



Janie Chroust 2010 – Jindřichův Hradec

Welcome to IDIMT 2011!

A hearty welcome to the 19th IDIMT Conference!

The IDIMT conferences, started in 1993, are now a well-established event in Central Europe. We enjoy interdisciplinary discussions between scientifically and geographically diverse groups of participants. The main focus are the current and future challenges in a world dependent on Information and Communication Technology.

Jindřichův Hradec, chosen in 2008 as the new location for IDIMT and Hotel Concertina has proven to be a good choice and an additional improvement over previous years. You will again be able to enjoy this beautiful old town with its historical market square, its old castle with a famous fountain, and a lovely lake. The surroundings of Jindřichův Hradec are also quite remarkable: numerous beautifully decorated houses (e.g. Slavonice), several excellent restaurants offer delicious food. Small shops with the handcraft from the area and a wide central plaza will invite you to rest or to wander around the town. And the famous Czech beer might well inspire our discussions.

As every year, 2011 brings about an innovation: we accept posters! By this offer we hope to enable participants to show their research result if they are not fully ready for a paper contribution.

Continuing with interesting topics of last year but also introducing new topics, the following key topics were selected for this year:

- Human Resources in ICT
- Systemically Reacting to Regional Emergencies
- ICT Impact on Economy and Innovation
- Information about Human Well-Being in Organizations
- Social Computing for Cooperation
- Socio-economic Aspects of Digital Business Economics
- Information & Communication Technology – Trends, Scenarios, Impact

Based on a double-blind review we were able to accept 42 papers for the 7 topics, the authors coming from 7 different countries. Each session was organized by a Sessions Chairperson. By tradition a session begins with a keynote, the other papers provide additional points of view. They are followed by intensive discussions. We believe that intensive discussions are one of the attractions of the IDIMT-Conferences, by providing interdisciplinary exchange of thoughts. Staying together in one hotel, having lunch and dinner together, also fosters animated discussions.

The preparation and realization of IDIMT 2011 would not have been possible without the support of many organizations and persons. Therefore we would like to thank:

- the Austrian Federal Ministry of Science and Research for supporting the preparation of the proceedings (Grant BMWF-4.010/0004-III/2/2010),
- the Czech Grant Agency for partially sponsoring the conference (GACR Grant 403/09/0385 and Internal Grant Agency (IGA) Grant 14/2011 (IG409051),
- the University of Economics Prague and the Johannes Kepler University Linz, which as partner universities provide the organizational infrastructure,
- the Security Research Programm KIRAS of the Austrian Federal Ministry for Transport, Innovation and Technology (BMVIT).

My further thanks go to:

- Václav Oškrdal and Antonín Pavlíček who took up the work of collecting all papers into the proceedings, keeping contact with all involved parties, especially reminding the authors and performing all the other necessary administrative jobs,
- Petr Doucek for chairing the Organizing Committee and organizing accommodation in Jindřichův Hradec and the lovely excursion on Thursday afternoon,
- Lea Nedomova, secretary at the University of Economics Prague,
- all keynote speakers, speakers and contributors of papers,
- all Session Chairpersons for establishing contacts and soliciting contributors,
- all reviewer providing critical remarks and by this improving the papers,
- the Trauner Verlag for acting as the publisher of our conference, and
- all other unnamed persons contributing to the success of this conference.

To a successful conference!

Gerhard Chroust, July 2011

Sponsors of IDIMT 2011

BMW_F^a

Bundesministerium für Wissenschaft und Forschung



The Grant Agency of the Czech Republic (GACR)



