through DER status transfer to BEMS.

When external public grid needs to reduce demand by consumer with reaching to peak demand is realized a DR (demand signal) message transfer to BEMS through ESI, and BEMS controls the usage conform BEMS energy management algorithm and policy. Based on the DR message and/or dynamic pricing information from utility BEMS is able to control any energy consuming component intra building area through ESI. Based on some information including dynamic pricing message and/or DR message from utility, BEMS is able to control charge/discharge of EV's.

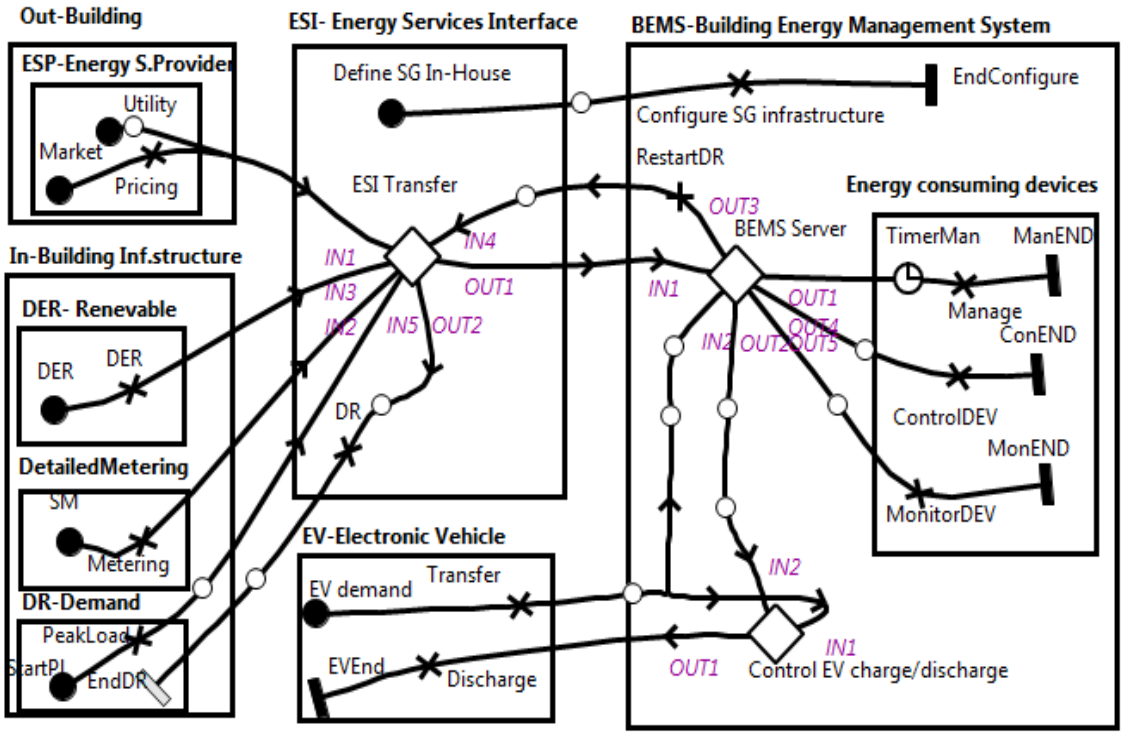

Figure. 4. UCM functional model for BEMS processes supported by SG services

Figure 4. shows the BEMS processes supported by SG services modelled into UCM functional model. The model elements are expressed with usual basic workflow signs and the elements required to structure the business process model with regards to information passing and modularity in root-map and sub-map diagrams. The route of the process takes place along directed Path in which the Functions and Activities receive a partial order with indication of consecutive sequence. Loops and circles are allowed in the path direction. We can provide their consistency with structure division by Static and Dynamic stubs, and with Conditions during validation. The textual requirements which cannot be built in functions, activities or conditions are collected by categories and are shown as notes with reference to Dynamic stub. Organizational cross-cutting events are highlighted by bounded path with Components which model Actors and Divisions. For quality expectations we can give idioms for timing, pairing, constraints, limits and asynchrony synchronic functions. The checking of the wellness of the processes and the concrete cases of their execution take place with simulations in the form of scenarios within UCM functional model. Textual description is in the pages 53-57 in Appendix III. Use Cases for Building Management in "Use Cases for Smart Grids" from in Smart-O-31Rev.7, ITU-T FGSG, Geneva, 18-21 December 2011, published at [3].

Conclusions

Smart Grids have a set of software and hardware components to support complex networks system's functionalities in order to obtain the energy network effectiveness. Reference Models for smart grid services and architectures are given as EU Smart Grid Task Force's objectives perspectives, and as ITU-T Focus Group for Smart Grid's ICT perspectives [1, 3] given for detailed development at National level.

This paper focuses on smart grids' attributes and standardization issues in order to establish a modelling framework for services on customer-side to support the evolution of electricity information network system services, and customer involvements in home-related electricity usage management to avoid peak load with efficacy. Our previous work on BUSITEV Framework [4] offers a good basis to manage services strategies for smart grid developments and support stakeholder's communication. Goal and scenario models built following reference models support valid domain-specific architectural decisions, and form a traceable library for business process models and for modeltransformations based implementations, with reusable repositories.

BUSITEV is based on MDE technologies and URN mapping techniques that assure quality and improve testability [16], as well the URN modelling fills the UML gaps in requirements engineering [4]. For example, at the modeling of the business processes on user level the shortages of process organization which cause inconsistency in the work processes among the organizational units are revealed. These are typically caused by the manually executed problem solving in the sphere of administration due to the low integrity of the enterprise application system which are whitened by URN validations. This way the modeling of the business processes results in the optimization of the processes and the changes of the organization at the same time as well as the required software maintenance for the problem generating change management.

Applying BUSITEV Framework and SG Reference Models for implementing a generic modelling framework for SG services and its management yields to benefits, which are strict related to the underlying MDE methodology: it pushes people to think about the actual energy usage state, and to concentrate on outcomes and results before an eventually implementation of changes of management and infrastructure. This helps decision makers to invest acordingly in information systems and other aspects of changes; it serves as tool for continuous fit and alignment between the energy usage strategies and the evolution of information network, and as a dynamic services evaluation system with evaluating the systems' performance [15]. As is shown in Section 3 the smart grids deployment will be a continuous learning process, when supporting standards and their appliances are crucial.

Future work needs to complete the Framework with all detailed use cases for Customer domain's functions to support services management development and end-users training for customer acceptance of smart grids in order to self-configuration of their usage strategies in home energy management systems.

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Analysing Enterprise Architecture Models to Detect Misalignment Symptoms

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ABSTRACT

Business–IT alignment has been one of the top information management concerns since the organisational role of information systems has accentuated. The state of alignment between business and IT can be analysed either through its presence (alignment) or through its absence or deficiencies (misalignment). Most of traditional alignment studies deal with achieving alignment. On the contrary, misalignment issues (detecting, analysing and correcting misalignment) are considerably underemphasized in the literature. This paper relates to misalignment analysis. The state of (mis)alignment can be examined via several methods. Analysing enterprise architecture models to detect misalignment is a possible examination approach. The paper aims to introduce architecture assessment-based misalignment analysis from a theoretical perspective. With regard to the theoretical foundation the paper focuses on presenting an initial research plan, pointing out the conceptual body of the proposed research. *The financial support of TÁMOP 4.2.2/B-10/1-2010-0023 is gratefully acknowledged.*

Introduction

Business–IT alignment has been one of the top information management concerns since the organisational role of information systems has accentuated. The need to align business with information systems is unquestionable and is regarded as one of the most important issues on information systems research. The concept of business-IT alignment has to be present among the top concerns of an organisation, since information systems play an important role in business strategy: they facilitate the success of business strategies. This connection indicates the importance of alignment between business and information systems [14], [7]. The need for aligning business and IT consists of several reasons, e.g. using IT effectively to achieve business goals, capturing the ability of IT to create business value, bridging the gap between business and IT or integrating IT to business strategy, mission and goals [5].

While organisations address alignment achievement, they are continually suffering from *misalignments*. These difficulties (the misalignments) encumber the achievement of alignment. This observation indicates that misalignment analysis is an important step in achieving alignment. Understanding the underlying cause of misalignments, as well as trying to correct the existing misalignments is one of the ways to achieve alignment [3]. Misalignment is therefore a key issue in alignment achievement. It helps to understand the nature of alignment. If an organisation can catch the evidences of misalignment, it is on the way of being able to correct them. If misalignment evidences are corrected, the state of alignment can be achieved [4].

Most of traditional alignment studies deal with achieving alignment. On the contrary, misalignment issues (detecting, analysing and correcting misalignment) are considerably underemphasized in the literature. The low attention on misalignment is inadmissible, since organisations are in the state of misalignment as long as they achieve the state of alignment. This fact indicates that more attention ought to be paid to the phenomenon of misalignment, as well as to its symptoms and effects.

The state of (mis)alignment can be examined with several methods. One of the main research methods is enterprise architecture assessment. It helps to reveal this important state and its emerging symptoms. This paper deals with misalignment,

with special attention to architecture-based misalignment analysis. The paper aims to establish the literature body of architecture-based misalignment symptom analysis. It introduces the three building blocks: strategic alignment, misalignment and enterprise architecture to connect them to each other in an architecture-alignment perspective.

The paper has three parts. In the next section a short summary is given on strategic alignment, misalignment and enterprise architecture, mentioning the most relevant works and different viewpoints on these topics. Section 2 deals with architecture-assessment in alignment analysis, with special attention to the recent studies on architecture-based alignment assessment. Section 3 gives an introductory research plan on the proposed topic. At the end of the paper conclusions are drawn.

Theoretical foundation

The theoretical foundation has three parts. The concepts of the foundation will be presented as (1) strategic alignment, (2) misalignment and (3) enterprise architecture

Strategic alignment

The first building block of the literature review is the concept of strategic alignment. In this part we present different alignment definitions as well as well-known alignment models. Alignment has different definitions in the literature. [11] defines alignment as a degree of fit between business and IT strategy, as well as business and IT infrastructure. [15] conceptualizes the term alignment as a level how IT strategy can support the business strategy. [17] points out that IT is a mirror for business management. [13] argues that alignment is the situation when organizations apply appropriate IT what is congruent with business strategy.

Alignment models are holistic approaches which can be used in a prescriptive manner. Although there are several alignment models in the literature, some alignment models are particularly influential, such as the MIT model [18], Henderson and Venkatraman's Strategic Alignment Model (SAM) [11] and the Baets model [1]. The SAM model can be referred to as the most cited alignment model in the literature. The model has four key domains of strategic choice: (1) business strategy, (2) organizational infrastructure and processes, (3) IT strategy and (4) IT infrastructure and processes. The model is based on two primary building blocks: strategic fit and functional integration [11].

Misalignment

The second building block of the literature review is the concept of misalignment. First we introduce different misalignment definitions, and then we explain misalignment with different examples. At the end of the section misalignment models are shown.

To give a decent definition on misalignment, several approaches were studied. The different views on the topic resulted different definitions, which will be showed hereafter. The state of business-IT alignment can be analysed either through its presence (alignment) or through its absence or deficiencies (misalignment). In this sense misalignment can be referred to as a state when organisations fail to achieve or sustain alignment [3].This definition stresses that misalignment is an undesired state what has to be avoided or corrected. Another perspective declares that misalignments are different problems (aggravating circumstances, complicating factors) occurring while an organisation is trying to achieve alignment [3]. [7] states that misalignment is any business process what is not appropriately aligned with the requirements. To sum up the different views on misalignment definition a collection of general misalignment characteristics is given. According to the different definitions it can be stated that

- misalignment has an innate negative connotation,
- alignment and misalignment are antonyms,
- misalignment has to be eliminated and substituted with alignment,
- misalignment is any difficulty what impedes alignment,
- misalignment indicates a disorder in the operation of the organisation.

To approach the misalignment problem in a more practical manner, we continue misalignment introduction with some examples. Misalignment has several symptoms through what an organisation

can detect its existence. Misalignment symptoms (or signs) are evidences of inefficiencies, difficulties, inabilities concerning business and IT strategies. [3] gives a decent list of misalignment symptoms. Table 1 shows some explanatory misalignment symptoms. These evidences demonstrate the state of misalignment in an organisation.

Table 1.: Explanatory misalignment symptoms (proposed by [3])

– Misalignment symptom
– Undefined organizational strategy/organizational goals
– Undefined business process goals
– Undefined security needs over information entities
– Users managed differently in different applications
– Undefined capacity and performance requirements
– Lack of relation between process/organizational goals
– Lack of data ownership
– Poor IT planning and portfolio management
– Multiple hierarchy or lines of reporting
– Lack of data quality controls
– Lack of applications interfaces
– Multiple applications managing the same information

Misalignment management means the triad of detection, correction and prevention [7], [4].

- *Misalignment detection* means the diagnosis of this undesired state. It includes the processes of misalignment identification and symptom analysis.
- *Misalignment correction* is the process of *re*-aligning business processes with information systems. The correction step is about terminating the symptoms by correcting the malfunctioning procedures.
- *Misalignment prevention* is the process that helps to avoid the state of misalignment. Prevention means an array of activities with which the non-desired condition can be avoided. Prevention includes detection and correction skills as well.

There are several misalignment models mentioned in the literature. The very first mentioning on misalignment was conducted by [12], who collected a set of misalignment symptoms. The relevance of this work was two-fold: (1) it declared that misalignment can be detected by its symptoms; (2) it stated that misalignment inhibits the achievement of alignment. The next relevant work on misalignment was conducted by [14]. They gave a summary on key issues concerning Business-IT Alignment. In their work they identified misalignment as one of the key alignment concerns. The most famous works on misalignment were the so-called BISMAM model (Business and Information Systems MisAlignment Model) by [4] and the BITAM method (Business IT Alignment Method) by [7]. These models will be introduced in depth in Section 2.

Enterprise architecture

The third building block of the literature review is the phenomenon of enterprise architecture (EA). We approach the concept from an interpretational perspective, and then we introduce the most important EA frameworks.

Architecture is the fundamental organisation of a system, including its components, and their relationships. Architecture is a formal description of a system; it shows the structure of components and the main architectural principles and guidelines [20]. *Enterprise architecture* is the fundamental organisation of an enterprise, described by its components and its relationships. Enterprise architecture is a possible organizing structure of the business processes and IT infrastructure in an enterprise. The main idea behind enterprise architecture is the need to a primary enterprise logic in order to review, maintain and control the whole operation of the enterprise.

Enterprise architecture is an approach which helps
- to capture a vision of the entire system in all its dimensions and complexity,
- to coordinate the many facets that make up the fundamental essence of an enterprise and
- to provide a structure for business processes and supportive information systems.

Enterprise architecture is an organising logic which acts as an integrating force between the aspects of business planning, business operations and the enabling technological infrastructure of the business. Enterprise architectures help to integrate the different information systems and business processes into a coherent map. It supports IT strategy, IT government and business-IT alignment [16].

An enterprise architecture framework is a collection of methods to create and manage the enterprise architecture. There are several enterprise architecture frameworks available, e.g. IEEE Standard 1471-2000, the Zachman Framework, the TOGAF framework, or the DODAF framework. The most recognized frameworks are the Zachman Framework and the TOGAF framework.

Zachman's well-known framework [25] is considered to be a logical structure of an enterprise. It represents the whole enterprise in descriptive building blocks. It is an evolving framework; in its latest version enterprise ontology was introduced. The main advantages of this framework are that it is quite easy to understand and it is independent of methodologies.

TOGAF (The Open Group Architecture Framework) is a commonly used architecture framework. It is a holistic approach which describes the architecture building blocks, the connections between them, as well as the method how to build and maintain enterprise architectures. The framework has main four architecture domains: 1) business architecture, 2) data architecture, 3) application architecture and 4) technology architecture [20].

Alignment analysis

Enterprise architecture assessment is an examination approach to analyse the state of business-IT alignment in an organisation. It assesses how IT is aligned with organisational goals by analysing enterprise architecture models. Enterprise architecture describes the logical structure of the different architecture layers and it links all levels from business strategy to IT implementation. In this sense EA enables us to assess the alignment between business and IT [23]. Architecture assessment consists of sole architecture layer analysis, as well as fit analysis between the different layers [14].

Earlier studies on alignment assessment primarily focused on strategic and holistic perspectives, the innate connection between business models and architectures has not been revealed [6], [7]. Identifying this gap many authors linked enterprise architecture to strategic alignment. [14] defined that the operation of the different architecture components relates to alignment performance. [22] proposed an EA framework what is able to check alignment along functional and organisational hierarchies. [2] clashed the different EA layers in order to assess the state of alignment. [21] as well as [19] determined measures to assess information system architecture. [8] proposed a methodology to define how relevant is EA in addressing strategic alignment. [9] set up an architecture-based maturity model for alignment assessment.

The above introduced studies on architecture-based alignment assessment prove that it is a relatively young, evolving topic. Some issues on architecture alignment assessment are still open to debate. To give an example, the different views on which layers to align will be introduced. [6] argues that 1) business models, 2) business architectures and 3) IT architectures have to be aligned with each other. [24] stresses the importance of application architecture and business architecture alignment. [14] argues that 1) business, 2) information, 3) application and 4) technical architecture alignment is necessary. It means that all mentioned layers have to be aligned with all other layers. Last but not the least, [10] points out that aligning 1) business and application, 2) application and information as well as 3) business and information layers is satisfactory.

Architecture-based alignment assessment, as introduced above is a useful way to analyse the state of alignment through enterprise architecture components. This method is also applicable to the concept of misalignment. To rephrase the definition of misalignment in the context of enterprise architecture, it can be stated that misalignment is an irregular condition that

- destroys the different architecture components as well as the desired fit between them,
- means the inaccurate mappings between the different architecture layers [7], [4].

There are a few studies on EA-based misalignment assessment in the literature. They primarily deal with misalignment detection methods. This section strongly builds on Section 1, misalignment summary. The first study on architecture-based misalignment assessment was conducted by [14]. They pointed out the relationship between architecture components

and alignment performance, stated that alignment performance can be assessed by measuring misalignments between the architecture layers. They argued that misalignment can be deduced from three different perspectives:

- from the improperness of business process and business information alignment,
- from the improperness of business process and application alignment,
- from the improperness of application and business information alignment.

They identified that misalignment occurs when the state of alignment splits up between the above mentioned layers. They introduced a set of questions which helps to detect misalignments between the different layers. The BITAM approach [7] dealt with business and IT architecture misalignment management. It was an engineering-principled misalignment detection and correction method what connected misalignment with architecture. It set up 12 steps through what misalignment can be detected and corrected. The aim of the twelve steps was fourfold:

- to capture the business goals and visions and to negotiate them between the stakeholders,
- to document the different architectures,
- to measure and assess misalignment, and
- to determine realignment strategies.

In the BITAM project a three-level model was defined, in which business model, business architecture and IT architecture were analysed, trying to define the signs of inappropriate mappings between the different layers. The goal of this method was to manage misalignment through fitting the different architecture layers, i.e. business architecture, IT architecture, application architecture and technical architecture.

The BISMAM approach [4] also connected misalignment to enterprise architecture. This model pointed out that enterprise architecture alignment is a prosperous way to implement misalignment detection, correction and prevention. It was a symptom-based approach defining a set of preliminary signs what forecasts the danger of misalignment. The model stressed that misalignment identification can be best executed by symptom and sign analysis. It provided an initial misalignment cause library and collected misalignment detection techniques. The main idea of the BISMAM model was that misalignment symptoms can be connected to possible misalignment therapies and vice-versa. The model defined the nomenclature of misalignment, created the general denotation of misalignment and provided several examples on misalignment classification.

Research plan

Building on the introduced literature body the research deals with EA-based misalignment analysis. With reference to the literature overview on misalignment management, it can be stated that misalignment can be identified by its symptoms. Since several misalignment symptoms occur in enterprise architecture models as well, architecture assessment is a possible way to detect the state of misalignment. The research aims therefore to analyse enterprise architecture models to identify different misalignment symptoms. The research attempts to focus on the following research questions:

- Which misalignment symptoms can be detected via enterprise architecture assessment?
- Which dimensions and layers are needed to examine in an EA model to detect misalignment symptoms?
- How do EA layers manifest the different misalignment symptoms?
- With which methods can we explore the different misalignment symptoms in different EA layers?

Based on the recent misalignment studies (especially on BITAM [7] and BISMAM [4] approaches) the research aims to propose a framework through which an organisation is able to detect different misalignment symptoms. The goal of the research is to create such methods, techniques, or even software tools which are able to support enterprise architecture-based misalignment assessment. These methods will help us to detect alignment problems between different organisational areas, architecture layers and alignment dimensions.

The expected framework will be applicable for theoretical as well as practical purposes. On the one hand it extends the available theoretical frameworks on misalignment symptom analysis. On

the other hand it contributes to organisational assessment toolkits in order to support misalignment detection in practice.

The proposed framework has several limitations. It is known that not all misalignment phenomena can be detected via enterprise architecture assessment, e.g. corporate culture or shared values. In addition, due to the lack of documentation, several symptoms will stay hidden. The undocumented symptoms cannot be identified with the proposed tool. Regarding these limitations the research does not aim to identify every misalignment symptom, but only the ones that can be detected via enterprise architecture models. Taking these limitations into consideration the research aims to use the proposed framework to 1) detect different misalignment symptoms, 2) indicate misalignment signs that cannot be detected via architecture assessment and 3) propose suggestions to solve the detected or indicated misalignments.

After setting up the framework we will test its correctness, relevance and operation. Different best of breed organisations will be examined in order to analyse their enterprise architecture models with the proposed framework. As a result case studies will be created on the outcomes of the architecture assessments. Case studies will introduce the operation and accuracy of the framework, as well as the results of the examined architecture models. Expected outcomes from the proposed research include:

- A framework which can support EA-based alignment assessment
- Case studies on the operation, correctness, relevance, accuracy and results of the framework
- Classification of different misalignment symptoms: EA indicators on misalignment, EA detection techniques, EA layer clashes

Conclusion

In this paper the concept of architecture assessment-based misalignment analysis was introduced. After emphasising the relevance of the topic a literature summary was given on strategic alignment, misalignment and enterprise architecture. In the next section the concept of architecture assessment-based alignment was presented, with special attention to the recent literature on EA-based alignment and misalignment analysis. Defining the main building blocks as well as introducing the recent studies on the topic enabled us to draw up the initial research plan and primary research questions what this research aims to address. In that section the proposed framework as well as the examination method were shortly presented, together with the expected outcomes and the possible limitations of the research.