University of Economics Prague



JOHANNES KEPLER
UNIVERSITÄT LINZ

Netzwerk für Forschung, Lehre und Praxis



Contents

Human Resources in ICT	9
Human Capital in ICT – Competitiveness and Innovation Potential in ICT.....	11
Petr Doucek	
Comparison of the Czech and Austria Education Systems.....	23
Miloš Maryška, Petr Doucek	
Communication and Human Resources Management within Virtual Organization.....	35
Jan Čapek, Jana Holá	
Measuring Returns on Investments in Human Capital by Mincer Model and its Impact on Czech Higher Education System	43
Savina Finardi, Jakub Fischer	
ICT Experts in the Czech Republic – Development in the Past and Future Prospects.....	51
Tomáš Fiala, Jitka Langhamrová	
On the Relationship between Perceived Importance of ERP Systems Selection Characteristics and Satisfaction with Selected ERP Systems.....	59
František Sudzina, Andreja Pucihar, Gregor Lenart	
Changes in Position of the IT Department in Organizations.....	71
Renáta Kunstová	
 Systemically Reacting to Regional Emergencies	 79
A Systemic View of Interventions in Regional Disasters.....	81
Gerhard Chroust, Günther Ossimitz	
Risk Management as an Proactive Tool for Disaster (and Other Loss Events) Management	95
Vlasta Svatá	
Process Simulations in Emergency Situations in the Czech Hospitals.....	103
Klára Antlová, Michal Tvrzník	
Effective Notification of Civilians of Regional Emergencies – Illusion or Reality?.....	111
Jan Skrbek	
 ICT Impact on Economy and Innovation	 121
Economic Aspects of Cloud Computing.....	123
Martin Pochyla, Petr Rozehnal	

Impact of Legal Regulation of Technological Developments on Competitiveness.....	131
Michael Sonntag	
National Accounts as a Useful Data Source for Competitiveness Analysis Including the ICT Impact	141
Jakub Fischer, Kristýna Vltavská	
The Position of ICT Sector in the National Economy of Czech Republic	147
Antonín Pavlíček, Radovan Kačín, Tomáš Sigmund, Josef Hubáček	
The Limits of ICT for Innovations and Economic Growth	157
Stanislava Mildeová, Radim Brixí	
Supporting State Competitiveness by Government Enterprise Architecture.....	165
Pavel Hrabě	
 Information about Human Well-Being in Organizations	 173
Human's Well-Being: A Cause or a Result of Social Responsibility.....	175
Simona Šarotar-Žižek, Matjaž Mulej, Amna Potočnik	
Pay Taxes for Being Well! Business Ethics and Tax Accounting as Important Enterprise Success Factors	191
Jernej Belak, Lidija Hauptman	
The Multi-Criteria Measurement of Well-Being	199
Vesna Čančer, Simona Šarotar-Žižek	
Social Benefits of Forestry Investments	207
Robert Mavsar, Vesna Čančer, Jožica Knez-Riedl	
Responsibility for Well Future Being: Value, Information and Measurement – Systemic Concept	215
Antonín Rosický, Antonín Pavlíček	
Requisite Holism of Information about Well-Being	227
Katja Rašič, Vesna Čančer, Matjaž Mulej	
Enterprise Policy for Social Responsibility and Enterprise Stakeholder Well-Being	233
Simona Šarotar-Žižek, Tjaša Štrukelj, Matjaž Mulej	
Wellbeing and Social Science	243
Tomáš Sigmund	
 Social Computing for Cooperation.....	 251
Social Computing for Cooperation.....	253
Konrad Klöckner	

Management by Objectives-Based Groupware: Requirements for Efficient and Effective Achievement of Objectives	261
Sam Tschernitz, Tom Gross	
Sharing Data and Information Through Digital Portfolio.....	273
Martin Pochyla	
User Privacy Protection from Trajectory Perspective in Location-Based Applications....	281
Trong Nhan Phan, Tran Khanh Dang, Josef Küng	
Current Issues of Social Networking Site Facebook from the Perspective of Active Users	289
Petr Kašpar, Roman Kozel, David Nespěšný	
Analysis of Sentiment in Unstructured Text	299
Jan Ministr, Jaroslav Ráček	
Analysis of Effectiveness of Selected Social Media	305
Peter Dorčák, František Pollák	
 Socio-economic Aspects of Digital Business Economics	 313
Trust Building Electronic Services as a Crucial Self-Regulation Feature of Digital Business Ecosystems	315
Radoslav Delina	
Economical Aspects of Reputation Mechanisms on Electronic Markets.....	329
Radovan Dráb	
The Use of Hidden Data in Electronic Business Networks: Benchmark and Network Performance Indicators	341
František Janke	
Role of Trust Building Mechanisms as a Necessity Requirement of Entry to e-Business Environment	349
Michal Tkáč	
Role of the Army in Local Development as Seen by Inhabitants of Polish Municipalities	357
Marzena Piotrowska-Trybull	
 Information & Communication Technology – Trends, Scenarios, Impact	 367
ICT Trends, Scenarios in Microelectronics and their Impact	369
Christian W. Loesch	
 Poster Session – Abstracts	 381
After Graduate Education for Enterprise Architects.....	383
Libor Gála, Jaroslav Jandoš	