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Time-Varying Coefficient Models and the Big Data Problem

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ABSTRACT

One of the most important goals of socio-economic modelling is to provide prognoses for the future, based on historical data, in order to support decision making in the present. In recent decades, the stochastic approach of economic data modelling has become predominant. The core idea behind this approach is that the empirical observations (time series) can be treated as a single realization of a theoretical and stochastic data generating process (DGP), and that model creation is the most likely (accurate) realization of the DGP and its parameters. One of the initial axioms of time series modelling was "the more the data, the better the model" (see e.g. Klein in [10]).

Introduction

In the most recent decade, the problem of big data has become more and more prevalent regarding economic time series modelling. The financial data being generated at an ever increasing and ever changing frequency requires the consideration of questions such as handling non equidistant time series, time series aggregation or the filtering of outliers. One of the greatest challenges of modelling long and volatile price data series is that the parameters of the data generating process can change even if there is no structural friction in the time series. Therefore, models with time-varying parameters have to be applied.

In the first section of this paper, we provide a brief summary of three frequently applied methods of parameter estimation used in time-varying time series modelling. Next, we review the possible problems that may occur when the estimated values are based on inadequate methods, by means of analysing a simulated data series. At last, we give an overview of the applicability of time-varying models for empirical financial time series by summarizing major observations drawn from the daily values of a forty years long time series of the Dow Jones Industrial Average (DJIA), one of the best known indices of the New York Stock Exchange (NYSE).

Techniques for Estimation

The core idea behind the models with time-varying coefficients (TVC) is that the volatility of the dependent variable can not only be caused by the change of the explanatory variables but it can also be a result of changes in the model's coefficients. Another beneficial feature of these models is that they enable the description of non-linear processes with only linear operators (for a more detailed description, see [5] or [13]). The simplest form of these models is

$$y_t = \beta_t \mathbf{x}_t + \varepsilon_t \qquad (1)$$

where y_t is the dependent variable, $\mathbf{x}_t$ is the vector of explanatory variables, ε_t is the random (residual) variable at time t ($t \in [1, 2, \ldots, T]$). From (1), it can be seen that unlike "typical" econometric models, this one contains a coefficient vector (β_t) that is not constant but changes with time. If the empirical time series are long enough (T is sufficiently large), it becomes possible to provide quality estimates for the time-varying parameter vector.

Here, we discuss a simplified version of the generic model: we do not include further explanatory variables but we apply the often used AR1 specification.

The simplified model, therefore, is

$$y_t = \mu + \beta_t y_{t-1} + \varepsilon_t \qquad (2)$$

We estimate the time-varying coefficients using three methods: Rolling regression, Recursive regression, and Kalman-filter. Although the technique of rolling regression is straightforward and methodologically simple, the related literature is inimical to this area, i.e. it is seldom used and researched for its lack of complexity, among other reasons. Its most frequent application is the technical analysis of financial time series - see [1], [3], or [14]. One of the first appearance of the idea can be read in [2].

Let's form subsamples with the constant length of n ($n < T$) from the time series with length T. Now, instead of (2), $T-n+1$ equations can be written (3):

$$\begin{aligned} y_t &= \mu + \beta_n^{roll} y_{t-1} + \varepsilon_t \quad t \in [1,2,\ldots,n] \\ y_t &= \mu + \beta_{n+1}^{roll} y_{t-1} + \varepsilon_t \quad t \in [2,3,\ldots,n+1] \\ &\vdots \\ y_t &= \mu + \beta_T^{roll} y_{t-1} + \varepsilon_t \quad t \in [T-n+1, T-n+2,\ldots,T] \end{aligned}$$

where each equation can be estimated individually, and we obtain the time-varying coefficients of the model as a result of these individual estimates:

$$\beta_t^{roll} = \left[-,-,\ldots,-,\hat{\beta}_n^{roll},\hat{\beta}_{n+1}^{roll},\ldots,\hat{\beta}_T^{roll}\right]' \qquad (4)$$

Note that the time series of the coefficients becomes shorter than the time series at hand (the "-" sign in (4) refers to this contraction). The extent of this reduction obviously depends on the length of the subsamples. In many respects, the method of recursive regression is very similar to the rolling analysis described earlier[3]. The means of estimation differs from the previous method by obtaining the regression coefficient using time series of increasing lengths. The time series of the timevarying parameter is obtained by estimating the β_t^{rec} parameters of the equations

$$\begin{aligned} y_t &= \mu + \beta_n^{rec} y_{t-1} + \varepsilon_t \quad t \in [1,2,\ldots,n] \\ y_t &= \mu + \beta_{n+1}^{rec} y_{t-1} + \varepsilon_t \quad t \in [1,2,\ldots,n+1] \\ &\vdots \\ y_t &= \mu + \beta_T^{rec} y_{t-1} + \varepsilon_t \quad t \in [1,2,\ldots,T] \end{aligned} \qquad (5)$$

from which we construct

$$\beta_t^{rec} = \left[-,-,\ldots,-,\hat{\beta}_n^{rec},\hat{\beta}_{n+1}^{rec},\ldots,\hat{\beta}_T^{rec}\right]' \qquad (6)$$

where a reduction is present in the length of the parameter vector, similar to the case of rolling regression. (Although it is not explicitly referred to later in this paper, it can be easily seen that $\beta_n^{roll} = \beta_n^{rec}$ but – not considering the deterministic case – $\beta_{n+i}^{roll} \neq \beta_{n+i}^{rec}$.)

The classical solution of time-varying coefficient models is well-known in scientific circles since Kalman's article ([8]), and Kalman-Bucy ([9]). The authors' core idea was to extend the time-varying coefficients' equation to a state space model, that can be estimated with Kalman-filter. An overview about state-space models can be read in Varga ([13]) or in Goureroux-Monfort's ([4]) book. State-space models are designed to describe linear systems and they include three groups of variables: input, state and output variables. The output variables are the observed variables, i.e. the time series to be modelled. The system consists of two parts: the state and the observation equations, where the latter one connects the state and observation variables. The general form of the system is

$$\begin{aligned} \xi_{t+1} &= \mathbf{F}_t \xi_t + \mathbf{v}_t \\ \mathbf{y}_t &= \mathbf{A}_t' \mathbf{x}_t + \mathbf{H}_t' \xi_t + \mathbf{w}_t \end{aligned} \qquad (7)$$

where ξ_t is the state vector, $\mathbf{y}_t$ is the vector of endogenous variables, $\mathbf{x}_t$ is the vector of exogenous variables, $\mathbf{v}_t$ and $\mathbf{w}_t$ consist of the ordinary white noise variables, therefore

$$E\left(\mathbf{v}_t \mathbf{v}_s'\right) = \begin{cases} \mathbf{Q}_t, \text{ if } t = s \\ 0 \text{ otherwise} \end{cases}$$

$$E\left(\mathbf{w}_t \mathbf{w}_s'\right) = \begin{cases} \mathbf{R}_t, \text{ if } t = s \\ 0 \text{ otherwise} \end{cases}$$

hold.

[3] For the detailed description of this technique, see Maddala (2004). The generally used tests of model diagnostics, such as CUSUM, CUSUMSQ, are based on recursive regression.

According to Kalman's solution, we obtain the unconditional expected value and variance with regard to the first state:

$$\hat{\boldsymbol{\xi}}_{1|0} = E(\boldsymbol{\xi}_1)$$
$$\mathbf{P}_{1|0} = E\left\{\left[\boldsymbol{\xi}_1 - E(\boldsymbol{\xi}_1)\right]\left[\boldsymbol{\xi}_1 - E(\boldsymbol{\xi}_1)\right]'\right\}$$

Following this, the parameter estimation is conducted in two steps. In the first step, we update the estimations regarding the state (obtaining the "new" conditional expected value)

$$\begin{aligned}\hat{\boldsymbol{\xi}}_{t+1|t} &= \mathbf{F}_t\hat{\boldsymbol{\xi}}_{t|t-1} + \mathbf{K}_t\mathbf{e}_t\\ \mathbf{e}_t &= \mathbf{y}_t - \mathbf{A}_t'\mathbf{x}_t - \mathbf{H}_t'\hat{\boldsymbol{\xi}}_{t|t-1}\\ \mathbf{K}_t &= \mathbf{F}_t\mathbf{P}_{t|t-1}\mathbf{H}_t\boldsymbol{\Sigma}_t^{-1}\\ \boldsymbol{\Sigma}_t &= \mathbf{H}'\mathbf{P}_{t|t-1}\mathbf{H}_t\mathbf{R}_t\end{aligned} \tag{8}$$

In the next step, the variance can be updated.

$$\mathbf{P}_{t+1|t} = \mathbf{F}_t\mathbf{P}_{t|t-1}\mathbf{F}_t' - \mathbf{K}_t\boldsymbol{\Sigma}_t\mathbf{K}_t' + \mathbf{Q}_t \tag{9}$$

Now we can construct the time-varying coefficients from the estimated values in the $\mathbf{P}_t$ covariance matrix and the state vector.

In this study, we are applying a very simple single-variable state-space model where the change of state is a first order autoregressive process (as earlier), and the observed variable (i.e. the time series at hand) can be written as the sum of a state and a white noise:

$$\begin{aligned}s_{t+1} &= \mu + \beta^{kalman}s_t + v_t\\ y_t &= s_t + w_t\end{aligned} \tag{10}$$

Thus, (7) can be written as (11):

$$[y_t] = \mu + [y_{t-1}]\left[\beta_t^{kalman}\right] + [\varepsilon_t] \quad \mathbf{Q} = \begin{bmatrix}\sigma_\varepsilon^2 & 0\\ 0 & \sigma_v^2\end{bmatrix}$$
$$\beta_t^{kalman} = [1]\left[\beta_{t-1}^{kalman}\right] + v_t$$

By applying the two-step method described above, we can now determine the time-varying coefficients. In the following two sections of this paper we are performing the estimation methods we have discussed above, first, on a simulated, then on an empirical data set, in order to compare the methods of time-varying coefficient estimation.

Estimating the coefficients

In order to compare the different methods of time-varying parameter estimation with regard to bias and efficiency[4], first we are testing the results of the estimation methods on a simulated data set. Let

$$\begin{aligned}y_t &= \mu + \beta_t y_{t-1} + \varepsilon_t\\ \beta_t &= (1+\alpha t) + u_t\\ \varepsilon_t &\sim N\left(0, \sigma_\varepsilon^2\right)\\ u_t &\sim N(0;0,001)\end{aligned} \tag{12}$$

be our simulated model with properties similar to the aforementioned models where $t = 1, 2, \ldots, 300$.

Let us generate different time series (observation variables) by changing the σ_ε^2 variance of the white noise in the first equation and by changing the α parameter that determines the time-varying coefficient. For the latter parameter, we examined three possibilities:

a) $\alpha = -0.0001$
b) $\alpha = -0.002$
c) $\alpha = 0.001$

In case a) the sequence of the time-varying coefficients descends at a slow pace with time and its expected value reaches 0.9 at the end of the examined period. In case b) the coefficient values decrease faster. In both a) and b) cases the simulated time series is stationary, however, y_t is explosive in case c). Let's analyse these three scenarios with different residual standard deviations ($\sigma_\varepsilon \in [0,5;1;10]$). This results in nine time series with 300 elements each, with every time-series having a different parameter setting. Following this data generation, we estimate the β_t parameters for each time series with rolling and recursive regression, as well as with Kalman-filter. Note, that the efficient estimation of the parameters of both rolling

[4] For the requirements regarding estimation techniques see Greene (2008) or Hunyadi (2001)

and recursive regression requires sufficiently long time series, which results in a shorter sequence of estimated regression coefficients. In this analysis, we are comparing the two hundred estimated parameter values between t=101 and t=300. This procedure can be repeated several times (in our case, a hundred times) for each of the nine possible parameter pairs, from which we obtain the estimated time-varying parameter sequence related to the simulated data set. Simulation and parameter estimation were performed using EViews6. For the source code please see the Appendix. Daniel Kehl, assistant professor of PTE KTK and Viktor Várpalotai, scientific colleague of PTE KTK deserve special acknowledgement for their help in the code writing process.

Below there is a visual representation of the parameter estimation regarding the time series with the $\alpha = -0.0001; \sigma_\varepsilon = 1$ parameter setting. On the Figure 1 marks black solid line the theoretical time-varying parameter, and the coloured fields represent the density function of the simulated parameters.

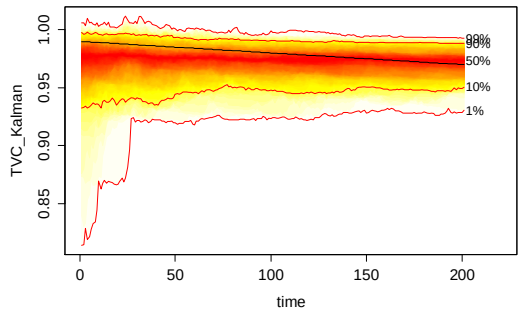

Figure 1. Theoretical time-varying parameters and their estimated values obtained from the state-space model

Table 1: Some of the most important basic statistics of the TVC models

Simulated Model Parameters	Rolling Regression	Recursive Regression	State-space model
$\alpha = -0.0001; \sigma_\varepsilon = 1$	$\overline{MSE} = 0.05393$ $SD(MSE) = 0.02701$	$\overline{MSE} = 0.02863$ $SD(MSE) = 0.01945$	$\overline{MSE} = 0.01824$ $SD(MSE) = 0.01633$
$\alpha = -0.0001; \sigma_\varepsilon = 0.5$	$\overline{MSE} = 0.05218$ $SD(MSE) = 0.02613$	$\overline{MSE} = 0.02740$ $SD(MSE) = 0.02144$	$\overline{MSE} = 0.02045$ $SD(MSE) = 0.02161$
$\alpha = -0.0001; \sigma_\varepsilon = 10$	$\overline{MSE} = 0.05339$ $SD(MSE) = 0.02341$	$\overline{MSE} = 0.02909$ $SD(MSE) = 0.02103$	$\overline{MSE} = 0.02054$ $SD(MSE) = 0.01661$
$\alpha = -0.002; \sigma_\varepsilon = 1$	$\overline{MSE} = 0.11329$ $SD(MSE) = 0.03713$	$\overline{MSE} = 0.25126$ $SD(MSE) = 0.05700$	$\overline{MSE} = 0.24918$ $SD(MSE) = 0.05090$
$\alpha = -0.002; \sigma_\varepsilon = 0.5$	$\overline{MSE} = 0.09759$ $SD(MSE) = 0.02756$	$\overline{MSE} = 0.24206$ $SD(MSE) = 0.05468$	$\overline{MSE} = 0.24487$ $SD(MSE) = 0.04781$
$\alpha = -0.002; \sigma_\varepsilon = 10$	$\overline{MSE} = 0.10591$ $SD(MSE) = 0.03253$	$\overline{MSE} = 0.25615$ $SD(MSE) = 0.05320$	$\overline{MSE} = 0.25147$ $SD(MSE) = 0.05065$
$\alpha = 0.001; \sigma_\varepsilon = 1$	$\overline{MSE} = 0.00222$ $SD(MSE) = 0.00035$	$\overline{MSE} = 0.00242$ $SD(MSE) = 0.00035$	$\overline{MSE} = 0.00571$ $SD(MSE) = 0.00463$
$\alpha = 0.001; \sigma_\varepsilon = 0.5$	$\overline{MSE} = 0.00276$ $SD(MSE) = 0.00388$	$\overline{MSE} = 0.00295$ $SD(MSE) = 0.00387$	$\overline{MSE} = 0.00918$ $SD(MSE) = 0.02139$
$\alpha = 0.001; \sigma_\varepsilon = 10$	$\overline{MSE} = 0.00389$ $SD(MSE) = 0.00759$	$\overline{MSE} = 0.00407$ $SD(MSE) = 0.00751$	$\overline{MSE} = 0.00424$ $SD(MSE) = 0.00307$

The results of the parameter estimation methods performed on the simulated time series with each model setting can be examined by comparing the estimated $\beta_t^{roll}, \beta_t^{rec}, \beta_t^{kalman}$ time-varying parameters with their distance from the hypothetical values – see the second equation of (12). We selected the well-known index of Mean Squared Errors (MSE) as the way to compare the three methods, i.e. we measure the distance between the actual (simulated) time series parameters and the ones that were estimated using the methods discussed earlier. For some of the most important results, see Table 1.

As we can see, each estimation technique performs differently across the parameter combinations. In the approximity of the unit root ($\beta_t \approx 1$) the state-space model gives the most accurate estimated coefficient sequence; however, when the time series is stationary and volatile the results of the rolling regression technique fall closer to the parameters used in the simulation process. Based on the results in Table 1, we can conclude that there is no unequivocal order of "goodness" between the different methods of parameter estimation concerning TVC models

TVC models

In the last section of this study, we examine the properties of the aforementioned time-varying coefficient time series models under real-life conditions. The empirical time series, in our analysis, consists of 10,324 observations, the daily closing "prices" of the Dow Jones Industrial Average (DJIA) index of the New York Stock Exchange between January 5th, 1970 and July 30th, 2009. Figure 2 depicts the index values in the given time horizon.

It was an intentional decision to select a time series with sufficient length, dramatic changes in its shape and structure and that cannot be efficiently modeled using the standard statistical methods applying only constant coefficients. [5] From the analysis' point of view, it should be noted that the time series is not stationary, despite the fact that the autoregressive coefficient of the AR1 model that was fitted to the empirical values is within the unit circle – the estimated value of 0.999912 is presumably a result of a spurious regression

Figure 2. Daily closing prices of the DJIA between 1970 and 2009

After applying the Ordinary Least Squares Method to obtain parameter estimates on varying time horizons, the coefficient sequence of the rolling and the recursive regression models take the shape as depicted below (the parameter sequence consists of ten thousand estimated values due to the reasons described earlier):

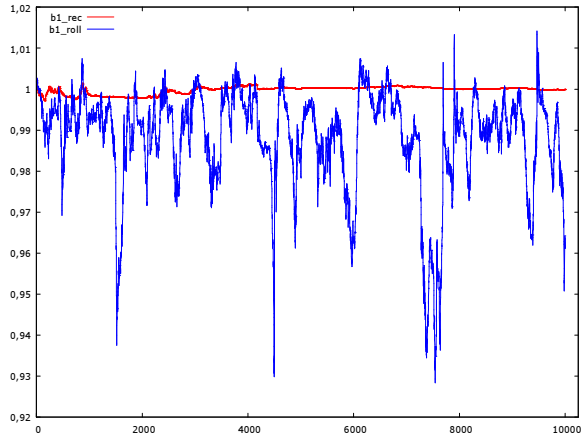

Figure 3. The estimated parameter values varying with time, using rolling and recursive regression

As it can be seen, the general observations that we made earlier also apply for the empirical time series: the parameters that have been estimated using rolling regression have a greater variability and, in some cases, they can exceed the "sensible" limit of +1 (which would mean that the original time series

[5] For details about stochastic time series models and the analysis of their specifications see Rappai (2013).

is explosive, i.e. share prices would increase to infinity). The lesson is very powerful if we compare the previous estimation results with the TVC coefficients that were gained using the Kalman-filter.

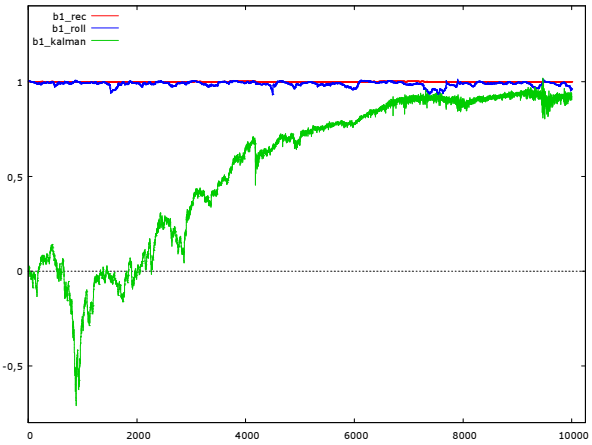

Figure 4. . The estimated parameter values varying with time, using all three methods

As one can easily observe, the parameters that were estimated using the state-space model approach the constant parameter model's estimated value from "afar", i.e. the relatively uneventful period of approximately the first ten years can be described with low, many times negative, parameter values.

Conclusions

It is very likely that trends are present in economic, mostly financial time series. Also, it isn't unlikely that the visual depiction of long or high frequency time series indicates an explosive process (e.g. exponential growth), but the regression coefficients of the standard, stochastic time series models with constant parameters provide no evidence of this tendency. Naturally, having no logical explanation for exploding processes is also bothersome when unit root tests suggest there ought to be one. Both of these problems can stem from using "ordinary", constant parameter models to emulate data generating processes that are equipped with time-varying parameters.

We have shown that there are simple and also more complex techniques to estimate time-varying parameters, and that the choice between these methods is not arbitrary. We have demonstrated that rolling or recursive regression is useful approaches when the parameter changes are relatively small and stable. However, when parameter changes are drastic or the model blows up with time, time-varying estimation is more reliable when it is based on state-space models.

Altogether, we are emphasizing the importance of making a thorough choice between model specifications and estimation techniques, especially when the empirical observations and the estimated values show considerable discrepancy.

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Appendix

The EViews6 code used for simulation

```
' Simulation: TVC models
wfcreate(wf=gyor) u 0 300
matrix(300,100) b1_roll
matrix(300,100) b1_rec
matrix(300,100) b1_kalman
vector(300) v1

' Parameters
scalar alpha = 0.0001
scalar mu = 0
scalar sigma = 1
series b1
b1 = (1 - alpha*@trend)
for !j=1 to 100

' Generating random series
smpl @all
series eps
eps = sigma*@rnorm
series u
u = @rnorm
series y
y = 0
smpl 1 @last
y = mu + (b1 + 0.001*u) * y(-1) + eps
vector(1) svec1
svec1.fill 0.5

'State-space model
sspace ss
ss.append @signal y = c(1) + b1_hat*y(-1) + [ename = e1]
ss.append @state   b1_hat=b1_hat(-1) + [ename = e2]
ss.append @evar  var(e1) = exp(c(2))
ss.append @evar  var(e2) = exp(c(3))
ss.append @mprior svec1
ss.ml
ss.makestates(t=smooth) ss_*
vector v1=@convert(ss_b1_hat)
colplace(b1_kalman,v1,!j)

'Rolling and recursive regression
for !i = 100 to 300
smpl !i-99 !i
 ls y c y(-1)
 b1_roll(!i,!j) = @coefs(2)
smpl 1 !i
 ls y c y(-1)
 b1_rec(!i,!j) = @coefs(2)
next
next
```

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Matrix-based time/cost trade-off methods

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ABSTRACT

Due to the effects of the crisis, budgets of present as well as future projects are decreasing steadily. In this study a new exact method is introduced for minimizing cost and time demands and combining time/cost trade-off methods and finding alternative project implementation techniques. This method supports not only the traditional but also the agile project management. Furthermore these methods can be used not only in case of network planning, but also for matrix-based project planning and solving trade-off methods. This study is a full paper version of the conference presentation, which was presented at the 30th Annual Hungarian Operation Research Conference.

Introduction

In the course of planning and implementation of the projects it occurs frequently that after the preliminary planning of a project with optimal resources allocation to be implemented with minimal total costs cannot be realized at a price which is expected by the inviter of the tender. In this case traditional time/cost trade-off methods cannot find a feasible solution, because every project plan will be overbudgeted. Thus alternative project implementations should be defined. In this study a novel framework algorithm is introduced, where traditional time/cost trade-off methods and finding alternative project implementation techniques are combined based on matrix-based project network planning methods.

Background of the study, cost and time minimising methods: In these chapters different kinds of cost and time minimizing and scheduling algorithm are shown. Most of them based on network planning techniques; however matrix-based methods can also be used for decreasing cost demands of the projects.

Time/cost and time/resource trade-off methods

The main proposal of the time/cost and the time/resource methods that there is a deterministic [1] or stochastic function [2] between duration time of activities and their cost or resource demands. Minimal project duration can be calculated in a very easy way: the project network should be scheduled as crash duration time (see left side of the Fig. 1) in case of every activity (see right side of the Fig. 1); however project costs are unnecessarily increased. Therefore in these methods two different kinds of target function can be defined:

- Minimize total project time (TPT) or duration time of the project with minimal increase of cost and/or resources.
- Minimize total project cost (TPC).

In this study only the first target function is considered. When using traditional project scheduling like CPM/PDM (see [3,4]) methods the scheduled duration times are considered as normal duration times of tasks. In this case minimal direct cost is assumed. Every decrease or increase of duration time causes increase of direct cost. There are minimal or crash duration times for every task. The cost/resource demands of crash durations are crash costs/resources (see the left side of the Figure 1).

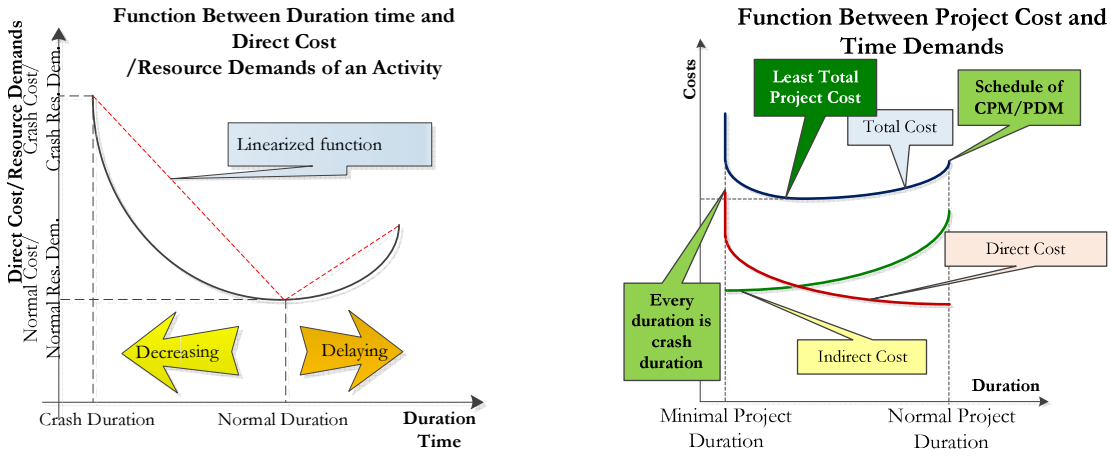


Figure 1. Cost/time and resource/time functions

The minimum value of the direct cost curve is in the normal duration time of the project. The decrease of the TPT infer the increase of direct cost. (More resources and advanced technologies are needed.) The minimal TPT is the bound of time reduction. Time-cost trade-off methods usually consider the interval normal and minimal TPT; however the delays of the project can also generate the increase of direct cost. While direct cost can increase in case of decreasing TPT, the indirect cost will decrease if the project can be completed shorter than the normal duration time (see the right side of the Fig. 1). Therefore time/cost trade-off methods can be used to determine minimal TPT and minimal TPC. When using this method the initial solution is the schedule result of CPM or PDM method, where TPT will be the normal duration time of the project. This problem can be solved by minimum cost flow [5], cost scaling capacity [6,7] scaling [8,9], algorithms. The running time of enhanced capacity scaling algorithm is: $O((m \log n)\ (m + n \log n))$, where m is the number of arcs in an activity on arc (AoA) project net, n is the number of nodes (events in a AoA net.)

According to time/cost and time/resource trade-off methods a new schedule of original project can be determined. In case of proposed new schedule, every task will be completed, but duration time of critical tasks will be decreased as much as possible. Unfortunately, against the cost minimising, the least total project cost may be higher than the planned project budget. In this case there are three options: we give the implementation of the project up or we realize the project with losses or we replace some activities by new ones in order to reduce the costs [10]. In the course of our analysis we will not consider the first option any longer since in this case we lose this business and there is no sense in making any further optimal resource planning. The second option is sometimes undertaken when they estimate that in spite of the initial losses the deficit will return during the implementation of the subsequent projects. In this case the allocation of the resources which is optimal for the given target function involving a minimal total cost shall be determined.

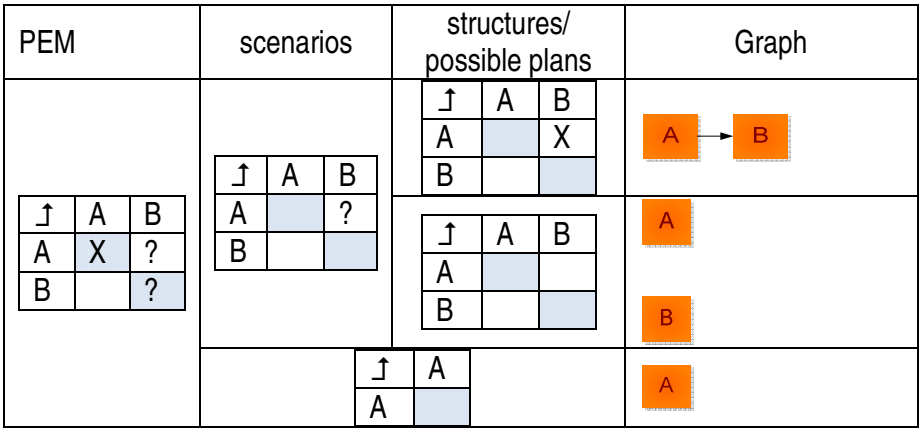
Alternative implementation can mean alternative task completions (see i.e. [11,12]), alternative project structures (see i.e. [13]), or alternative project scenarios (see i.e. [14]). Finding alternative implementation can be based on also matrix- and network-based project planning techniques; however it is shown that the matrix-based method can combine both time/cost trade-off and finding alternative implementation techniques.

Matrix-based project planning methods

Besides network planning techniques, matrix-based methods can also be used for project planning and scheduling problems. Matrix-based methods can describe the importance or probability values of task completions thus determining and ranking the importance or probability of possible project scenarios

and project structures. By using matrix-based project planning methods the main challenge is to serve management claims. Supporting the logic planning, matrix-based methods can be applied besides of traditional project planning techniques, aiming to meet manageement claims. Up to the present there were no fast and exact algorithms to select and order the first *n* possible (like first *n* least cost, least duration etc.) project plans. The under publication paper [16] introduces new algorithms to select the best *n* piece (either most probable, shortest duration or lowest budgeted) project plans regarding (time/cost/ resource) constraints. Possible projects can be determined in two steps. First one should decide *which tasks should be executed*. Table 1. shows that completion of Task B was uncertain. Therefore two *project scenarios* can be defined, where Task B is executed and where Task B is ignored. Secondly, if we decide that Task B will be completed, we should decide *how to execute* these project scenarios: parallel or sequential. So we can say that there are two *possible project plans* or *project structures*. If Task B will not be completed, the question of 'how to complete Task A and Task B' is irrelevant, therefore only one project structure exists where we complete only Task A.

Table 1.: PEM (Project Expert Matrix) – possible project scenarios and project plans
("X" certain, "?" uncertain completion/relation)



In that study four different kinds of scores are considered. These score values can be attached either to the project scenarios (noted by capital letters) or project structures (noted by lower case):

a.) Score value of task completion/task dependency (*S*,*s*) describing either possible task completion or dependency. This value can mean

- Either probability value, where 1 means certain, between 0 and 1 means uncertain realisation
- or importance value of the task completion/ dependencies, where 1 mean mandatory, between 0 and 1 means compulsory realisation.

b.) Score value of project scenario/project structure (*P*,*p*) describing either possible project scenario or project structure. This value can mean

- Either probability value if score values of task completions/task dependencies are probability values. In this case the probability values of project scenario/project structure is the production of probability values of task completion/task dependencies. (see Figures 2-3)
- or importance value if score values of task completions/task dependencies are handled as importance values. In this case the importance values of project scenario/project structure are the sum of probability values of task completion/task dependencies (see Figure 4)
  - Score value of project duration time (T,t),
  - Score value of resource demands (R,r) and
  - Score value of cost demands (C)

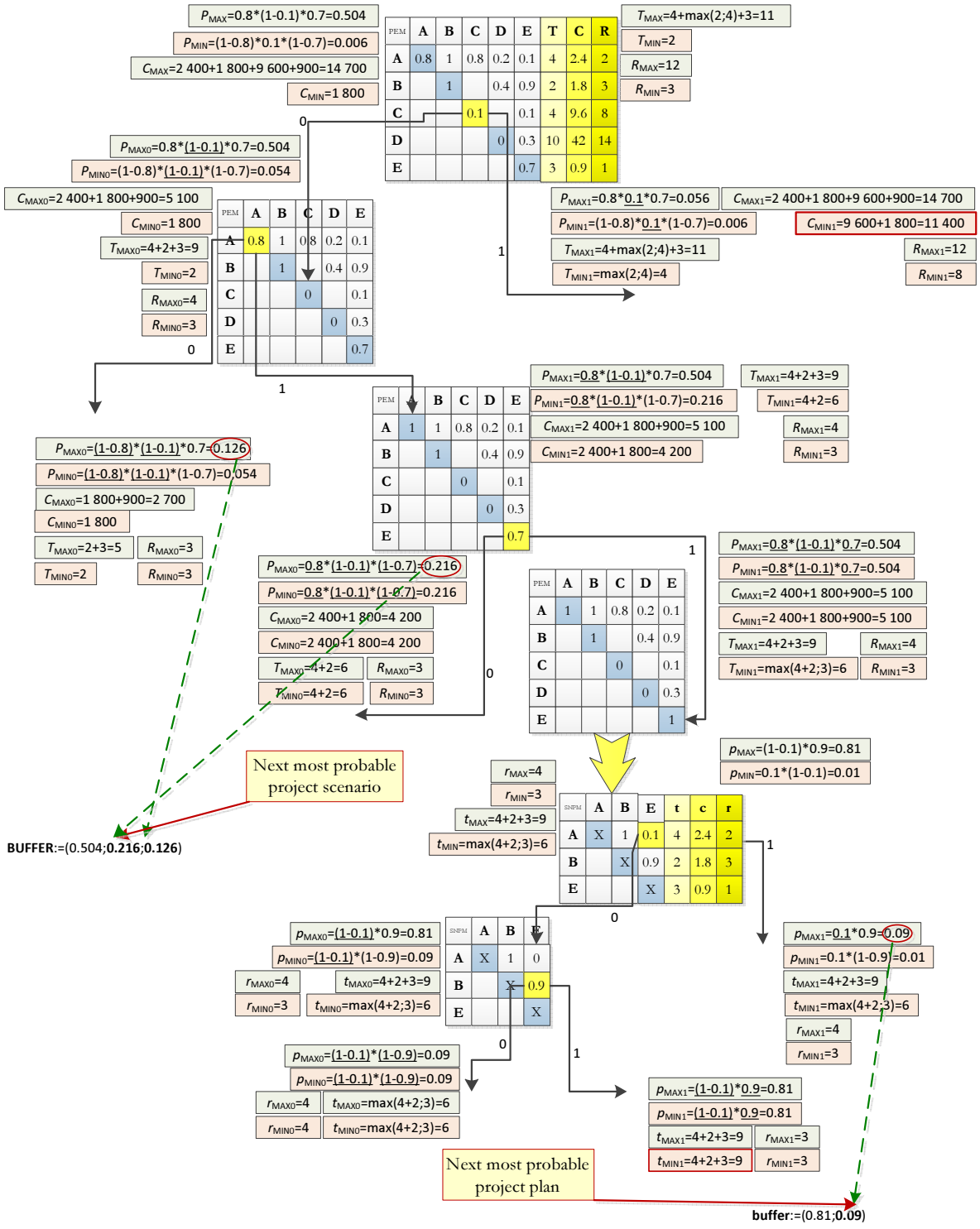


Figure 2. Specifying possible project structures (tasks: A,B,C,D,E; time demands: T=(4;2;4;10;3) weeks; C=(2.4;1.8;9.6;42.0;0.9) x 1 000 €; R=(2;3;8;14;1) employees)

In the following example the goal was to find the most probable project structure within a most probable project scenario, where the cost constraint is c_{COST}:=6.000 €; the resource constraint is c_{RES}:=4 employees; and time constraints is c_{TIME}:=8 weeks. The algorithm uses a Project Expert Matrix, where time, cost and resource demands are also noted. In every step there are two possible decisions: either realise (1) or ignore (0) task completion (in project scenarios) or task dependencies (in project structures).

When evaluating the minimal and maximal score values in binary decision tree the overbudgeted and too long project scenarios can be cut (see thick bordered score values in Figure 2)

The most probable project plan cannot be finished within the time constraint; therefore, the next most probable project plan should be evaluated. If there is no feasible project plan within the most probable project scenario, the next most probable project scenario should be considered (see Figure 3).

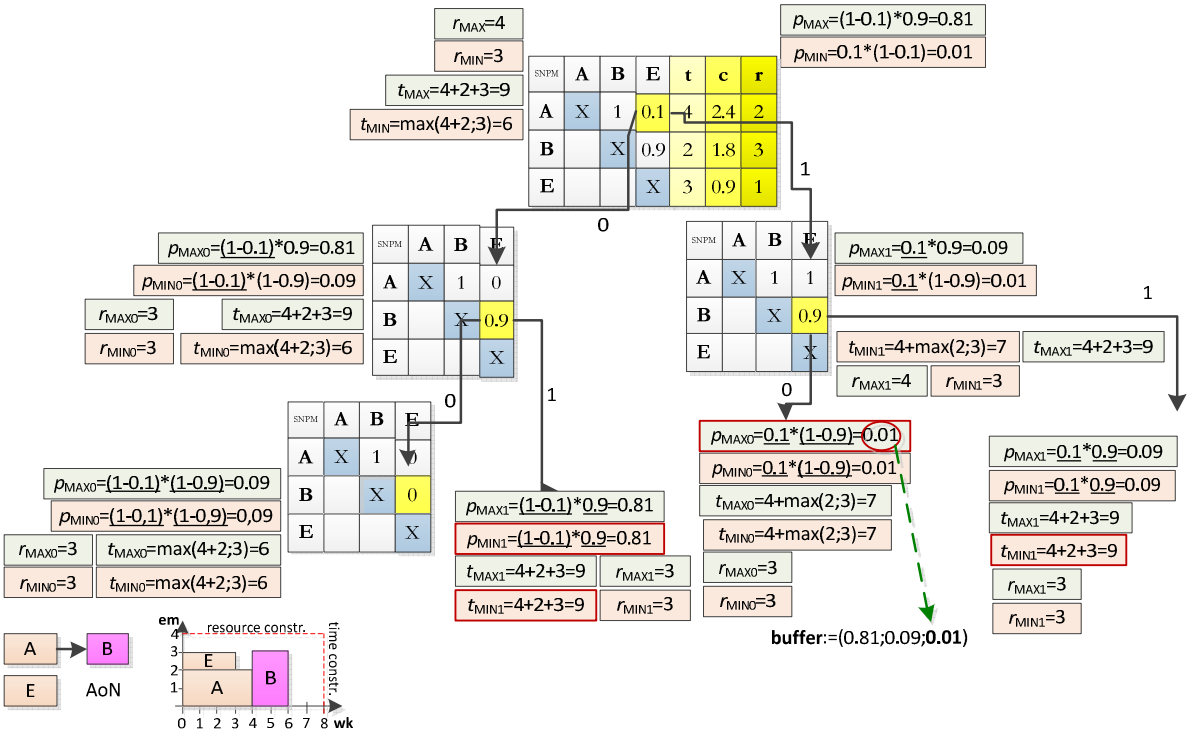


Figure 3. Specifying possible project structures (tasks: A,B,E; time demands: t=(4;2;3) weeks; c=(2.4;1.8;0.9) x 1 000 €; r=(2;3;1) employees)

This method called as EPR (Exact Project Ranking) method (see [16,17]). If the number of uncertain tasks is t and the number of uncertain dependencies is k then the most probable (most desired) project plan within a most probable (most desired) project scenario can be calculated within $O(k+t)$ step. The first n most probable (most desired) project plans can be specified within $O(n(k+t))$ step.

While this framework algorithm can find feasible, the most probable project scenarios, do not handle alternative task implementations, and do not integrate time/cost trade-off methods. The novelty of this study is that the proposed modified EPR algorithm can combine the alternative task implementation techniques and time/cost trade-off methods extending the consideration of uncertainty task completion and uncertainty task dependencies.

Extended Project Expert Matrix

If completions of the tasks or (sub) projects are depending on each other than Boolean (and, or, exclusive or (xor) etc.) operators are used for

characterizing the dependencies of task/subproject completions. This matrix-based approach is the extended Project Expert Matrix: xPEM [7] Exclusive or (xor) operators can be used for representing alternative task completion (see Table 2). In this example four different kinds of project scenarios can be calculated, where either task ABD, ACD, AB or AC will be realised. In this study different kinds of algorithms are combined in order to reduce time and/or cost demands.

Table 2. PEM (extended Project Expert Matrix) – possible project scenarios and project plans

("x" denoted as exclusive or operation)

xPEM	A	B	C	D	Time	Cost
					Demands	
A	1	0,2	0,2	1	4 wks	50 000 €
B		0,6 x		1	3 wks	25 000 €
C			x 0,4	1	2 wks	20 000 €
D				0,3	1 wks	12 000 €

Combining cost minimizing methods

In the first step the representation of this problem will be shown. After that a modified framework algorithm will be introduced.

Problem representation

The **m**odified e**x**tended **P**roject **E**xpert **M**atrix can represent the alternative task completions (see Table 2) and normal and crash demands (see Fig. 4). In this way both cost minimising and finding alternative project completion methods can be represented in the modified xPEM matrix. Score values of task completion/task dependency can mean either probability or importance values (see Fig. 4). If score values of task completion mean probability value than the score value of a probable task completion is the production of the probability of task completion, but if score values of task completions handled as importance values, than score value of a possible project scenario is the sum of importance values of task completions.

Score values of task completion and task dependencies can be defined, but if there is no a priori information dependencies/completions can be undefined. In this case undefined score values are handled as indifferent score values. It means we cannot order the project scenario or project structures by priorities or probabilities.

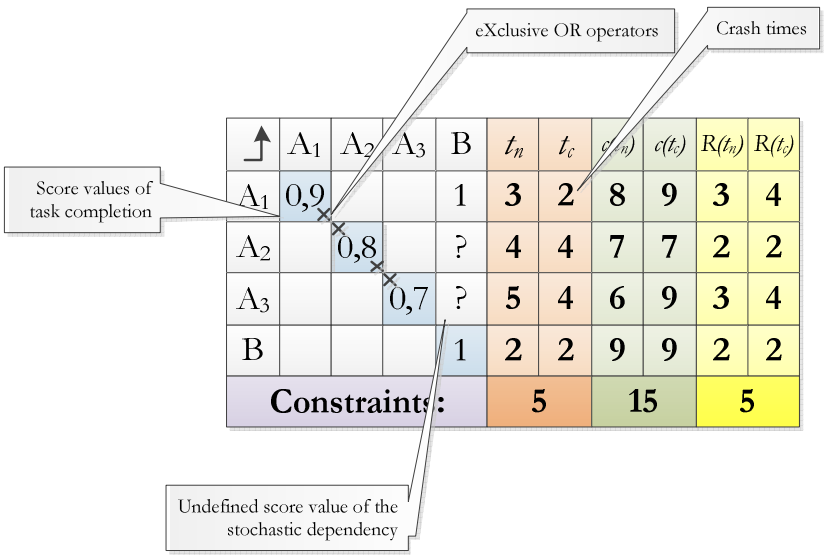


Figure 4. modified extended Project Expert Matrix (t_n normal, t_c crash duration times; $c(t_n)$ normal, $c(t_c)$ crash (direct) cost; $R(t_n)$ normal, $R(t_c)$ crash resource demands)

Figure 4 shows a stochastic project plan. Since task B is a mandatory task completion (importance value is 1), the possible project scenarios are: A_1B, A_2B, A_3B, where the score value of possible project scenarios are the sum of the score values of task completion, therefore: $P_{A_1B}=1.9>P_{A_2B}=1.8>P_{A_3B}=1.7$.