Recognition of Differentiation in Unemployment Trends among Regions in the Czech Republic	387
--	------------

Martina Miskolczi, Jitka Langhamrová, Jana Langhamrová

The Use of Cloud Computing (SaaS) for Small and Medium Enterprises to Improve the Quality of Their Information Systems	389
---	------------

Milena Tvrdíková, Ondřej Koubek

ICT-driven Performance in Global Economy – a Comparative Survey.....	391
---	------------

Václav Oškrdal, Antonín Pavlíček, Josef Hubáček

Human Resources in ICT

HUMAN CAPITAL IN ICT – COMPETITIVENESS AND INNOVATION POTENTIAL IN ICT

Petr Doucek

Department of System Analysis
Faculty of Informatics and Statistics
University of Economics Prague
doucek@vse.cz

Abstract

Information and communication technologies were drivers of economics growth in last decades. Improvement of it into human activities depends not only on the level of informatization of the society, but also on the level of ICT knowledge. This contribution shows importance of ICT industry for European economic. In the light of this importance are presented relations between economic successfulness of nations and average years of schooling. There are presented future possible scenarios of demand and supply for ICT specialists in Europe up to 2015 and impact of these scenarios on Czech ICT specialists market. ICT industry effectiveness indexes (the whole industry index, manufacturing and services indexes) for selected European countries are presented at the end of this contribution.

Keywords

Human capital in ICT, Competitiveness of Czech ICT, ICT Industry Effectiveness Index, ICT Services Effectiveness Index, ICT Manufacturing Effectiveness Index, Competitiveness of Czech ICT graduates.

1. Introduction – Ways to Competitiveness

ICT (Information and Communication Technologies) industry seems to be an important contributor to growth of European economy. Its contribution to the growth represents approximately 5% of GDP (€ 592,6 billion in 2007) and ICT also drive 20% of overall productivity growth (European Commission, 2010). The ICT industry includes ICT services and ICT manufacturing from general point of view. ICT manufacturing contributes by approximately 1% to GDP (€ 130,6 billion in 2007) and ICT service sector is responsible for a little less than 4% of GDP (€ 462 billion in 2007). These contributions seem to be quiet effective, but in comparison to other big players in world economy it is not enough. For the USA is the contribution of ICT manufacturing 1,33% of GDP and ICT services represent 5% of GDP. For Japan is the value of this indicator 2,9% for ICT manufacturing and 3,95% for ICT services (European Commission, 2010). Other Asian countries as Korea or China etc. show growing specialization in ICT manufacturing often higher than Japan. Using ICT is important step for competitiveness of each economy. Crisis overwhelming period and following economy recovery in order to increase the nation's wealth is very sharply related to increase of innovation potential in economies. ICT are key drivers for innovation putting into work. Improvement of ICT and to them related innovation activities are permanent processes that combines business processes, organizational structures, competencies and responsibilities, human

resources, personal skills, knowledge, hardware, software and other components of organization. These components represent only elements of system, new quality and innovation potential takes with it rethinking of the whole system applying appropriate ICT principals. **Main problem of ICT improvement into global society and into corporations as well is lack on ICT professionals in economies.** Low number of ICT experts in economies of European countries cause lower innovation activities in this region in the comparison to USA, Japan and Canada. One way, **how to remove this disadvantage of European countries is to increase investments into schooling.** There were identified a strong correlation between levels of education and national wealth. The interchange of goods, services and ideas across international borders is facilitated by advanced transport and digital infrastructure – and eased by knowledge of a widely understood language (Figure 1).