If the first scenario will be selected, then the task completion will be sequential, while a second and third project scenario can be completed sequentially, but also in parallel. Parallel completion needs more resources but less time demands than sequential realises.

Specification of framework algorithm

In the first step the minimal and maximal values of score values must be specified. This specification will be different from the formerly introduced. EPR algorithm, therefore this algorithm will be called *modified EPR algorithm*. In this case the minimal/maximal importance value of project scenario will be the minimal/maximal sum of importance value of task completions. Minimal duration time (T_{MIN}) will occur, if every uncertain task completion and every uncertain dependency are ignored, and every duration time will be crash duration. Similarly maximal duration time (T_{MAX}) will occur, if every uncertain task completion and every uncertain dependency are realised, and every duration time will be normal duration. The maximal (direct) cost demand (C_{MAX}) will appear if every uncertain task are completed, and every task duration time is reduced to crash duration. Similarly the minimal (direct cost) (C_{MIN}) will occur if every uncertain task is ignored and every other task duration are normal duration. The maximal resource demands (R_{MIN}) will be minimal if every uncertain task completion is ignored, but every uncertain dependency will be realised and when calculating maximal resource demands the normal resource demands of the tasks are considered. In contrast, in case of as-soon-as possible scheduling, the maximal resource demands (R_{MAX}) will be maximal, if every uncertain task completion are realised, but every uncertain dependency will be ignored (see Fig. 5) and when calculating maximal resource demands the crash resource demands of the tasks are considered.

The second step is to specify constraints and the target function, where this function can be the selecting feasible most desired (most important) project scenario or less duration/less cost demanded project structures. If a minimal score values of durations or direct costs are greater than the constraints, that this scenario is infeasible (see bordered, bold minimal score values in Fig. 5) and this scenario can be cut from the decision tree.

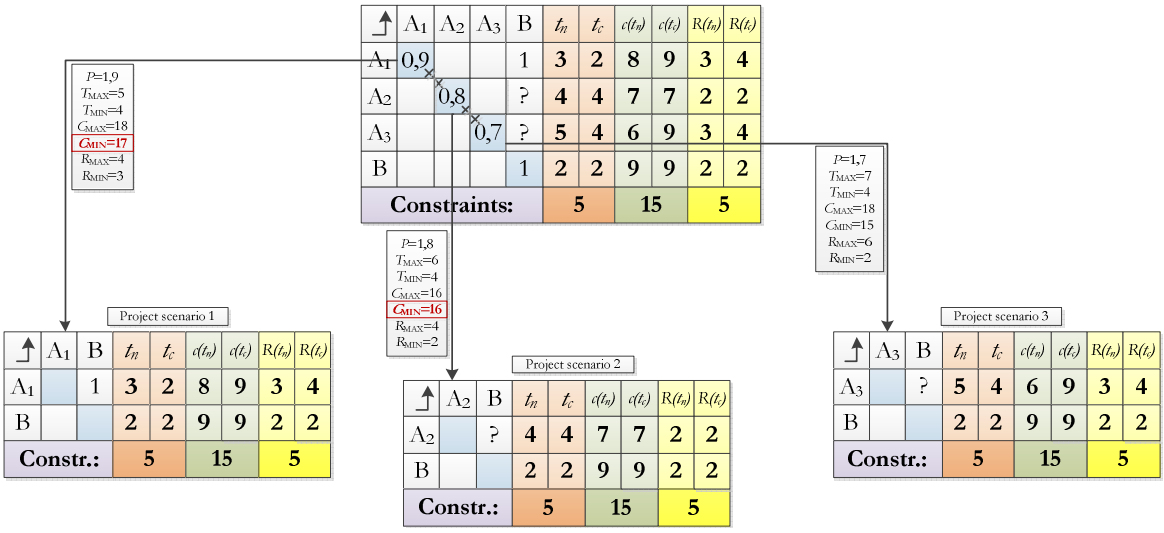


Figure 5.: Selecting feasible project scenario(s) (t_n normal, t_c crash duration times; $c(t_n)$ normal, $c(t_c)$ crash (direct) cost; $R(t_n)$ normal, $R(t_c)$ crash resource demands)

Similarly when finding feasible project structures, if a minimal score values of durations or direct costs are greater than the constraints, than this project structure is infeasible (see bordered, bold minimal score values in Fig. 6.) and this structure can be cut from the decision tree. Using this modification the formerly introduced EPR framework algorithm can be applied. And the run time will be: $O(n(k+t)+nC)$, where n is the top n feasible project structure according to the given target function; t is the number of uncertain task completion, k is the number of uncertain task dependency and C is the run time of time/cost trade-off method.

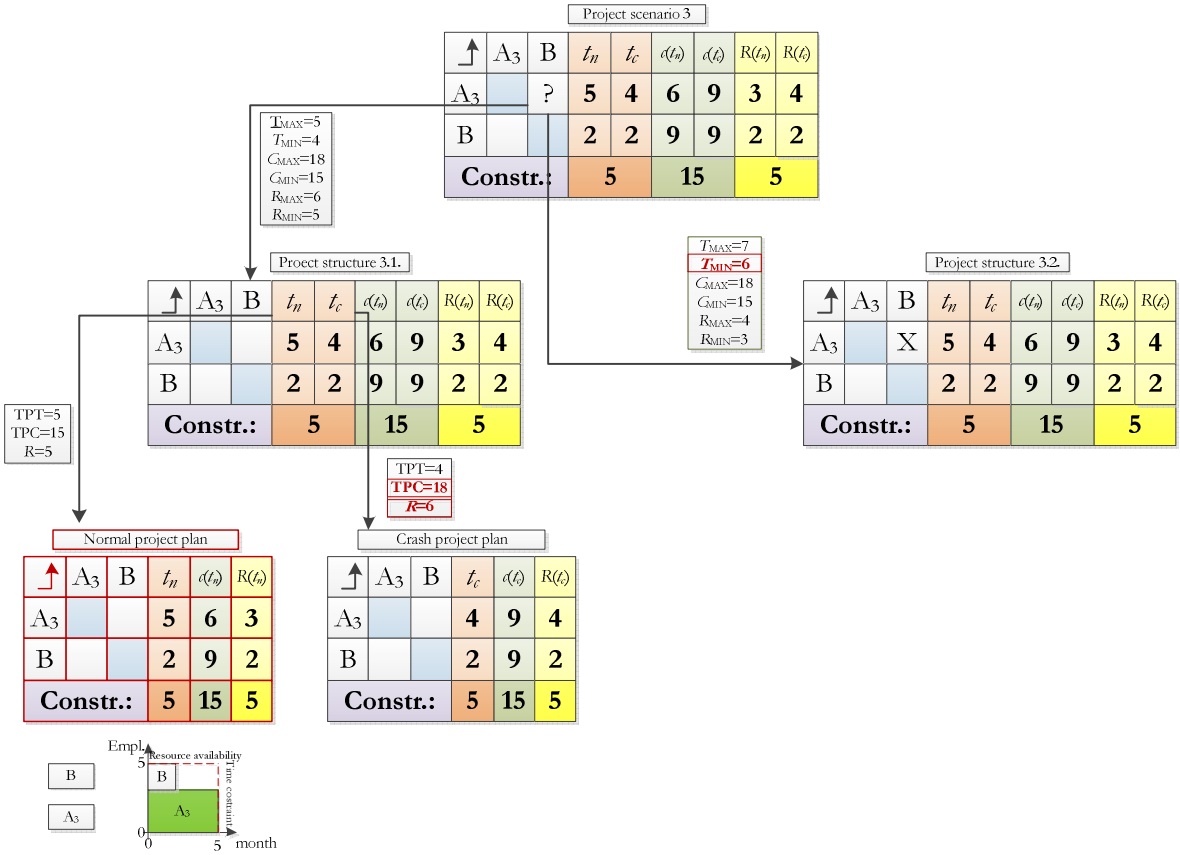


Figure 6.: selecting feasible project structure(s) (t_n normal, t_c crash duration times; $c(t_n)$ normal, $c(t_c)$ crash (direct) cost; $R(t_n)$ normal, $R(t_c)$ crash resource demands; TPT=Total Project Time, TPC=Total Project Cost, "X" mean realised dependency)

Time/cost trade-off and resource allocation methods should be run after a project structure has been specified.

Simulation results

In this chapter tests modified EPR algorithm in large, complex projects. 60 by 60 upper triangle matrices are generated, where every cell in upper triangle is randomised number between 0 and 1. The diagonal values mean uncertainty of task completion, where 0 means: these tasks will be ignored, 1 means: these tasks will be completed and between 0 and 1 means that these tasks either can be ignored or can be completed considering the time, cost and/or resource constraints. If a task completion is ignored, the score value of completion will be 0. If a task completion is decided to be realised, the score value of task completion will be considered. Let PEM be an n by n matrix, and $PEM_{ii} \in [0,1]$ i:=1..n the diagonal value of the PEM matrix.

$$P = \sum_{i=1}^{n} PEM_{ii}, \quad \bar{P} = \frac{P}{n}. \quad 10$$

alternative tasks are specified, in the xPEM matrix, therefore 10 different kinds of 50 by 50 PEM matrix can be defined, where maximum $10*2^{60-50}$= possible project scenarios can be determined. Out of diagonal (score of dependencies) values can also fall between 0 and 1. In this simulation the score value of project structure has not been calculated, therefore considering only 3 cases are distinguished: p=1: task dependency will be realized (serial completion); p=0: task dependency will be ignored (parallel completion); $p\in(0,1)$: task dependency can be either realised or ignored, but the score value is indifferent.

Two kinds of durations: crash and normal duration; two kinds of cost demands: crash and normal cost demands of tasks; and for different kinds of resource demands are also randomised.

Time, cost and resource constraints are 80% and 90% of maximal score values of time, cost and resource demands. The target function is to specify 5 most desired feasible project plans. Instead of sum of score values of task completions and task dependencies, the mean values of these score values are represented, because if every score value of task completion and every score value of task dependency is between 0 and 1 and if these values follow uniform distribution the expected value of the mean of score values ($\overline{P}$) is 0.5. And the expected value of the score values of selected project scenarios and project plans are also between 0 and 0.5. In case of the most desired project plans these values are maximal.

Let

$$P_j=\frac{\sum_{i=1}^{n}\begin{cases}PEM_{ii}, & \text{if task } i \text{ decided to be realised in project scenario } j\\ 0, & \text{if task } i \text{ decided to be ignored in project scenario } j\end{cases}}{P}$$

be the *relative importance value of the project scenario j*. If P>0, then $P_j\in[0,1]$. P_j=1: if every task will be completed, and P_j=0: if every task is ignored from the project. Table 3 shows the simulation results based on 1000 generated 60 by 60 xPEM matrix with 10 different alternative tasks.

Table 3. The results of simulation, where every cell represents a mean value of relative importance value of a project scenario based on 1000 simulation.

Mean score values of top n most desired feasible project scenarios	Budget/Maximal Cost Demands							
	80%				90%			
	Resource Availibality / Maximal Resource Demands							
	80%		90%		80%		90%	
	Time Constraint / Maximal Time Demands							
	80%	90%	80%	90%	80%	90%	80%	90%
P_1	0.80	0.82	0.84	0.85	0.95	0.95	0.96	0.97
P_2	0.76	0.72	0.71	0.75	0.95	0.95	0.96	0.96
P_3	0.74	0.72	0.70	0.74	0.94	0.93	0.93	0.91
P_4	0.71	0.71	0.70	0.73	0.91	0.91	0.91	0.90
P_5	0.71	0.71	0.70	0.73	0.90	0.90	0.91	0.90

With using MANOVA multivariate analysis of variance and decision tree techniques, the most significant constraint for changing relative importance value of a scenario is the budget (or cost constraint). Every relative importance value of the most desired project scenario is not lower than the budget-maximal cost demands, even if the relative time constraint (time constraint/maximal time demands) and relative resource constraints (resource availability/maximal resource constraint) are 90% or

80%. Time constraints can also be handled by parallelisation (ignoring task dependencies) and resource constraint can also be handled by sequencing (realising task dependencies). While this problem can be handled if these problems are separated, if we decrease these constraints by using time/cost trade-off methods and finding alternative solution techniques uncertain task also should be ignored in order to find feasible solutions.

Summary and conclusion

In this paper a modified matrix-based project planning method was introduced. In the course of the evaluation three matrix-based methods are used: PEM for characterizing multilevel projects; SNPM for describing a project scenario and a DSM for presenting a project structure. Both cost minimising and finding alternative solution methods are combined into this method. Since there are huge number of variations of different kinds of project scenarios and project structures, an exact algorithm should be used for selecting adequate project scenarios and project structures considering the management claims.

The modified Expert Project Ranking (EPR) method is a fast, exact method for selecting and ranking feasible project scenarios and project plans within different kinds of project scenarios. Applying score values the most desired, most probable feasible project plans can be selected considering time, cost and resource constraints.

Although the project expert system seems rather fictitious currently, the developed matrix based methods and proposed exact algorithms may be important and essential components of a project expert system supporting strategic decision makings.

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On-line Businesses in the World

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ABSTRACT

The online economy takes a huge role in today's globalized world. Internet as a general purpose technology changes how companies operate, but it also changes the markets. The online economy has a huge effect on people's everyday life, private and public companies as well. The goal of this paper is to analyse the global online economy by countries of origin answering the question which countries dominate the internet. After deep literature survey on the subject the Alexa Top 500 database is used to analyse it by the most visited websites in the world. The analysis shows the online economy is dominated by the USA and China. Correlation analysis confirms that GDP correlates with websites originating from that country. This means highly developed countries have better online economy with more websites, dominating the online economy.

Introduction

The online economy is getting more and more important in the world economy. As this part of the economy is a new one, it has not received as much attention from researchers as the 'traditional' economy. As companies can work from distant countries through the internet, it is not clear which are the dominating countries in the online economy. One may think that it is dominated by those countries which dominate the 'traditional' economy or it may be dominated by those countries which has the most population as people create content on the internet.

The object of this paper is to describe and analyse the online economy in a globalised world, defining which countries are dominating it, giving a nationality outlook on the internet. The objectives of the current research are to answer which countries have the highest role in the online economy and try to find some correlation between this, the GDP and the population of the countries.

The author first overviews the online economy than takes a deeper research into the nationality of websites. The research methods are based on deep literature review of those articles and books that are considered relevant on the topic by mainstream economists. Two hypothesis are set and analysed. Own research is done by analysing the Alexa Top 500 database. Correlation analysis with the World Bank (2013) GDP and population data is done.

The beginnings of online business

On 15 March 1985 the first registered domain name, symbolics.com was registered. Since that time, the Internet has revolutionized the business processes and even changed people's everyday lives. During this time, a number of innovative dot-com companies invented and used new business models. New products and services have been created, changing the purchasing habits of people and the distribution channels of companies. Internet has not only resulted in economic growth, but also changed social relations. ([2]) In December 2011 there were 2.2 billion internet users world-wide, which was 32.7% of the total population of the world (Internet World Stats 2012). Internet usage spread at an amazing speed. Only 18 thousand websites existed in the world in 1995, but 80 million .com domain names were registered in 2010 with an average monthly increment of 668 thousand. ([3]).

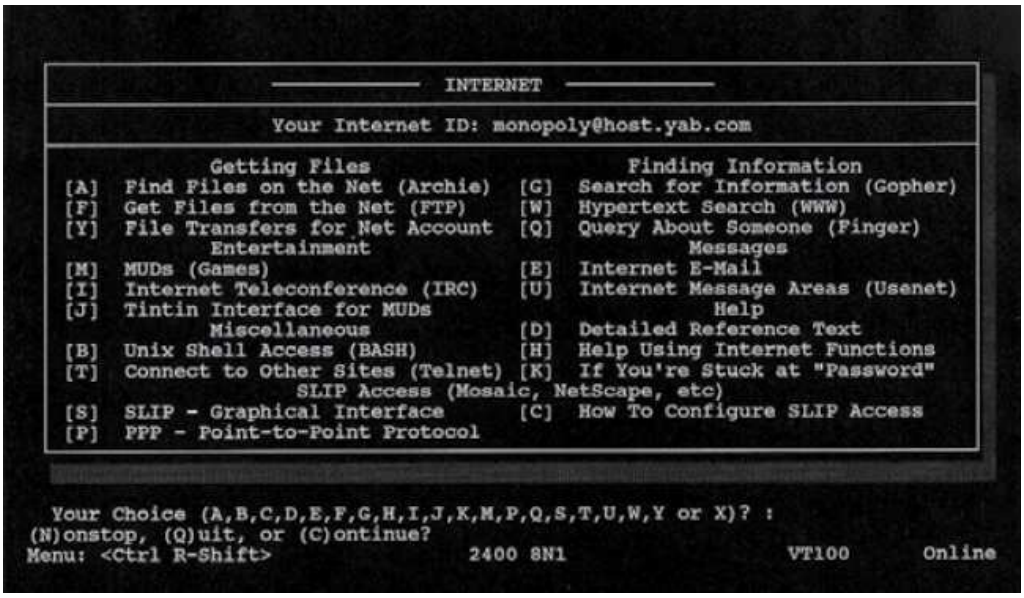

Figure 1. An early screenshot of the internet

Source: Atkinson et al 2010 [3]

In order for companies to introduce new technologies, it is important that the change should be easy to happen. The new technology should be as much compatible with the old technologies as possible ([10]). During the introduction of web solutions companies reported significant changes in their operations, the internet protocols (TCP/IP, HTML, etc.) and popular software are the bases of compatibility, whilst also providing opportunities for development. Websites can be viewed in the same way in today's browsers like in the early days, the e-mail as a communication solution unchanged for decades, only the displaying software and the hardware developed further.

Internet for general purpose

The development of information technology improves information processing and dissemination. Atkinson et al ([3]) describes the importance of the internet causing historic breakthrough developments that are comparable to the introduction of cheap steel, the telephone, the internal combustion engine or the electricity. Such general purpose technologies (GPT) appeared historically about in each half centuries changing the economy drastically including the fact what the industry produces, how to organize and manage the output, where to produce geographically and what knowledge is required for it, furthermore it changes the infrastructure and also the laws. The GPT industries usually start in small, but then they spread rapidly throughout the economy. Meanwhile their costs drastically reduce, their performance increases, industries and products become an integral part of the processes, business models and causes innovation in organizations. ([3]) A good example for the GPTs is the internet and the online economy. Internet in the beginning of the 2000s created new industries, such as online auctions and marketplaces ([14]). Internet has some of the greatest impact on the existing businesses.

The on-line companies

The online economy and the IT economy are interconnected, but the two are not identical. The online companies can be considered as a group of IT companies. While Amazon is a typical online company, primarily in hardware manufacturer Apple is said to be more like a traditional IT company. Hereinafter online companies are distinguished by the following:

- Mainly providing online products, services, contents or is an online intermediary company.
- A company that is functionally inseparable from the internet, for example having internet the main distribution channel.

The online economy rate can only be estimated, since many are not or hardly measurable. For example, it can not be that fast and simple online search will add to the economic indicators.

The online solutions allow companies to use the "long tail" phenomenon. The demand of typical traditional business is limited, causing that rare, little-demanded products are hard to sell. While a typical bookstore has somewhere between 40000 to 100000 books, at Amazon there are 2.3 million books to choose from. The Posters.com offers 3500 various posters, at Ties.com customers can choose from 2500 different ties. In the Netflix online DVD rental service 65000 DVDs can be found, compared to a traditional movie rental shop's inventory of about 3000. 40% of the income of Rhapsody online music service is derived from music not available in traditional stores offer. ([2])

Using the internet a larger market can be accessed than using traditional distribution channels. In case of traditional companies the market can be defined as the population of the accessible geographical area. Even for firms operating in big cities the market is not as huge as the online potential market. For example, a shop in Budapest has a potential customer base of about 2 million people, while an online Hungarian store has about 4 million potential customers, because that many people use internet in Hungary nowadays. Regarding the special features it is the same concept. Online education and online health care supporting solutions are increasing. These services become economically available to the rural communities as well.

Whatever the product is, the online solutions help mass customization, which has the goal to customize mass-produced products within certain limits. The mass customization is to effectively dis-

tinguish the products for the customer by the greatest extent allowed by the supply chain ([6]). By Kaplan and Haenlein ([13]) this is a value-creating strategy based on the relationship of the company and the customer to manufacture and assemble products to create personalized mass-produced products on the same price levels as not customized products ([16]). The online solutions improves the company and the consumer relationship, making it easier to assess needs and reduce change-over times and costs. This method is used for example by Land's End asking for exact sizes for our clothes ordered, providing a completely personalized outfit. Nike shoes can also be individualised, Quantum Cycles are producing custom-tailored manufactured bicycles. ([2]) This method can be easily extended to services, for example the Hungarian Smart card holders get personalized offers from the Smart card operating companies (Shell, McDonald's, etc.).

In the online economy financial markets are also affected. Share trading through online platforms largely shifted from the traditional broker trading to online trading methods. In Japan this feature became a huge commercial success. In 1999 there were only 300000 online broker accounts, but in 2006 this number reached 7.9 million, giving one quarter of the total shares trade in the country. ([9]).

Public sector can use online services as well. Online public services offering services that are provided at a

low cost can be made online. Municipalities usually provide such services: there is typically an online library of frequently asked questions for online office administration. These organizations cannot be said to be operating online, they are only active in the online helping tools. ([15])

Table 1. Origin of websites in the Alexa 500

	Web sites	GDP (US$, 2011)	Population (2011)
Australia	2	1 379 382 221 955	22 620 600
Bahamas	1	7 787 514 000	347 176
Belgium	1	513 661 111 111	11 008 000
Brasilia	6	2 476 652 189 880	196 655 014
B. Virgin Isl.	1	853 000 000	31 912
Bulgaria	1	53 514 380 731	7 476 000
Canada	7	1 736 050 505 051	34 482 779
Cayman sz	4	3 080 000 000	56 729
China	70	7 318 499 269 769	1 344 130 000
Costa Rica	1	40 869 768 515	4 726 575
Cyprus	4	24 689 602 446	1 116 564
Czech Rep.	2	217 026 553 672	10 546 000
Egypt	1	229 530 568 260	82 536 770
Estonia	1	22 154 722 222	1 340 000
France	9	2 773 032 125 000	65 436 552
Germany	15	3 600 833 333 333	81 726 000
Gibraltar	1	1 106 000 000	29 111
Hong Kong	4	248 611 896 197	7 071 600
Hungary	1	140 029 344 474	9 971 000
India	9	1 847 976 748 681	1 241 491 960
Indonesia	2	846 832 282 925	242 325 638
Iran	3	331 014 973 186	74 798 599
Ireland	2	217 274 951 267	4 487 000
Israel	4	242 928 731 135	7 765 700
Italy	6	2 193 971 063 086	60 770 000
Japan	11	5 867 154 491 918	127 817 277
Luxemburg	1	59 200 833 333	517 000
Netherlds	4	836 073 611 111	16 696 000
Antilles	2	3 810 000 000	175 653
Norway	1	485 803 392 857	4 952 000
Philippines	1	224 753 579 833	94 852 030
Poland	5	514 496 456 773	38 216 000
Portugal	2	237 373 611 111	10 637 000
Romania	1	179 793 512 340	21 390 000
Russia	10	1 857 769 676 144	141 930 000
Serbia	1	45 819 561 019	7 261 000
Seychelles	4	1 007 186 292	86 000
S. Africa	1	408 236 752 340	50 586 757
S. Korea	2	1 116 247 397 319	49 779 000
Spain	4	1 476 881 944 444	46 235 000
Sweden	2	539 681 664 099	9 453 000
Switzerland	1	659 307 920 845	7 907 000
Turkey	2	774 983 417 981	73 639 596
UAE	1	360 245 074 960	7 890 924
UK	12	2 445 408 064 516	62 641 000
Uruguay	1	46 709 797 684	3 368 595
USA	182	14 991 300 000 000	311 591 917
Vietnam	1	123 600 141 396	87 840 000

Source of figures in Table 1: World Bank (2013/1) and World Bank (2013/2); excluding: British Virgin Islands: GDP 2004, Population 2013 (Est.), source: Geoba (2013); Gibraltar: GDP 2006, population 2013, source: CIA (2013); Netherlands Antilles: GDP 2008, source: United Nations (2009: 139); Iran: GDP 2009, source: World Bank (2013/1); Cayman Islands: GDP 2009, source: Trading Economics (2013).

Companies in the information technology contribute directly to economic performance, some statistics show that the 2% of the GDP of USA can be originated from these companies. ([7]). Although various estimates give different results, a search reveals that even in the middle of the 2000s electronic commerce resulted in savings of $ 1.25 billion for the global economy, which was about a whole 4.9 billion dollars. This is roughly a 25% savings compared to using traditional commerce ([8]).

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Nationality of online companies

We have seen that online companies are very important in today's economy. We have the presumption that online companies can be identified by online websites and they can be judged by the number of visitors. It is interesting to look into deeper where these websites operate. Many of the online companies are global, but each of them has its country of origin, where it is based. Before the analysis two hypothesis are set:

- Countries with higher GDP have more websites.
- Countries with higher population have more websites.

The research was done using the Alexa Top 500 database (Alexa 2012). It is an online database of global websites. Alexa takes a sample of the visitors of websites by using a browser plugin. Based on this statistical data it provides a list of websites arranged by the number of visitors. The top 500 list of this global database can be accessed free at www.alexa.com. This is one of the most comprehensive databases of websites worldwide. The research was done on the 1st August 2012 state of this Alexa Top 500 list.

Each website was analysed one by one to determine its country of origin. There were a lot of duplicated websites in the database which were excluded (for example Google has different top-level-domain names for different countries). The websites were analysed deeply checking the operating company origin if possible, otherwise analysing the ownership of the domain name. This is not the same as the top-level-domain name. Besides some law restrictions in many countries any company can get any domain name with local top-level-domain name ending (for example .hu for Hungary). After excluding the duplications 419 websites remained. In nine cases it was not possible to check its origin due to technical or privacy problems. In 410 cases the county of origin could be determined. 48 different countries could be identified. Most of the websites are originated in the USA (182) and China (70). Table 1 shows the results by countries including GDP and the population data of the countries which are needed to analyse the hypothesis. The source of this data was mostly from the World Bank (2013), but in some cases data was missing at World Bank. In these cases it was needed to look for other sources.

Two correlation analysis were done on the data sheet. First, the correlation between the GDP of the country and the corresponding number of websites was analysed. It gave 0.928 which shows a tight connection between the GDP of the country and the number of websites in that country. Secondly the connection between the population and the number of websites was analysed. The result is 0.390 which is a weak correlation. Based on these values we can accept hypotheses 1 and reject hypotheses 2. "Countries with higher GDP have more websites."

There are limitations of the research. The less visited 'long tail' of websites were not included, only the biggest ones. There may be other online com-

panies without websites with many visitors. These factors were excluded in the research, so the results can be accepted with these limitations only.

Conclusions

After showing the importance of the global online economy a corresponding analysis was done. The paper looked for the answer if the number of websites originated from a country depends on the GDP or the population of that country – or they do not correlate at all. Based on this two hypothesis were formulated. After analysing the sample of the Alexa Top 500 database, one of the two hypothesis was accepted which states that the number of websites in a country correlates with the GDP of that country. However, a weak connection was also found between the population and the number of websites. Based on the research it can be stated that the online economy is heavily dominated by the USA and China.

The results show that the online economy is very much connected to the 'offline' traditional economy. Where the economy is stronger, the online economy develops similarly. This happens even if the online economy is considered an economy of new ideas and entrepreneurs creating huge venture enterprises from low-cost 'garages'. Finding the causes is not the topic of this paper, it could be a topic of a future research. The results show a huge disadvantage of less developed countries on their way to develop their online economy. As the correlation is very strong (0,928) between GDP and the number of websites of a country it can be stated the development of the online economy of a country is mainly based on the 'traditional' economy of that country, the population does not really matter.

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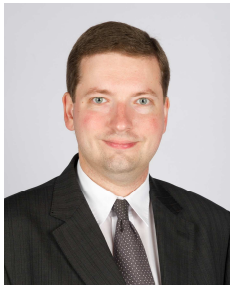

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Cloud Service Providers
Protection of Critical Information Infrastructure

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ABSTRACT

The prevention of data loss is one of the key buzzwords within the promotion activity of the cloud service providers (CSP). This article come round the main security issues of cloud services, which any decision maker have to take into consideration when choosing a CSP or specifying a private cloud service. The strengths and weaknesses of cloud architecture are examined closely from the security point of view to conclude in a system of aspects for decision makers to take into consideration before changing to cloud based services.

Introduction

The Info-communication Technologies (ICT) are more and more affecting our lives. The application of these technology drivers covers both the homes and the economy. We take their presence as granted. They are parts of the everyday infrastructural services. Therefore their deficiency or absence can so severely affect the economic role-players or households as the missing of any other critical infrastructural resources. Security issues, the importance of its proper configuration and operation is now an evidence for the business sector and the security-consciousness of the public and private sector is rising constantly as well.

The spreading of the new, cloud based services, the situation changed somewhat. Public clouds promise a new level of data security and accessibility to their users. The prevention of data loss is one of the key buzzwords within the promotion activity of the cloud service providers (CSP). The corporate and even the public sphere tends to think on moving to the cloud in order to enhance data security, service level, stability and costeffectiveness of the services.

But who watches the watchers? Cloud service providers – although they really make reaching a higher level of services possible – are not identical, particularly from security point of view. To choose the proper service provider or to make a decision about starting a private cloud base service, a higher level of trust among the client and the service provider is needed, as by entering the cloud, it becomes virtually impossible to trace the real processing our data, clients, etc. are going through, only assumptions are at hand according to the specifications and service level agreements (SLAs) with the CSP.

The EU member states have committed to protecting critical ICT systems via the European Commission's CIIP (Critical Information Infrastructure Protection) [4] action plan by preventing large cyber-attacks and cyber disruptions of critical ICT systems. This article examines this approach, analyses the matching security governance, and particularly the proper risk assessment points of the topic.

This research is part of a larger research project concerning the effects of IT and network vulnerabilities on economy and society, which is implemented by the author in ligament with the Foundation for Information Society with the correspondence of the National Cybersecurity Center and the support of Hungarian Scientific Research Fund – project number: PD-109740.

Brief Definition

Cloud computing is an on-demand service model for IT, often based on virtualization and distributed computing technologies. [4] Cloud computing architectures have:

- Highly abstracted resources
- Near instant scalability and flexibility
- Near instantaneous provisioning
- Shared resources (hw, database, memory, etc)
- 'Service on demand', usually with a 'pay as you go' billing system
- Programmable management (e.g. through WS API).

There are three categories of cloud computing:

- Software as a service (SaaS): is software offered by a third party provider, available on demand, usually via the Internet configurable remotely. Examples include online word processing and spreadsheet tools, CRM services and web content delivery services (Salesforce CRM, Google Docs, etc).
- Platform as a service (PaaS): allows customers to develop new applications using APIs deployed and configurable remotely. The platforms offered include development tools, configuration management, and deployment platforms. Examples are Microsoft Azure, Force and Google App engine.
- Infrastructure as service (IaaS): provides virtual machines and other abstracted hardware and operating systems which may be controlled through a service API. Examples include Amazon EC2 and S3, Terremark Enterprise Cloud, Windows Live Skydrive and Rackspace Cloud.

Clouds may also be divided into:

- Public: available publicly, any organization may subscribe
- Private: services built according to cloud computing principles, but accessible only within a private network
- Partner or Community: cloud services offered by a provider to a limited and well-defined number of parties.

Uptake of Cloud Computing

Public and private sector organizations are switching to cloud computing: While years ago software applications were running on servers on their own premises or dedicated data centers, now applications are outsourced to large cloud service providers and run in very large data centers.

Cloud computing is being adopted rapidly across society, and across different sectors of society. Many analysts predict a further growth (of around 20-30% a year). Some examples:

IDC reports public IT cloud services will reach $47.4B in 2013 and is expected to be more than $107B in 2017. Over the 2013–2017 forecast period, public IT cloud services will have a compound annual growth rate (CAGR) of 23.5%, five times that of the IT industry as a whole. The growing focus on cloud services as a business innovation platform will help to drive spending on public IT cloud services to new levels throughout the forecast period. By 2017, IDC expects public IT cloud services will drive 17% of IT product spending and nearly half of all growth across five technology categories: applications, system infrastructure software, platform as a service (PaaS), servers, and basic storage. Software as a service (SaaS) will remain the largest public IT cloud services category throughout the forecast, capturing 59.7% of revenues in 2017. The fastest growing categories will be PaaS and Infrastructure as a service (IaaS), with CAGRs of 29.7% and 27.2%, respectively. [6]

Gartner predicts that the bulk of new IT spending by 2016 will be for cloud computing platforms and applications with nearly half of large enterprises having cloud deployments by the end of 2017. The worldwide cloud-based security services market will be worth $2.1B in 2013, rising to $3.1B in 2015. [2] In the next five years enterprises will spend $921B on public cloud services, attaining a CAGR of 17% in the forecast period. [8]

McKinsey & Company projects that the total economic impact of cloud technology could be $1.7 trillion to $6.2 trillion annually in 2025. Of this total, $1.2 trillion to $5.5 trillion could be in the form of surplus from use of cloud-enabled Internet services, while $500 billion to $700 billion could come through productivity improvements for enterprise IT. [7] Similar figures are reported for the healthcare and financial services sector.

The public data tells only part of the story - from public data it is difficult to understand how many end-users or organizations depend on a cloud computing provider, because cloud computing providers often offer services to other organizations, which in turn provide services to the (sometimes millions of) customers. For example, a SaaS cloud computing provider who uses the cloud (an IaaS cloud computing provider) for computing and storage resources. [1] This kind of reselling of IT resources makes it hard to estimate how many end-users depend on a single cloud provider and this makes it hard to estimate the full impact of an outage in society. For example Amazon AWS infrastructure only is reported to carry as much as 1% of the all internet consumer traffic in North America and on an average a third of all internet users visit an AWS powered site daily and there are CSPs, like Rackspace, Google or Microsoft with similarly convincing numbers. [8]

Security governance elements

Considering the future and more excessive use of CSPs the goal would be to keep the data stored in the cloud uncompromised, prevent data breaches and security incidents. Cloud security governance, similarly to other areas, can be subdivided in three key processes, shown in Figure 1 below:

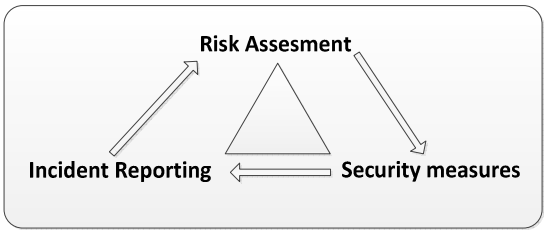

Figure 1. The security governance cycle

Risk assessment

Many risks are related to certain business opportunities, made possible by the cloud architecture. Therefore it has to be taken into consideration whether these risks are compensated by the opportunities provided. The key is risk-consciousness. Cloud services are not only about convenient storage, accessible by multiple devices, but include important benefits such as more convenient communication and instant multi-point collaboration. Therefore, the risks of using cloud computing should be compared to the risks of staying with traditional solutions, such as desktop-based models.

The level of risk will in many cases vary significantly with the type of cloud architecture being considered. It is possible for the cloud customer to transfer risk to the cloud provider and the risks should be considered against the cost benefit received from the services. However not all risks can be transferred: if a risk leads to the failure of a business, serious damage to reputation or legal implications, it is hard or impossible for any other party to compensate for this damage.

First of all it is needed to define the most critical cloud computing services. A widespread approach is that all cloud computing services are critical, but it is impossible to handle all cloud computing services at the same level. Since outages at IaaS or PaaS providers can have an impact across a range of organizations, this means that these services should be treated with priority. Often even SaaS type services depend on an IaaS/PaaS-type services and all of them depend on network connection and power supply of course. So the most crucial part to sustain is the physical infrastructure, than IaaS/PaaS services and finally SaaS is the least critical, as it depends on all of the previous ones.

Most countries make national risk assessments, large companies also carry out such analyses. In these cases the critical infrastructure perspective is an important point of view. These assessments usually take into consideration only power supply and electronic communications networks, although they should also take into account large cloud computing services and large datacenters. [5] The modern society is highly dependent on IT.

A successful risk assessment requires an honest identification of the true dependencies. It needs to be clarified which critical operators and critical services depend on cloud services. The true nature of cloud services plays a two-faced role here. A baseline of cloud services that hardware and software is shared between multiple tenants. This makes it possible to withstand DDoS attacks or peak loads for example. At the same time, this benefit creates further cross-dependencies among the business and society. A fall out of a basic IaaS or PaaS provider can affect a wide range of (seemingly otherwise unrelated) services across everyday life. It is vital to map the main logical and physical dependencies.

Figure 2 below shows a roundup of the most common risk drivers of cloud technology. The risk drivers are evaluated according to two main dimensions: the probability of the event to happen, and the severity of the effects of the certain events. The risks are classified into three categories:

- Policy and Organizational
- Technical
- Legal.

The figure below clearly shows that all three represent themselves in the highest probability-severest impact (red) section, so it is not enough to focus on one or two groups in the first place. All risk types have to be handled with equal attention. It also has to be pointed out, that the most serious risk driver is not a technological, but an organizational issue and it is usually the very first aspect to take into consideration when deciding about getting involved in the cloud technology at all.

If we look at the red-zone risk drivers, we find an organizational risk – loss of governance – at the top of the list, as mentioned above. In using cloud infrastructures, the client hands over control to the CSP on a number of issues which may affect security. Moreover, there may be conflict between the clients policy requiring the raising of security levels and the cloud environment, where security level is the liability of the CSP. On the other hand, SLAs may not offer a commitment to provide such services on the part of the CSP, leaving a gap in security defenses. Moreover the CP may outsource services to third-parties (unknown providers) which may not offer the same guarantees. In general, the lack of transparency can be a problem for the whole system. If a CSP does not declare which core IT services are outsourced - it is not realistic that providers should list the contractors since these may change frequently - the client is not in a position to properly evaluate the risk he is facing.

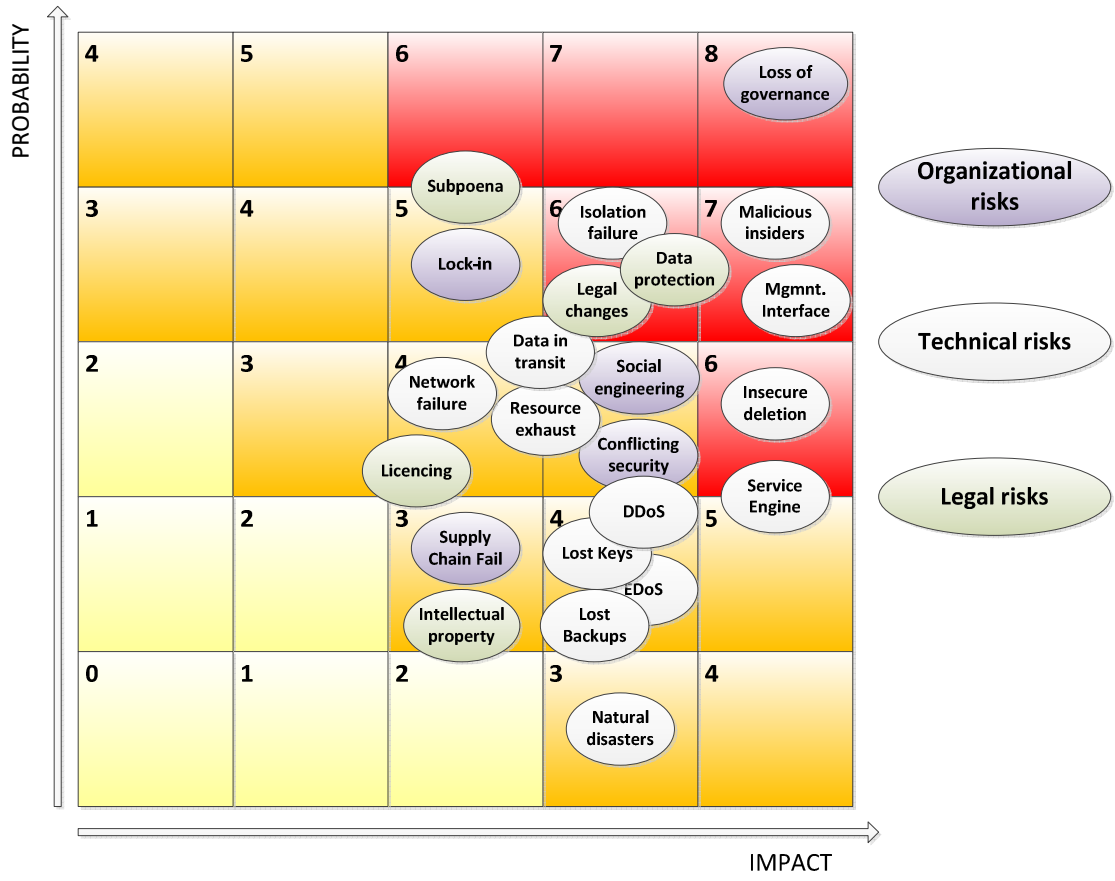

Figure 2. Security risk distribution

Further important risks are more technology based ones. The malicious activities of an insider could potentially have an impact on: the confidentiality, integrity and availability of all kind of data, services, IPs and therefore indirectly on the organization's reputation, customer trust and the experiences of employees. This can be considered especially important in the case of cloud computing due to the fact that cloud architectures necessitate certain roles which are extremely high-risk. Examples of such roles include cloud system administrators and auditors.

The customer management interfaces of public cloud providers are Internet accessible and mediate access to larger sets of resources (than traditional hosting providers) and therefore pose an increased risk of being compromised especially when combined with remote access and web browser vulnerabilities. This includes customer interfaces controlling a number of virtual machines and, most importantly, cloud providers' interfaces controlling the operation of the overall cloud system.

Multi-tenancy and shared resources are two of the defining characteristics of cloud computing environments. Computing capacity, storage, and network are shared between multiple users. Isolating the data and processes of the individual clients is a basic requirement awaited from every CSP. This class of risks includes the failure of mechanisms separating storage, memory, routing, and even reputation between different clients of the shared infrastructure (e.g., so-called guest-hopping attacks, SQL injection attacks exposing multiple customers' data stored in the same table, and side channel attacks). The probability is low in case of private clouds, but in case of public cloud environment it has to be seriously taken into consideration.

Data deletion problems are the last group of the high-risk technology based group. Whenever a provider is changed, resources are scaled down,

physical hardware is reallocated, etc, data may be available beyond the lifetime specified in the security policy. Deleting data from a cloud storage does not in fact mean that the data is removed from the storage or eventual backup media. If disk storage is not encrypted, the data could be accessed at at later time by another customer of a cloud provider.

There are some legal issues among the most severe risks as well.

Data protection is a key question, particularly under the strict European legislation. Processing data in another country may incur difficulties regarding the legal environment of data protection, or might even be considered unlawful by the responsible Data Protection authority. It can be difficult for the client (in its role of data controller) to effectively check the data processing that the CP carries out, and thus be sure that the data is handled in a lawful way. There may be data security breaches which are not notified to the controller by the CSP. Even the CSP may receive data that have not been lawfully collected by its customer (the controller).

The changes of legal environment also represent a severe risk for the clients keeping their data or services in a foreign and/or multinational CSP. There are numerous ways in which the change in jurisdiction could affect the security of the information. Examples include:

- Data might be seized or the operations of a service disrupted due to reasons that do not even exist in the clients' country.
- In some cases, national security interests of the hosting country might be cited as a reason for seizing data.
- Additionally, a CP might be subject to law enforcement or national security actions from the country its business headquarters is based in, not just those from the countries where its data centers are located.

The list of points to consider just goes on and on. For length restrictions of this article the complete list of risk drivers will be accessible in the research study.