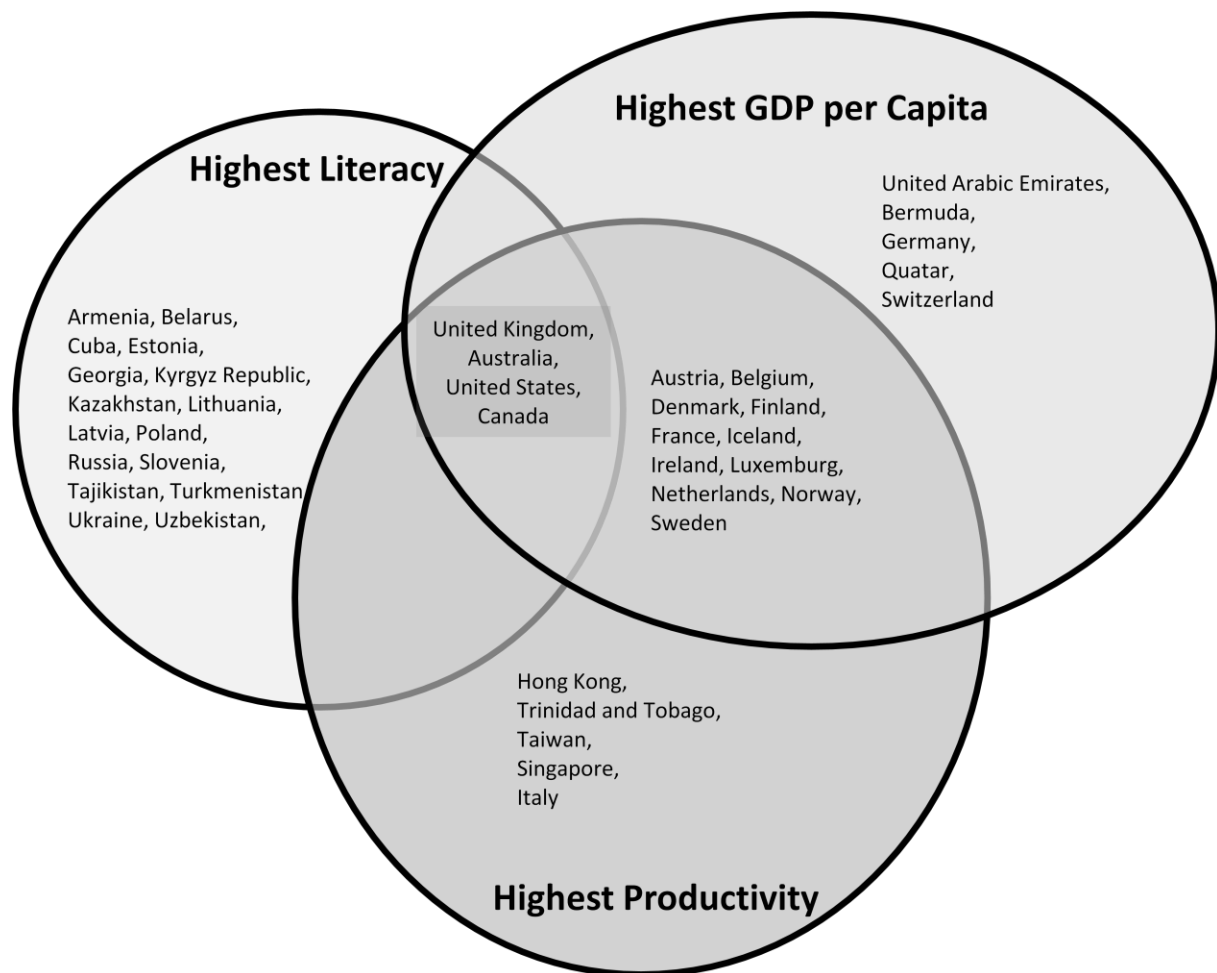


Figure 1: Countries with Highest Literacy, GDP per Capita and Productivity and Their Relations (WB, EIU, 2010)

What is common for countries in the centre of the Figure 1 (in intersection of all three sets on Figure 1)? Large **interconnected economy** (Kelly, 1998) is represented in successful countries by **good education** system (Figure 2), deep structured and developed infrastructure - and at last but not least ...by a **common used English language** (aspect of our actual fleeting world in this period). All these three key factors are enabling nations to capitalize on opportunities in the global economy. Other aspect as common accepted language is education factor. On one hand is a quantity of education (years of schooling), other aspect is a quality of it. Education factor and its role for

national prosperity are presented on Figure 2. It shows dependency of GDP per capita in 2000 on average years of schooling in various countries of the world in the same year.