Security measures

It goes without saying that it is important that cloud providers take appropriate security measures. Security is constantly changing and security measures must be improved continuously. Authorities as well as corporate participants of the cloud industry should encourage an open culture of exchange experiences with proper security measures. Security is about continuous improvement and a situation where a specific set of best practices is cast in stone (by regulation or self-regulation) should be avoided at all costs.

Cloud computing services are often set-up with several redundant datacenters to withstand outages (due to power cuts or natural disasters, etc.). However, cyber-attacks usually capitalize and exploit software vulnerabilities, which are persist across the datacenters. These vulnerabilities can cause outages by themselves. Although cloud service providers have the means to prevent cyber-attacks in professional way it still is important to create also logical redundancy as part of the defense system – that is, to use different layers of defense and to use separate systems with a different logical structure, to cross-check transactions and to detect intrusions and attacks.

Standardization, especially for IaaS and PaaS services, would allow customers to move workload to other providers in case one provider has an issue. In case of a standardized service and necessary backups an outage can be survived more easily. In case of an administrative or legal dispute the backups can be simply taken to the site of another (competing) cloud computing provider. This kind of scenario is only possible when the cloud services infrastructure is standardized.

Security professionals always stress the importance of test and independent audits. This is not different in case of cloud services as well. Although it has to be pointed out, that ICT systems are constantly changing (software is updated daily) and that this reduces the significance of periodic (yearly) audits. Cloud providers and regulators should focus on a continuous program of audits, tests and exercises in place. Audits by external third parties are only one part of the bigger picture.

Incident reporting

To solve and learn from a security incident depends on whether the organization knows about it at all, or it remains the well-kept secret of the IT-security staff. Without incident reports it is very difficult to understand the impact of security incidents on cloud computing providers. Lack of data about incidents makes it very difficult to prioritize security measures, and in this way security governance becomes inefficient or even ineffective. There are many issues concerning this topic, but first it is very important to set the reporting threshold properly to provide adequate information for the management, the authorities, the regulators and the clients as well.

Certain cyber-attacks are very advanced and their trails may be difficult to scout even for security professionals who know the cloud computing systems inside out. For fear of sanctions, business interests or legal consequences there is a serious risk, that security incidents are not reported to higher management or to authorities. Providing declared immunity to colleagues and professionals working in the field of security.

While there is at least some information about data breaches, there are virtually no sources about cloud computing service outages. Even for the scares number of incidents came out into the open, it is difficult to find basic information like numbers of users affected or duration. To be able to assess the risks of clod technology and assess the effectiveness of cloud security, it would be crucial to have public incident reports about the cloud computing providers.

Conclusions

By examining the risk assessment approach to cloud computing the following conclusions are important to point out. Cloud computing is critical: the usage is growing and in the near future the vast majority of organizations will rely on some form of cloud computing services. This makes cloud computing services critical in themselves. When cyber-attacks and/or disruptions happen, millions of users are affected. Cloud computing is present also in critical sectors, like finance, energy and transport.

Infrastructure and platform as a Service are the most critical branches of cloud computing.: Large IaaS and PaaS services which deliver services to other IT vendors who service in turn millions of users and organizations. Cyber attacks which exploit software flaws can cause very large data breaches, affecting millions of users directly. The impact of cyber attacks is multiplied by the concentration of resources which is a result of the rapid implementation of cloud computing. Elasticity is a key benefit of cloud computing and this elasticity helps to cope with load and mitigates the risk of overload or DDoS attacks. It is difficult to mitigate the impact of peak usage or a DDoS attack with limited computing resources. A key benefit of cloud computing is resistance against regional power cuts or local natural disasters. It is difficult to mitigate the impact of fairly common regional disasters like floods, storms, or earthquakes in a set up with only a single datacenter, or a traditional set-up with a legacy onsite IT deployment. Cloud computing is not immune to administrative or legal issues. If there is a legal dispute involving the provider or one of its customers, than this could have an impact on the data of all the other co- clients.

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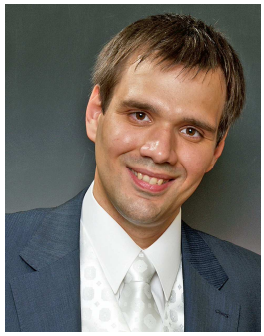

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A Case Study of ICT Innovation in Aluminum Recycling
Illustration of the Concept of Transformational Impact in Information Systems

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ABSTRACT

In our paper we present a Hungarian case study describing how an ICT based business model is created to make aluminum recycling more effective and to provide economical value for different actors while enabling the Hungarian State to fulfill high level policy requirements. From a practical point of view the case provides an illustration of how legislation, entrepreneurial agility, and technology innovation create a functioning business model generating staggering numbers of aluminum tonnage recollection. Theoretically, the case can be used as a narrative to show how a complex ICT artifact enables the change of routines and behaviour in aluminum recycling using the concept of Agarwal´s and Lucas´ "ICT transformational impact".

Introduction

Information Communication Technology (ICT) innovations have shaped several industries during the last decades. For instance, the commercial appearance of internet based technologies dramatically restructured the production, sales and consumption of digital products such as music, books, films and television. Understanding the mechanisms how technology triggers such restructuring is essential at least from two important points of view:

- Firstly, for creating and using innovation policy initiatives effectively in order to enhance economic development and competitiveness both at the enterprise (micro) and country (macro) level.
- Secondly, to increase our knowledge about societal change generated by ICT innovations influencing individual behaviour and societal institutions.

In our paper we present a Hungarian case study describing how an ICT based business model is created to make aluminum recycling more effective and create economical value for different actors and also enable the Hungarian State to fulfil high level policy requirements. The case provides and illustration for both of the above points. Firstly, it shows how legislation, entrepreneurial agility, and technology innovation create a functioning business model generating staggering numbers of aluminum recollection. Secondly, it shows how this particular innovation enables social inclusion in the Hungarian society by providing opportunity to the homeless collectors of aluminum cans, moreover how the ICT innovation influences legislation and high level policy making.

Research and Background

As we have described in the introduction our research motivation is to explore what makes complex ICT based innovation work and getting adopted. Coming from this motive we present a unique, cutting edge technology innovation – the so called Reverse Vending Machine and New Returpack Control Information System - in the area of aluminum packaging recycling. We describe how an effective business model is incorporated by creating effective motivation both for the stakeholder companies and for the Hungarian government to achieve high level policy objectives.

In the information system discipline the focus of studying these problems is ambiguous: as Benbasat and Zmud summarized, some issues immediately associated with ICT-based systems are under investigated while phenomena distantly as-

sociated with ICT-based systems are over investigated. To resolve this dilemma, they have suggested a nomological network centered around the construct of the ICT artifact [1]. The ICT artifact can be conceptualized as a specific application designed to enable and/or support some routines in a structure which is itself embedded in a context..

Furthermore, Agarwal and Lucas state that high-value and high-impact contributions for understanding information systems success might be derived, if we look at ICT as the "glue" that binds processes together, thereby impacting stakeholders and every aspect of organizational and social life [2]. They introduce the concept of the transformational impact of ICT and propose research agendas to relate powerful stories of how ICT changes the way individuals, teams and organizations work together [2].

The contribution of our study is to present such a narrative through the Returpack case which illustrates the nomological network and powerful transformational impact of routines in aluminum recycling. To accomplish this objective our paper is structured in the following way: firstly we describe the background of aluminum recycling and the policy initiatives to improve collection. Then we introduce the Returpack ICT artifact and the blueprint of the business model, followed by the detailed description of the business model dynamics with its key parameters. Finally, in the conclusion section we summarize our findings and the implication of our study to practice and research in information systems.

The alu-can and recycling

Aluminum cans are widely used for the consumption of beverages although in different ratios compared to other alternatives. In Central and Eastern Europe which is the broader geographical region of our case study Hungarians buy 750-800 million aluminum cans annually from which 600 millions contain beer. Compared to this, in Romania and in Bulgaria for instance 60% of beer consumption is from PET bottles which situation on the other hand is inconceivable in Slovakia or the Czech Republic. Slovaks and Czechs drink mainly draft and bottled beer, just like the consumers in Germany or the Benelux countries. In Hungary draft and bottled beer consumption totals up to 60% leaving a quite impressive market to drink beer from metal cans, of which 95% are aluminum.

Recycling aluminum cans have several good reasons from technology point of view. The first and foremost reason is that aluminum is considered as an "energy battery"; it takes tremendous energy to convert the raw bauxite to alumina and from that to the metal form of aluminum. This energy input is basically stored in the metal which can be re-melted in furnaces basically unlimited times with relatively low level of new energy input. As a comparison, the wide spread plastic PET bottle can only be recycled 2-3 times, while a regular bottle may turn 50 times during its lifecycle. The second reason, which we would like to highlight, is the flexibility of its recycling. Ideally, the best would be to produce new cans from the scrap ones, because the alloy structure is makes it to one of the most expensive type of aluminum products, but as it is quite often the case, molten aluminum frequently travels to manufacturing facilities for getting processed into something very different than cans (engine block, car wheels, machine parts etc.).

The economical and institutional background of aluminum packaging recycling, however, is more challenging then the technology side. The Hungarian government has established a centralized institution, the so called environmental product fee or ecology-tax (eco-tax), attempting to motivate manufacturers (brewers in our case) to take sustainability issues into maximum consideration. In the case of aluminum 1 Euro/kg is the eco-tax to be paid which translates into 1,5 Eurocents for an 0.5 litre can, 1 Eurocent for a 0.33 litre and only 0,003 Cents for a Nespresso can. According to existing Hungarian regulations those manufacturers who are able to recycle more than 17% of their sold cans, are eligible for eco-tax refund and up to 65% they are eligible for proportional refund from the government. As a general framework, this regulation motivates brewers to recycle, and also has the policy intention to bring the Hungarian government closer to European Union regulations for fulfilling recycling quotas.

While, as we see, there is a high level regulation institution on the policy level for motivating recycling, there had been no, or just very little, motivation for citizens and customers to bring back empty cans to the authorized collection points. In Hungary there is no deposit on aluminum cans, and at the same time there are quite strict regulations for metal collection. Basically, only for the sheer purpose of crime prevention and governmental transparency special collection and treatment points were implemented in the value chain of recycling which points regularly have to be authorized and coordinated by the so called National Waste-management Agency (NWA).

The intense competition between the market leaders of Hungarian beer production have deepened the challenges of effective aluminum recycling as well. In case of the breweries 75% of the sold beer cans are shared by these three leading companies (Heineken - NL, Dreher - HU and Borsodi - HU). On the second place we find the dynamically growing sales of energy drinks, and on the third position the non-alcoholic beverage leader - Coca-Cola.

When we look at the simplified ROI based on the eco-tax refund and the cost of collection, it looks economically justified that attention of the brewers were more focused on recycling regular glass bottles since they had offered much better returns. The deposit fee for a regular bottle always have been around 7,5 Cents and for this amount about 80% of bottles have been returned. Bottles contain no eco-tax, can be re-used, refilled many times during their life cycle, and this makes the whole endeavour much more feasible than to embark on the low margin recycling of cans which are in most cases squished, broken, or damaged – come in unrecognizable form which brewer they originate from – so even the keystone element of tax refund is often technologically challenged.

This situation has changed drastically, when Returpack Ltd. appeared on the Hungarian market with a technology innovation and new business model for aluminum can recycling in 2009. In the following section we describe the technology and information system.

Technology Innovation – ICT artifact

The central technological artifact of the Returpack aluminum can recycling model is the so called Reverse Vending Machine (RVM) as we show it in Figure 1. As the name suggests, the RVMs are collection points in the form of an “inverse” vending machine where users input the empty cans. They consist of standard and several innovative and patented features which places the RVMs into the high-tech category.

Figure 1. Reverse Vending Machine (RVM) in Use

RVMs consume small places (around 1 square meter) while able to hold 9000 aluminum cans since they execute a 1:12 ratio pressing, but most importantly, they have a complex automatic built in aluminum recognition sensor system. They receive cans not only in their intact cylinder shape, but in any form and condition. RVM identifies manufacturer and can types, also filters out non-metal and non-aluminum materials. Even in extreme cases, if a tennis shoe or tune sandwich is being inserted, the RVMs automatically handle the vandalism by diverting the object to the exit slot, closing and protecting the aluminum pathway. If it is necessary, after an easy software initialization process the vandalized RVM is operational again.

RVMs are also complex info-communication technology (ICT) devices. They are equipped with M2M (machine-to-machine) communication enabled by fixed IP address SIM cards. Through the network of Hungarian Telecom using a GSM modems and the SIM cards these machines are connected to a complex information system – Returpack Information and Reporting System (RIRS). RIRS is built on the communication and networking

capability of the RVMs and not only ensures monitoring, high quality maintenance, real time status reports, but by doing this all enables Returpack to function as the integrator between government policy and business collaboration for keeping the aluminum recycling circulating. Since Returpack business model is seamlessly intertwined with RIRS, and also the objective of our analysis is stimulated by the IS implications, we will symbolize RIRS with Returpack itself, as it is seen in Figure 2.

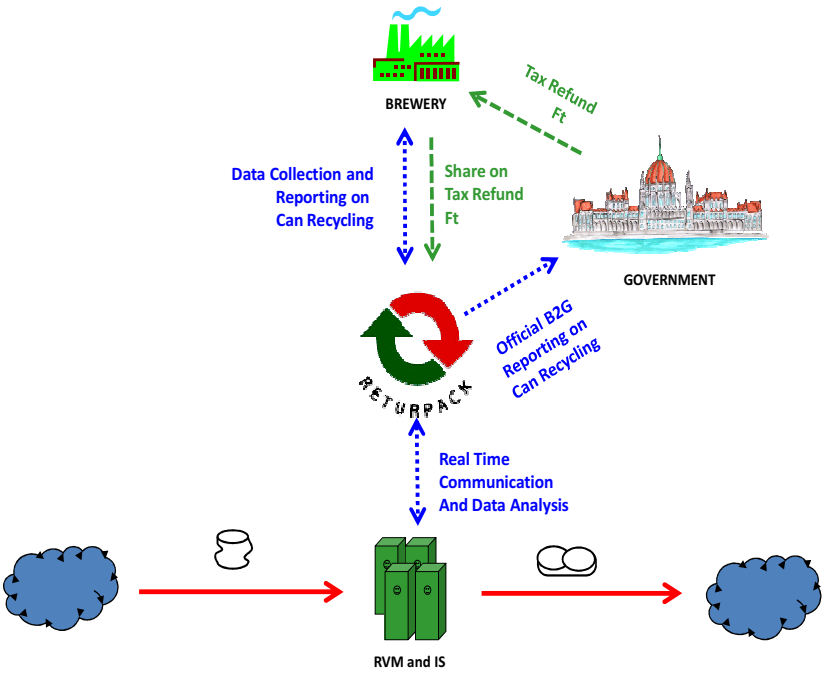

Figure 2. The Core of the Returpack Recycle Model

The technology configuration has enabled Returpack to create a contractual agreement with the three leading breweries (Borsodi, Dreher and Heineken) to orchestrate a fully functioning recycling circulation where both the upstream collection process (on the left side of Figure 2.) is motivated and the recycle of cans or re-circulating of aluminum is also ensured in the downstream part (shown on the left side of Figure 3.). This configuration, henceforth, provides regular reports on can recycling both for the breweries and for the NWA – that is to the Hungarian government. On the basis of these reports, which contain the number of collected and recycled cans of each brewery separately, eco-tax refunds are paid to each of the partners and this revenue is shared with Returpack as the main source of its income. The information flow is indicated with dotted, the money flow with dashed, and the aluminum can flow with continuous lines.

Conceptually, the system was tested in 2009 using 2010 as a pilot run. The three breweries invested in 24 RVMs and Returpack tested the collection, operation and recycling of cans. The results were very promising: in the period from March to December 2010 100.000 cans/month were collected totaling up to 28,4 tons of aluminum. Also the clearinghouse concept was working: based on the RVMs´ special can recognition feature and the RIRS reporting capability the three breweries and the government authority had received timely and accurate numbers of cans collected from each particular manufacturer, so product tax refund could be calculated and filed to the government. One important spill-over effect of the successful pilot run was the official acceptance of Returpack as trustworthy clearing house on aluminum recycling which has become beneficial both for the breweries (they did not have to report individually on recycling efficiency) and also for the

authorities (who suddenly started to receive impressive numbers of reused aluminum tonnage). This special inter organizational B2G operation started to serve as an obligatory passage point creating an interpretation between government policy and business model operation. The implications of the Returpack model are described in the next section by opening up the upstream and downstream "clouds" in Figure 2. This also further refines the business model and the role of ICT innovation.

Model for Recycling

During the pilot phase, quickly turned out that easy access and hassle free, convenient approach to the machines was critical: they had to be installed in places of natural customer traffic. This had been the point when retailer chains came into the blue print of the business model. According to legislation all retailers operating in a larger area than 200 square meters are obliged to run bottle return services, if they are selling refundable bottle products. The retailers have not been allowed to build in any margins into this service, as a matter of fact, they could not have even enforce the customers to repurchase in the stores for the returned value. Consequently, any kind of return service has been a mandatory chore and a potential managerial problem issue for retail management. Contrast to this, Returpack, could offer a free, clean and environmentally attractive solution for the retailers by basically appearing as an outsourcer of their return-business. Returpack only required place (size of vending machine) and regular electrical current. In return, however, it offered regular maintenance, timely vacating, and extra revenue from the collection. In order to make this work, Returpack had to extended the core of the clearing-house model, and initiate further collaborations and functionalities in the upstream and downstream processes of aluminum can recycling. All of these functions were enabled by the technology features of the RVMs and the communication and data processing capabilities of RIRS.

Figure 3. shows the key elements of the Returpack model extension both on the upstream (returning used cans) and the downstream (vacating RVMs and organizing the logistics of collection) phase. First we examine the upstream, then the downstream part this model extension and their implications.

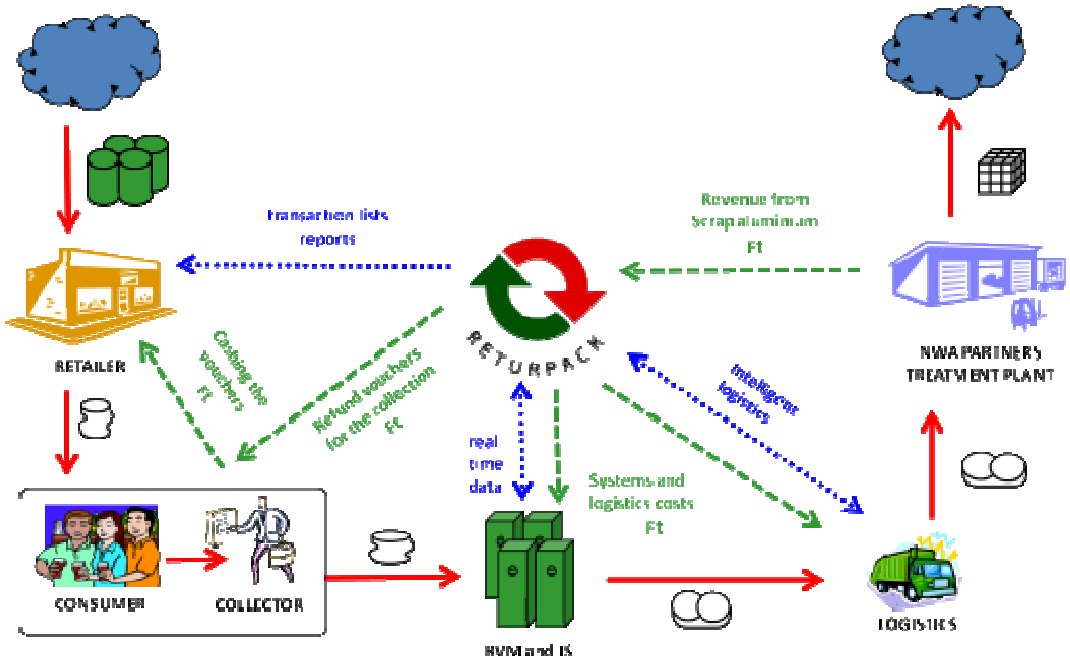

Figure 3. Up- and Downstream Extension of the Core Returpack Model

The installation of RVMs was not only attractive for retailers because of the free maintenance, small place and getting rid of a critical management problem, but very importantly they provided extra revenue source for the retailers. This opportunity was enabled by the printing capability and built in communication features (M2M and GSM modem) of the RVMs. The routine of returning the recycled cans (shown in Figure 1), was finished by a print slip voucher for which the particular retail store offered re-purchase possibilities, which later were cleared by Returpack based on the transaction reports shared by the retail (dotted and slashed lines in Figure 3). From this point of view RIRS has served as an inter-organizational information system (IOS), because it has not only generated report, but in some cases (like with Auchan, the French retail chain) there was a direct business-to-business connection between the fileservers of the organizations, so transactions were cleared electronically.

While technologically this is a smooth solution, economically it had shown some difficulties and risk. As we showed earlier in the case of regular glass bottles the economics has worked fine: for 7,5 cents more than 80% of glass bottles have been regularly returned. This is very different in the case of cans, since the price for a can is ten time less coming up to only 0,7 Eurocents (2 HUF) which is not a real motivation for the beverage consumers. Regardless, the pilot in 2010 had shown that the RVMs placement at the retailers was working, people returned aluminum cans in large numbers partly because of the convenience factor of the upstream process, the easy utilization of the refund value. One of the most interesting and far reaching unintended consequences of the business model had turned out the dominant appearance of homeless in the city collection. We symbolize this phenomenon by separating the consumers of beverages from the collectors: as Returpack interviewees have told us, more than 50% of can returns have been realized not from the actual consumers, but by the specialized collectors. Some individuals collected 2-3000 cans daily earning around 20 Euros/day which as a regular income – in Hungarian price levels – provides a decent access to get one´s life organized in terms of regular eating, clothing and shelter. This is quite important because success at collection is to a large extent due to the fact that system has mobilized the homeless society.

A constructivist analysis of the case - similarly, to Wiebe Bijker´s classic studies of social construction of technology in the cases of bicycle, Bakelite and the fluorescent light bulb [3] –could reveal how technology enabled aluminum recycling may construct an institution for social inclusion and by doing so create greener economy and improve quality of life. The Returpack-Retail-Voucher-Clearing configuration has constructed a vital and lively can collection model in Hungary. In Figure 1. we summarize the effectiveness of the Returpack collection system and innovation. By 2012 there are 180 RVMs installed into the operation of the 8 retail chains basically creating an unprecedented, close to 60 times, growth in tonnage collection.

Table 1. The key numbers of the Returnpack

	2010	2011	2012
Number of RVMs (units)	24	57	180
Recycled aluminum quantity (tons/year)	28,4	400	1700
Recycled quantity (cans/month)	0.1 millions	0.3 millions	9.0 millions
Number of retail partners	4	8	8

RIRS offers many functions as an infrastructure for an effective enabler on the downstream phase: planning, organization and management of vacating, collecting and delivering the huge amount of scrap aluminum from the RVMs to special treatment plants (right side of Figure 3.)

On the most operative level monitoring, maintenance and the timely schedule of vacating is the most essential. Each RVM is plotted on Google Maps with an appropriate colour code indicating its status. In the RIRS dispatching centre dispatcher might intervene from distance to the operations of each machine. On a higher level RIRS analyses real time data and feeds it to a forecasting algorithm for route planning and tour management. Given the pattern of historical can returns and the status of the

storage space logistical tours can be initiated, routed and organized. In Budapest for instance logistical can collection tours are initiated at 85% capacity of RVMs while in a further location they are initiated at already 70% capacity level because of longer travelling times.

Planning of the vacating times, routing and the management of the actual aluminum transportation happens based on continuous data analysis resulting from the communication with RVMs. Returpack has been operating three specially designed trucks with 8 drivers, 20 hours a day, three shifts in "drinking" seasons. The vehicles are specially designed for several reasons: a) to be able to access places in the city centres, c) could be driven by the most widely possessed driving licence in Hungary, d) being able to load the trucks by one person (1000-1300kg) with a special loading lift, e) equipped with GPS for tracking and providing capability for real time re-routing. The objective of the logistics tours is not only to vacate the vending machines, but also to provide basic cleaning and maintenance. Given the amount of this time (about 10 minutes/machine) and the distance to travel each truck handles 10-15 RVMs. In Budapest this number might climb occasionally to 17 RVMs in a day.

As we depicted in Figure 3., operation in the downstream of recycling is dependent on reliable operation of the whole communication and technology infrastructure therefore it is rather costly and requires key management priorities. The extension of the business model, on the other side, generates extra revenue by the sales of scrap aluminum to the NWA contracted treatment plants. In order to ensure the revenue stream from the downstream process of the recycling aluminum is delivered to the bidder of the best price. Since there is a supply-demand driven global market price for aluminum, the partners always negotiate on some percentage of this as the deal. Regardless of the fact, that Returpack sells directly to NWA special authorized partners, they participate on the price setting negotiations together with the smelters they deliver the cleaned cans. As we already referred to this in the introduction, the price is usually around 1 Euro/kg. Since from 1 kg of aluminum approximately 60 cans are manufactured, the price of on recycled can is about 1,7 Cents. Compared this number with the 0,7 Cents/can paid for the collection, we can conclude that the recycling revenue is shared around 40-60% between the collector and Returpack.

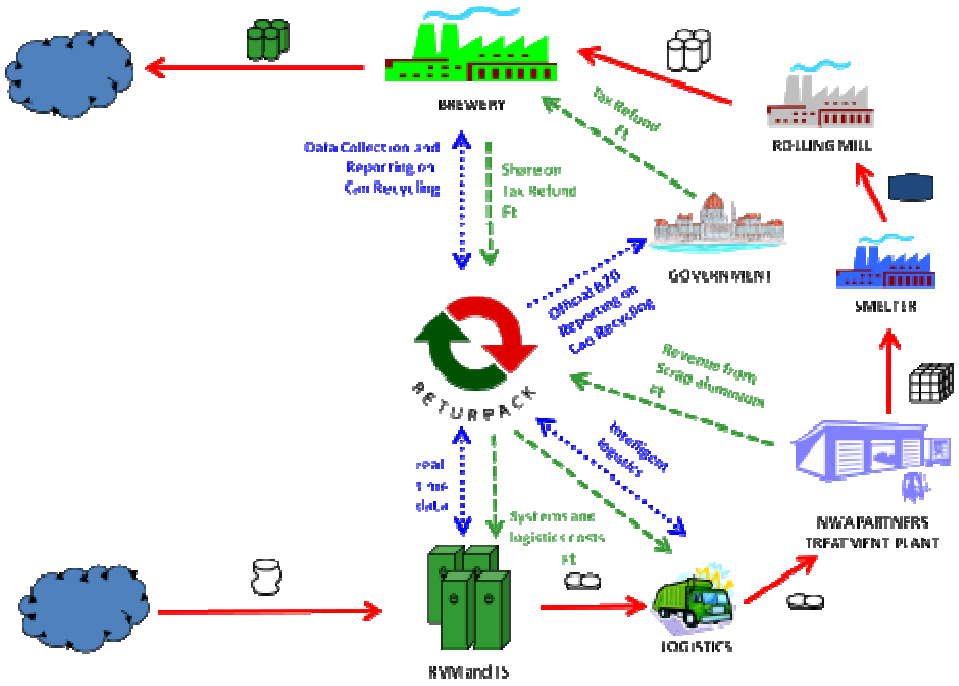

Figure 4. Re-use of Used Beverage Containers

In Figure 4. we extended and actually closed the recycling process at the breweries by showing how the used beverage containers (UBC) travel from the treatment plants, to smelters and rolling mills where they manufactured to the form of loadable containers again.

Returpack logistical delivery feeds a major metal wholesaler as the first industrial partner in the downstream process. From a technological point of view scrap aluminum is getting de-ironated with a magnetic separator and consigned into containers for further delivery. From here, aluminum is travelling to a smelter or to another industrial partner for the re-use. In the first years of operation – while Returpack itself controlled the iron separation and delivery to the smelter – liquid "purified" aluminum travelled to the Audi engine block facilities in Győr (Western Hungary) and the TT-model engine block got casted partially from recycled cans. Recently, a technologically more feasible partnership has been created for the actual quasi reuse of cans to their original purpose: carrying beverages. This technological solution is called can-to-can cycle during which collected and cleaned cans are transferred to specialized smelters and rolling mills that handle them separately without mixing with other metals. Such smelters are rather rare in Europe, but on the other hand, their input – the UBC (Used Beverage Container) - is more valuable since the alloy structure remains intact and used according to its original purpose.

In Hungary, this complex industrial network of the downstream process of recycling is coordinated by the National Waste-management Agency (NWA) who has special authorized partners for metal handling. For cans, if and when they are fed to the proper smelter and manufacturer, takes a couple of months at most until to re-appear in the market from the time of their disposal.

The rounding up of the business model spreads from vacating the RVMs, transporting the pressed cans to storages and cleaning, and finally to the place of recycling (as cans again) or the aluminum scrap for different purposes. Three phases offer innovative solutions in these areas: the intelligent logistics, the innovative utilization of industrial resources, and creating a supply network to the European recycling market. By merging Figure 2, Figure 3, and Figure 4 we drew Figure 5 as a summary and titled it technology enabled recycling due the immanent role of ICT in this process. We summarize the story of the case and its practical and theoretical implications in the last section.

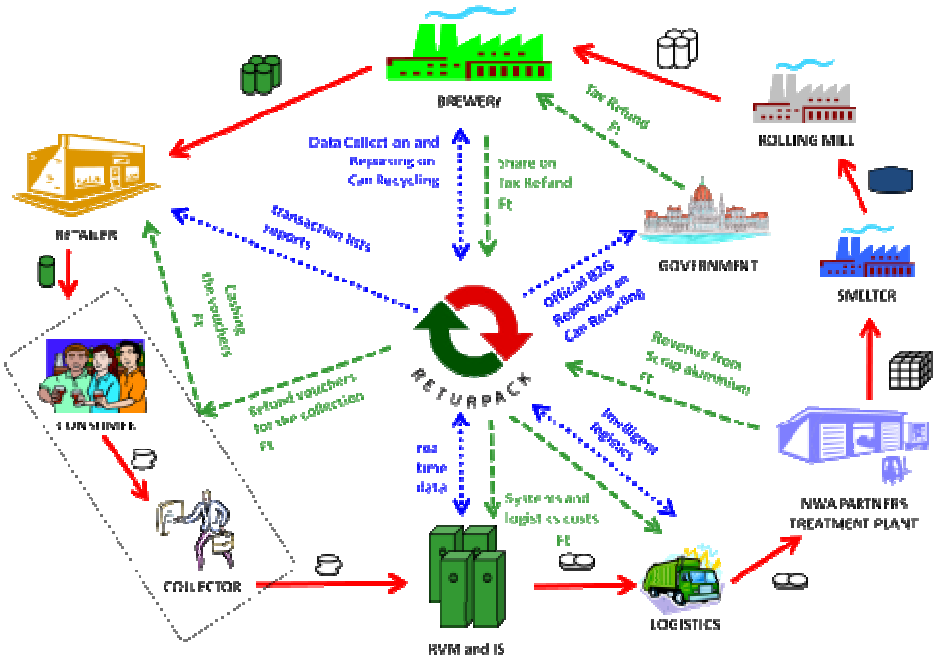

Figure 5. Technology Enabled Aluminum Can Recycling

Conclusion

In this paper we have shown, how high level policy objectives of can be achieved by aligning regulation, business modeling and technology innovation. In 2012 the central budget of Hungary collected 200mEuros in eco-tax fee part of which contributed to covering state deficit and another part had been reinvested into recycling technologies. The Returpack system – directly and indirectly - generates work for some hundreds of people, contributes to the state budget with many million Euro VAT payment and also recycles valuable materials literally from the garbage into the blood circulation of the Hungarian economy. Using the transformational impact concept of Agarwal and Lucas, RIRS is an illustration of a high-value and high-impact technology innovation capitalizing on institutional legislation, entrepreneurial agility and ICT development [2].

The second outcome of our description is a detailed analysis of an ICT driven nomological network – in a form of a causal loops – which integrates key constructs and their relationships to demonstrate how transformational impact is achieved [1].

In the center the ICT artifact is the RVM and the RIRS connecting logistics, clearing house and reporting designed to enable and/or support a series of routines such as collection process, fleet scheduling, tax reporting. The analysis also showed the broader structure within which the ICT artifact is operating consisting of consumers, retailers, government and other actors.

Our study has several limitation which offers opportunity for further research. One of these areas is the investigation and explanation of the underlying mechanisms introduced in the models. Another direction of future research is the exploration of the Returpack model´s implication on social inclusion of the homeless in the upstream collection phase.

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Identification in an On-line Learning Environment

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ABSTRACT

The students of the Corvinus University of Budapest are using the University's eLearning system almost every day. Probably most of them are not aware how much information they share with the website. In my research I am trying to find the answer why the gathered data is important for the companies and how it can be converted to valuable information. In this paper I am describing the first phase of my research and the preliminary results.

Prologue

Tim Berners-Lee created the very first website in '91, in 2013. March 18. he was awarded the Queen Elizabeth Prize for Engineering, because „his innovation has revolutionized the way we communicate" [1] Probably he did not think how popular the Internet and the HTML will be 20 years later. According to the statistics in 2012 more than one third of the entire human population were using the Internet [2] and by the year 2015 the worldwide Internet traffic will approach the astonishing 1 zettabyte per year. Just for comparison it is all the digitally stored information as of 2010. [3]

Problem statement

The Internet enabled the development of whole new industries and also helps existing businesses to expand. Marketing was one of the winners of the expansion, because with the Internet it has never been easier to send targeted advertisements to customers. With profiling the visitors of web sites it is possible to categorise them by their common properties or interests. But how does profiling works. How many information do we need of the visitors to categorize them properly?

On the chart of identification (Figure 1.) ranging from somebody has visited the website to we know exactly who is the current visitor; there are different levels of identification.

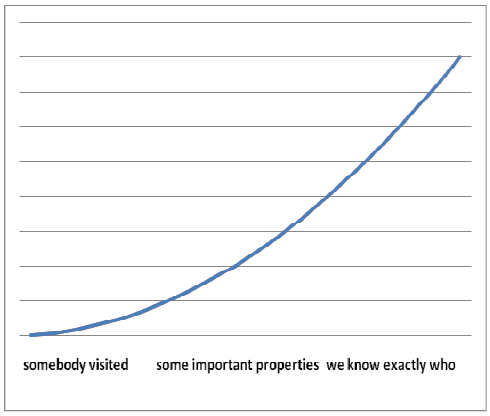

Figure 1. Amount of acquired information of the visitor (self-edited)

The goal defines the level of identification. For the business, it is not necessarily important to know the exact identity of the visitor it is enough to know his essential properties and preferences.

Research issue

In my research I have developed a data collector software, that I integrated into the eLearning system of Corvinus University of Budapest, that collected all the available data of the visitor students' software and hardware environment. It also saved their geographical position and available data on Facebook with their prior consent.

The eLearning system (aka Corvinus Moodle) has 8542 users in the spring of 2012 and the total number of students of the University is 17 869 and the number of teachers are 867, which means that approximately 45% of the university teachers and students are using Moodle. The data collection started on 18th April 2012 and lasted for 1 month. The application gathered more than 840,000 records. (1 record means 1 page download)

Device-browser

Before going on, we need to define the term of device-browser. While browsing the web websites can store data on the client side. A popular way of storing this data is the cookies (which is basically a text file that can be read by the website that previously had saved it). Unfortunately a browser cannot read the cookie of other browsers, which means, that if the same person from the same device changes browser, in my database he will be treated as a different individual. I use the term „device-browser" for a browser on a device of the visitors. In the current state of my research, my aim is to find a way how to link different device-browsers. In this paper I am expounding how I started to link the different-device browsers, what are the results and what are my future plans.

Why is it important?

In 2007 Facebook introduced the „Beacon" marketing program, that would help users keep their friends better informed about their interests and would help drive more sales to the participating sites. But this application showed in status updates and with photos of what items their friends had bought or reviewed. That's why users complained, that friends could learn of holiday gifts they had bought at the online retailer. [4]

In 2010 Facebook introduced the "Like buttons" and other widgets that can be implemented into websites. These modules can also send some information to the servers of Facebook about the visitors. There is still a vivid battle for the attention of the visitors. Years later, many of the top influencer companies of the IT industry are decided to take up the gauntlet and join the battle, including Microsoft with So.cl, co-founders of Twitter and Blogger with Medium. [5] These companies are fighting for the customers, because a well-functioning social site can collect valuable information on its visitors. The information of the visitors can be categorised and targeted advertisement can be sent to them.

Also there are other purposes for identification of the visitors:

- Fine tuning online services / Improve user experience : if the preference of the user is known, then a higher level of user experience can be given to him
- Targeted advertisements : if the interest of the visitor is known, then more relevant information on products can be sent to him by e-mails
- Finding somebody on the Internet : people can be found in the real world with the help of the above mentioned techniques

The different purposes claim different levels of identification. In the first two cases it is not necessary to know the exact identity of the visitor. In my research, I am dealing with the data collection part and I used ideas from Bursts – The future is predictable. The book says that most people behave in a predictable way. [6]

Approaches of identification

According to the literature I found, that there are two different approaches for identification of individuals:

- Top-down: Starts from the entire population and drills down to the individuals [7]
- Unique in the crowd: The theory is based on the uniqueness of human mobility (or behaviour) [8]

Since there is no behavioural data for all of the visitors of Corvinus University, the top-down approach cannot be used here, so I decided to go with the unique in the crowd approach. It is possible to identify the individuals by the features of visitors' software and hardware environment used for browsing visitors' online behaviour

Methods of identification

During my research I found many identification methods, which can be categorized in the following way:

- Technological
- Account based
- Social site linkage or OpenID usage
- Location based
- Software & hardware environment based
- Browsers' cache mechanism based
- Based on behaviour

The account based or social site linkage identification is not in the scope of my paper, because in case of a unique id (like e-mail or Facebook account) the identity of the visitor is obvious.

Account based

The visitors are identified by their e-mail address or their self-chosen unique login name. If the user is signed in, it is pretty easy to detect what he is doing on the website or get in touch with him.

Social site linkage or OpenID

Today it is popular to use Facebook as the authenticator for websites. With the installed Facebook login application it is possible to register and authenticate visitors. It is also much more convenient for users, because they don't have to waste their time with filling the websites' own registration form, not even mentioning they don't have to memorise an additional password. The registration is just a couple of clicks, the visitor can grant access for the website to fetch his required data from Facebook and authorise the user.

As I mentioned before this is a pretty convenient for the customers, but this has also disadvantage for the visitors and that's why some people are reluctant to use it. The visitor has to restrict his Facebook profile from other people to check it out. And sometimes it is not enough, by any chance the visitor is the friend of the owner of the website, then he can get sensible information on him.

Location based

It is known that the IP address can be resolved to a rough location. The ability of changing places of people has its limitations and they usually use the internet only from a few places. If the user approves the website to use his geolocation info, the location will be much more precise. (We can use the IP address, the ISP and the location of the user to identify in his session)

Software & hardware environment based

With the help of Javascript and Flash technologies, it is possible to get a thorough feature list of the visitors' hardware and software components, from which a fingerprint can be generated that helps to identify the visitors browser-device.

Browsers' cache mechanism based

Cache is a great help for the browsers, with which the requested webpage can be shown much faster and bandwidth can be saved. During browsing all the resources (including images, scripts, CSSs and HTMLs) are stored temporarily in the hard drive of your computer. If the visitor wants to visit a web-

page that he has visited before, then the browser will check its cache first. If it finds the requested resource there, then obviously it will not download it again, thus saving bandwidth. But there is a mechanism that tells the browser if there is a newer version of the resource on the server that needs to be downloaded. This mechanism can be used to identify visitors. [9]

Based on Behaviour

This method includes the identification of the visitors by their behaviour, which means that everything you do in the online world can define you. If we gather lots of data of the visitors, it is possible to find out, what they are interested in. Profiling is a method that puts the similar individuals into groups of the same property.

Research & Result

In April 2012 I implemented a visitor tracker application into the eLearning system of the Corvinus University of Budapest with the approval of University. The application saved all the available attributes of the visitors' software and hardware environment and their geolocation and public data on Facebook with their consent. There is an entry in the database for every click of the visitor. When the visitor downloads the very first page, he gets a unique ID that is stored at the client-side in a cookie and in localStorage[6] (see on Figure 2.).

After every page download the application examines the content of the cookies and the localStorage and if it finds valid existing tracking data, then it means that the user has already been visited the webpage from the current browser in the current device.

Browser does not share cookies, which means if the visitor downloads a page with Internet Explorer and later does the same thing with Chrome from exactly the same machine the application is not able to track him. The other browser is not able to read the browser's cookie or localStorage, but the hardware and the software environment is still the same. (Though might not be detectable with an older browser) If the visitor downloads the page for the first time, the application generates a unique ID and saves it on his browser, so later this can be used to track him.

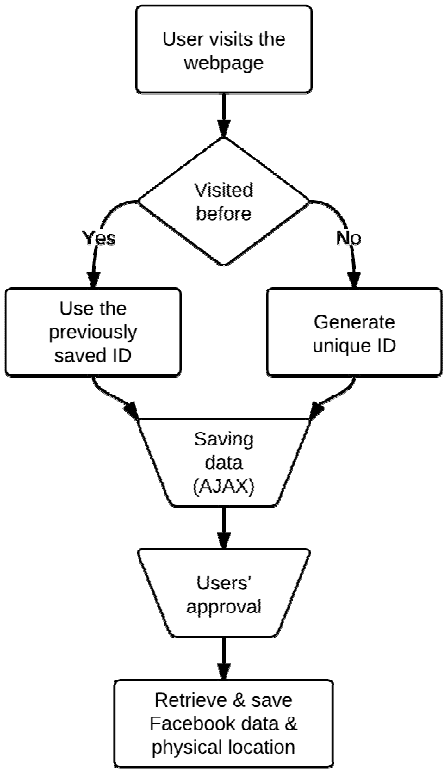

Figure 2. A visitor tracker application

Behaviour based identification

The content consumption from different device-browsers might be significantly different. But from this point of view the eLearning system of the Corvinus University is special, because the visitors can get to the desired content through the same pages (nodes), the chance of direct linking is low. So we can say that visitors browsing from different device-browsers can have similar browsing path or history. For example the students can use the eLearning system for learning at home from their laptops, but they can also check the test results with their mobile phone. In this case they have to login, then click on the site of the course and then they can click on the results. In this case there is no chance of direct linking, because the students don't know the link of the results prior to publish.

[6] In 99,36% of the records supports localStorage in the sample

This means that it is possible to build the path tree of the visited pages of the visitor and can search the database for similar patterns. In real life test the following points should be considered:

- tree path of the visited webpages
- order of the visited webpages
- used device-browser for visiting the webpage
- process of identification

As mentioned before the visitors can be identified by the software and hardware environment of the used device, by the behaviour of the visitor and the combination of these. As a first step select a random record from the dataset, then draw the tree path of the visited pages. Then search the database for similar patterns, only those visitors were selected, whose tree path had at least 2, 3, 4 or 5 visited pages. If the number of the matching visited pages is low, then the algorithm results lots of similar visitors that are probably classmates or alternatives device-browsers of the main visitor. If the number of the matching visited pages is high, then potential device-browsers might be skipped. That's why I decided to keep this number low.

After having the group of the potential classmates and device-browsers, started to compare them with the sessions of the main visitor according to the following rules:

a./ Time dimension
- short time frame: in a short time frame, most of the stored data can be used for identification (it is unlikely for a visitor to change IP address, screen or OS within few minutes)
- long time frame: in a long time frame, none of the stored data can be considered permanent, so it cannot be used for identification (for example: during the period of the data collection most of the visitors upgraded their browser, but it is also possible that somebody changed his screen or laptop)

b./ IP address
- Non-Corvinus University IP address
  Fix: can be used for identification or *Dynamic*: Can only be used for identification in short time frame. Most people are sharing the internet at home, with a SOHO router. This means that it is using one public IP address, that's why in short time frame if two different device-browsers are accessing the internet, then it is the same person or somebody that lives in the same place
- From the domain of Corvinus (all the IP addresses of Corvinus starts with 146.110)
  Fix: Most of the IP addresses at the Corvinus are fix. The fix IP addresses can be given to employees, campus building classrooms, students in the dorm or *Dynamic*: Smaller part of the used IP addresses is dynamic. Dynamic addresses can be given to campus wifi access and VPN. Assuming that the users are not sharing the given IP addresses, these can only be used during the session, because the users get a new address, each time they connect to the network.

c./ data of the ISP: the name of the ISP for the connection can be resolved from the IP address can also be used for identification (it is not possible that a user has many internet connections at home)

d./ geological position
- position from IP address: there are online databases with which it is possible to resolve IP addresses into geographical locations. The free version support city level resolution, so it can be used in case of a visitor who is not from Budapest.
- Geolocation: in case of *wired connection*: in case of wired connection the geolocation position is superficial, it only shows city level resolution; *wireless connection* or equipped with positioning capable device (A-GPS, GPS, GLONASS, Wifi)

e./ font types: the font types installed into the device used for browsing. The fonts are browser independent, that's why it can be used to identify different browsers on the device (device used for browsing: in case of tablets and mobile phones the hardware environment can be the link between different browsers)

Visited web pages: the common web pages in the visitors' tree path can be a starting point to connect the device-browsers. In some of the points I used the specificity of the network of the Corvinus University. I tested the above mentioned rules on a group of 24 individuals. I used the combination of the above men-

tioned rules and in 25% of the cases I could link the device-browser with full certainty. In 8% of the cases I found the probable device-browser.

Conclusions

An average of 3,93 kB of data is saved with every click of the visitor in my database, and there is an average of 19,89 records of every browser-device in my database. So there is 80 kB of data of every device-browser and there is 300,5 kB of data of every user in my database.

The result of the query shows, that with browsing visitors are sharing lots of information about themselves and about the device used for browsing, and other researches claim that it can be used to conclude aspects of their personality, including sexual behaviour or intelligence. [10] By browsing the web, we are offering the sensitive points of our personality and habits to the social sites and the visited websites. The more we use the web, the more accurate profile they will have on us.

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The Role of eLearning in the Knowledge Management System of Higher Education Institutions

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ABSTRACT

Electronically supported learning is gaining ground in our daily lives, as the use of computers is becoming an important tool for lifelong learning. The integration of information and communication technologies (ICT) in education affects a wide variety of educational systems and the participants of education as well. Most of the studies, however, does not give a clear answer to the impact of these novel techniques on the learner and the learning process. According to figures from the Central Statistical Office (KSH, 2011) students studying in higher education institutions in the school year 2012/2013 was 338,467. 233,678 conduct their studies on a full-time basis, while 104,789 study on distance or correspondence courses, so the total number is about. one-third. It also shows that a significant proportion of those students chose distance learning. Those students involved in distance learning have special needs due to different living conditions.

Introduction

Customized knowledge management solutions and services play an increasing part both in the business and the academic sector. Higher education institutions also present several other challenges. The declining number of students and the rising cost of training encourage institutions to seek more attractive features in order to draw attention to themselves, to attract and keep students in the institution. Knowledge management tools can be the method of attraction and may prevent the dropout of students. In this process teachers play a key role in new functions as mentors and tutors. The tutor as a "master" introduces students to these novel knowledge acquisition methods. Technical and IT solutions, like eLearning management systems (LMS), have an essential function, while digital competence development and use also play a key part.

I started my research just in the right moment for this issue to be addressed. At my workplace I had access to students' data sets entering and staying active in ILIAS, the time spent within and the data of students' exam results queried from the Neptune system. Since students used two different codes when entering the systems,, the two databases were linked with certain IT tools. The idea came up to draw conclusions from a comparison of the students' online activity within the semester and exam results.

To my best knowledge, such an empirical study on linking two data sets have not yet been conducted. The results are presented below. Furthermore, I would also like to note that - in my opinion - the results of my research can be used to tailor solutions to knowledge management services, so that they get more and more ground both in business and in the academic sector. Higher education institutions are also more fraught with challenge. The declining student enrollment, the increasing costs of training encourages the institutions to offer more attractive services to call attention to themselves, thus to attract and retain students for the institution. Knowledge management solutions may be one of these tools.

Background and Objectives

Based on scientific objectives by means of a complex statistical analysis the main goal of the research was to explore, whether there are significant differences in study habits, methods and motivation among the full time and distance learning students.

My research has been conducted in a specific higher education institution, Dennis Gabor College. I regard the survey and its results as a case study. Based on the results of this study and the findings of other higher education institutions I have drawn general conclusions as an answer to my research question. I have done complex econometric analysis on the basis of primary data for the specific structure and format available. My goal was:

- to convert and organize the data
- to create new derived data.
- to select the appropriate statistical methods for the systematic analysis of the data for
- to examine whether there is a connection between the form of education (full-time and distance learning), the students1' online learning activities and number of credits earned at the end of semester

As a result, I will draw conclusions, which:

- On the one hand: answer the fundamental question of whether the use of eLearning framework influenced the study results of the students.
- On the other hand: I propose suggestions to promote the more effective participation of students in higher education institutions supported by ICT tools educational process, taking into account the specific needs and circumstances of students in distance learning, which vary from full-time students' needs.
- Third, draws attention to the opportunities and increased importance of non-academic use of frameworks used in teaching.

Thus I intend to:

- Explore and evaluate the differences outlined above between full time and distance learning students, with particular reference to the use of eLearning tools.
- Evaluate the results of distance learning students using eLearning tools, rate economical and additional impacts of eLearning.
- Evaluation of Knowledge Management tools used in higher education institutions.

In my research is not my intention to examine either primary and secondary school education and digital learning materials. My research focuses on adult education and adult training. I examine the didactic principles and andragogical methods used in adult education in this regard. I define student groups on the basis of their specific circumstances and learning habits based on national and international literature. I also give an overview to which extent can the system provide a solution to different student needs. In my analysis is not my intention to deal with the use of eLearning and knowledge management outside higher education institutions , such as companies either, since although there are similarities between the behaviour and function of these organizations - the academic institution plays a unique multi-functional role in the transfer of knowledge. I also delimit my analysis of lifelong learning, because it would lead to the direction of investigating higher education graduates' opportunities in the labour market. This topic is a natural extension of my research, but would unnecessarily extend the scope of the paper.

Hypotheses

Based on the literature review, and my professionnal experience gained predominantly in the field of eLearning I set the following research hypotheses:

- H1. There is a significant difference between full time and distance learning students in learning and Internet access habits. By study habits I imply curriculum access methods and time and place of access.
- H2. The use of learning management systems (Learning Management System, LMS) may improve the learning outcomes of students. The positive effect is not system-specific.
- H3. The use of learning management systems is changing traditional learning habits.
  Non-traditional forms of learning facilitates adaptation to different situations. Students acquire teaching material at a suitable time and methods different from traditional ones, which facilitate the success of participation in the training process.

- H4. eLearning, as a knowledge management tool in higher education, support students, making the learning process more effective. By using online tools, students in higher education can keep in touch with each other and with their teachers and administrators, thus facilitating more successful administration, and knowledge transfer.

Methodology, Data Sources

The survey was conducted during the 2011-12 academic year. The study occurred in a special moment because vast changes took place in higher education in 2013 with the introduction of public education law. The survey recorded this last moment. I have used two set of data for the research:

- The quantitative survey data sets consist of the students' logged time spent in the ILIAS Learning Management System (LMS), and credits earned during the semester recorded in the Neptun Administrative Study System. These data sets were analyzed to discuss the effects of the LMS use on the students' study results.
- A questionnaire has also been distributed among students who were active ILIAS users. Their survey responses provided data to gain information on their living conditions and study habits related to the distance learning system.

The two data files had to be converted for statistical processing.To carry out my research a primary data set was used. I have used data of the academic year 2011-2012, of the ILIAS LMS use and students' exam results. The target group was all Dennis Gabor College students using ILIAS: undergraduate, higher education degree, postgraduate, and students who started college before the Bologna system. I examined the exam results of 1,695 students.

The student sample is representative as this is the base population. Students only have access to learning materials through ILIAS only as printed textbooks are not available. In addition to taking notes in class therefore logging in to ILIAS is the only opportunity to prepare for the exam, so it is the students' best interest to use the system. Thus, the sample distribution is most likely the same as the probability distribution of the variable being tested. This question does not arise in Neptun, the learning administration system, as all student information can be found Neptun. Each student is assigned credits at the beginning of the semester, and some of these completed by the end of the exam period. In order to examine the relationship between academic success and the use of the ILIAS distance education system, I have used the following data: the time spent in the Learning Management System, and the students' academic performance obtained from Neptun. In order to analyze the interaction between the two variables, the ILIAS and Neptun records had to be connected. This was performed with the help of an auxiliary file, which included students' codes from both systems. The test results were analyzed using the percentage of credits assigned and completed. The reason for this is that this statistic had been used for college semester results statistics, thus the methodology and the results were given. The best result for the student was, if they obtained 100% of the credits they had been assigned to, so I chose the ratio of credit to measure student success.

Evaluation of Research Results

Data file generated by linking data sets

When selecting evaluation methods, I had to take into account the temporal and additional limitations of the research. Thus I chose two available data sets: ILIAS system usage data, and the students' exam results. Technically, I had the opportunity to receive students' exam results, who used ILIAS, and join the two sets of data on the level of individuals. 1,690 students results have been examined. Since the two sets of data to be examined – time spent in the distance education system in minutes and the rate of credits completed – are high measurement level metric variables, correlation analysis was used to examine the connection between them. The differences between the two forms of training were analyzed by analysis of variance and correlation calculated separately for the two forms of training.

Questionnaire

A promotion of the questionnaire was conducted via the Neptun education administration system. I drew attention to the possibility of filling in the questionnaire through targeted e-mails to students in May 2012. E-mails were sent to all active (who entered the system during the investigation period) BSc and Higher Education Degree students signed up to college courses.

Also, I have placed the questionnaire and a brief description on the main surface of the ILIAS desktop. Thus, those students also learned about the possibility, who did not receive an e- mail notification. The ratio of filling in the questionnaire was approximately 11%. A total of 177 persons opinion was analyzed further.The questionnaire itself was an ILIAS application. I was able to access statistical data as an administrator and results import in a suitable format (PDF, Excel).

Justification of Hypotheses

H1 There is a significant difference between full time and distance learning students in learning and Internet access habits. By study habits I imply curriculum access methods and time and place of access. Summarizing the results of the study I declare the following statements:

- There is significant correlation between the form of study and age group. The 18-22 age group studies mostly in full time programs, while the age group older than 30 studies in distance learning.
- Full time students typically have no children opposed to distance learning students
- There is also a connection between the form of training and work habits. Almost all distance learning students work. More than 50% of full-time students work besides their studies.
- Full-time students use the distance learning system in the main school building in a prominently higher proportion, than distance learning students. This result is reversed in case of the workplace.
- Twice as many distance learning students enter the system at night than full time students.

Table 1.: Differences between full time and distance learning students Source: Own research

	Full time	Distance Learning
Age	18-22	30+
Work	50%	94%
Place of study	college	workplace
Time of study	during the day	at nigh
Child	no	yes

I conclude, therefore, that the typical full-time students belongs to the age group 18-22 years old, has no children, uses the distance learning system especially during the day in the main school building, and is likely to work part-time in general parallel with her studies. Distance learning students are typically over the age of 30, likely to have children, work full time, use ILIAS at night and at work. Thus, I accept the first hypothesis. Different student groups study according to their needs and circumstances. Their learning and knowledge-seeking habits vary.

H2 The use of learning management systems (Learning Management System, LMS) may improve the learning outcomes of students. The positive effect is not system-specific.

According to the hypotheses relationship was compared between the two forms of learning. The difference between the two groups may be characterized by the different extent of the distance learning system's effect on student performance. According to the results in case of full-time students the correlation is much higher than in case of distance learning students

Correlation of time spent in ILIAS and credit performance of full time and distance learning students

- Full time students: ,491**
- Distance learning ,304**

Both results were significant, p = 0.00.

In case of full time students the correlation coefficient is 61% higher. If coefficients of determination are calculated, the results are 0.24 and 0.09. Thus calculations show that the use of ILIAS has two and a half times greater impact on academic performance in case of full time students.

Based on the results of analysis of variance and correlation tests I make the following statements:

- Time spent in ILIAS definitely improves the ratio of completed credits.
- The use of ILIAS has two and a half times greater impact on academic performance in case of full time students, than in case of distance education students.

Thus I consider the second hypothesis justified, since ILIAS use improved each student group's performance, but in a higher extent in case of full time students. In my opinion, the fact, that the more than half of the respondents work beside their studies in some for or another, explains this result. Access to online learning materials for full-time students is of great importance

H3 The use of learning management systems is changing traditional learning habits. Nontraditional forms of learning facilitates adaptation to different situations. Students acquire teaching material at a suitable time and methods different from traditional ones, which facilitate the success of participation in the training process. eLearning, as a knowledge management tool in higher education, support students, making the learning process more effective. By using online tools, students in higher education can keep in touch with each other and with their teachers and administrators, thus facilitating more successful administration, and knowledge transfer.

There is a significant (statistically proven) difference mainly between the location of using ILIAS: in case of the answers "I use ILIAS on campus, on classroom / library computers", "I use ILIAS on campus on my own laptop" and "At my workplace". P = 0.000, so this result essentially ruled out, that the distortion of the sample induced (or substantially influenced) the differences. Wen justifying the third hypothesis I refer to these results already mentioned during the justification of H1:

- Full-time students use the distance learning system in the main school building in a prominently higher proportion, than distance learning students. This result is reversed in case of the workplace.
- Twice as many distance learning students enter the system at night between than full time students.

I would like to highlight the results of the gradual spread of mobile devices (27%). This value was negligible during a similar survey years ago, but over the years with the proliferation of mobile devices (smartphones, tablets) this form of learning has grown by leaps and bounds. The third hypothesis therefore is regarded as justified, as non-traditional forms of learning (home, work, mobile device, per night) has been clearly shown gaining ground, especially among distance learning students.

H4 eLearning, as a knowledge management tool in higher education, support students, making the learning process more effective. By using online tools, students in higher education can keep in touch with each other and with their teachers and administrators, thus facilitating more successful administration, and knowledge transfer.

ILIAS is used for educational administration by one-third of the respondents (on a low - medium level). Whereas a higher proportion of distance learning students (39%) turn to online resources than full time students (31%), because they have fewer opportunities for personal contact. These life situations (see above) almost determine students to have different experiences and strategies related to IT use. However there is no significant difference between the two groups concerning overall satisfaction with ILIAS. Communication with teachers and administrators less significant than study activities, however, since the ILIAS system is primarily designed for self-study, this result is natural. However, since administrative activities is still around 30% of the online activity of respondents this is considered significant. Thus, the fourth hypothesis is justified.

New and Original Achievements

Based on research results I came to the following conclusions:

- Variance analysis proved that there is a significant difference between full time and distance learning students ($p = 0.000$). Correlation calculation proved that time spent in ILIAS significantly improves the ratio of credits completed by the students. The coefficient of determination in case of fulltime students is 0.24, while at distance education students is 0.09. Thus, in case of full time students using ILIAS has two and a half times greater impact on learning performance than in case of distance learning students.
- I demonstrated by applying correlation analysis, that online education has a positive impact on the academic achievements of students compared to traditional education, in accordance with similar studies,. The correlation coefficient is 0.376, which is of medium strength. Students using online resources for knowledge acquisition purposes have improved their academic performance, thus higher eLearning literacy contributes to the successful acquisition of knowledge. Sample of students tested in the case study is considered representative, in view of the higher education institution examined.
- Based on the questionnaire statistical methods prove that 67% of distance learning students work besides their studies. 55% of full time students work in some form or another besides their full time studies. Thus there is a great overlap between full time students, and students working parallel with their studies. Using cross-table analysis I proved that 55% of full time students work in some form or other. The student sample in this case is not representative, since filling in the questionnaire was optional. Nevertheless, it may logically be assumed that the results may be applied to a larger range of data.
- Full time and distance learning student groups study according to their needs and life situations, thus their study and knowledge acquisition habits also differ. Non-traditional forms of learning (at home, in the workplace, on a mobile device, during the night) clearly gain ground, especially among students of distance learning students. The cross-table analysis showed a significant difference in several cases. These empirical results have confirmed the allegations, which are listed in the literature of eLearning as the most important advantages of online education: non-traditional forms of education compared to traditional methods facilitate learning besides family and work.
- Questionnaire answers confirmed that students make use of online tools to liaise with teachers and administrators in addition to the traditional personal forms. This issue concerned a specific area, where - according to best of my knowledge - no investigation has been made, so the research, although the sample is not considered representative in this case, may serve as the basis for further investigation.

Conclusion

As a result of my research, I conclude that the use of digital tools in education is inevitable, there was a breakthrough in the user point of view. Students already possess the tools and attitude, which enables the exploitation of available content in the online environment.

Traditionally the transfer of knowledge takes place with the teacher's assistance in person, or by books and notes. However, due to the expansion of online media, a LMS (Learning Management System) can be an up-to-date solution to manage knowledge transmission. The introduction of this service is recommended in an ascending system, gradually covering the entire organization. The goal is that the system would be exploited by all teachers, students, administrators on an institutional level within the daily practice of education.

By introducing eLearning systems the students have the opportunity to measured themselves and acquire knowledge in a new medium, through active involvement, not only passively absorbing knowledge. Learning in virtual groups, developing joint projects prepare students for team work, which they will use in their future workplace. The opportunities

of Web 2.0, wikis, forums promote teamwork and sharing of experiences.

Full-time students also commit themselves to work in various forms. This contradicts the fact that theoretically they should fully concentrate on their studies and should be present in the educational process. Instructors need to find the opportunities in this situation that help full time students to cope with the learning process. Digital teaching materials facilitate this process.

The use of eLearning and educational administration systems significantly help the transfer of knowledge in the case of students, teachers and employees. Although higher education institutions and for-profit companies differ in many respects from each other in terms of knowledge management, they would like to achieve the same goal. However, similar situations occur in both types of institutions, for example the quitting or retirement of employees. In these cases, it is essential that the employee's knowledge will not be lost for the organization. The retention, codification and transfer of knowledge is achieved by using the same tools. In this process, eLearning and blended learning appears not as a "panacea", but as an opportunity that facilitates effectiveness.

A key feature of third-generation universities is their relationship with market actors. It is essential that higher education institutions and the corporate sector work more closely, enhancing each other's effectiveness. Universities and colleges should continuously monitor and probe labor market and business needs, and to educate such knowledge workers with marketable skills, who fulfill the gaps in the labor market, thus contributing to long-term economic development.

To further examine the change of study habits a time-series panel study is necessary. The research should be carried out in an institution where digital learning materials and teaching aids are still to be applied on an institutional level. My present position in the Budapest College of Communication and Business is ideal for this purpose, as the introduction of eLearning tools is being applied. The subject of the research is the study of a group of students before and after the use of learning management tools. With the comparison of the results new information will be gained concerning the use of digital learning materials and the effectiveness of eLearning tools.

These tasks are extremely comprehensive, they require significant time and financial resources. The topic however is very interesting, it is definitely suitable for research. Research has been conducted on similar topics by the Knowledge Management Working Committee of the Hungarian Academy of Sciences. It would be advisable to unite the previously accumulated knowledge of professionals in this subject and involve researchers in a long-winded, hoop-style study, using grant resources.

In the coming years knowledge-based economy will become the engine of economic development. During this process, higher education institutions will function as knowledge centers, to identify, develop, publish, and deliver knowledge, thus take part in regional development.

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SEFBIS Board's Approved and Performed Decisions in 2013

Decision No. 1/2013

The re-elected SEFBIS SIG (GIKOF) Board put together and accepted the Annual Workplan required by the Secretariat of the JvN CS. Decisions were made on 13rd February, 2013 as:

- Review and control valid membership of the SEFBIS SIG/GIKOF
- Check the central Workplan of NJSzT and other SIG groups in March, 2013
- Contact the only PhD School on BIS (at Budapest Corvinus University) to form the Journal as a basic publication platform and to recruit new members
- Move the SEFBIS website under the njszt.hu domain
- Start the acceptance process of SEFBIS and GIKOF JourSnals by the Hungarian Academy of Sciences, PhD schools, and the MTMT reference Database
- Create the Organizing Committee for the jubilee ISBIS/OGIK Conference in November

Decision No. 2/2013

The Board had a short meeting at the General Assebmly of the JvN CS and had some decisions related to the the ISBIS'2013 (OGIK'2013) Conference as follows:

The members of *Organizing Committee:*
Chair: Dobay Péter Members: Mária Raffai, Gabriella Juhász, Ferenc Tóth, Horváth Ádám, Kristóf Péter, Hornyák Miklós

The members of *Programme Committee:*
Chair: Raffai Mária;
Co-chairs: Dobay Péter, Pozna Claudiu Radu,
Members: Gerhard Chroust, László Cser, László Cserny, Petr Doucek, Ferenc Erdős, András Gábor, Gábor Homonnay, András Jánosa, László Jereb, Vesna Bosilj Vuksic, Zsolt Tibor Kosztány, Kruzslicz Ferenc Erzsébet Noszkay, A Min Tjoa, Tetsuya Uchiki

A request should be sent to the EBSCO Secretariat (UK – US) to accept the Journals as referred publications to this online database.

Decision No. 3/2013

- The Board expresses gratitude and thanks to organizers, reviewing board members and authors to successful work of the annual ISBIS/OGIK Conference, held in Győr, on 7-8th of November, 2013
- Finalyzing papers for publication into the GIKOF Journal (in Hungarian) and into the SEFBIS Journal (in English) and sending to the Committee by 28th February 2014 the latest. According to financial conditions, the publications should be sent to print in August the latest.
- The Activity Report 2013 and the Workplan 2014 of the SEFBIS SIG/GIKOF has to be circulated and – after acceptance – sent to the Secretariat of the JvN CS by 20th December, the latest.