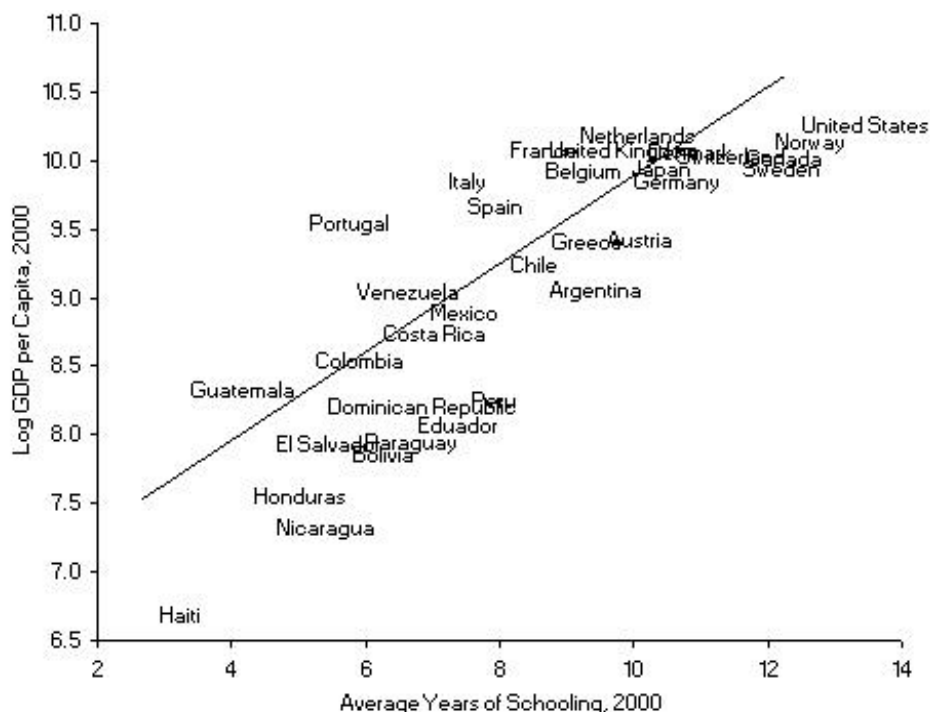


Figure 2: Relation between Average Years of Schooling and GDP per Capita (Glaeser, 2009)

According to my opinion it is not correct to investigate correlation between actual schooling time and GDP per capita in the same year, because education in a period represents investment into future and actual GDP is also result of former expenses into education. Sometimes we can find out correlation of these two factors for longer period (Glaeser, 2009), where is investigated correlation between school enrolment in 1900 in percents of the whole population and GDP in our time. But why would education in 1900 correlate so well with income today? Why did the 20th century belong to countries, like the United States, that were investing so much in education a century ago? One reason that historical education levels have such predictive power is that educational investment is extremely persistent. School enrollments in 1900 can explain more than 72 percent of the variation in years of schooling across countries today, as measured by data collected by Robert J. Barro and Jong-Wha Lee; a similar degree of persistence occurs across United States cities. Educated parents and teachers produce educated children; societies that invested in schooling a century ago still generally do so today. Moreover, education has an extraordinarily high contemporaneous relationship with national income levels (Glaeser, 2009).

Economic crisis caused lower expenses for ICT in past years. Decrease of expenses for ICT was indicated by Gartner for approximately 7% in 2009 (Gartner, 2009). What is the expected or forecasted future of our “Euro-Atlantic” population? Is our future linked to progress, stagnation or decadent period? Some scenarios of future development of the information society in Europe are presented in following chapter and on Figure 3.

2. Information Society in Europe - Future Scenarios

McCormack (2010) expects that ICT will generate almost 5.8 million new jobs till year 2015. These new jobs will have to be saturated also by adequately qualified ICT specialists. Parts of these

new jobs will be saturated through new employee entering into the ICT sector. Differences among future scenarios of economic growth with impact on the gap between supply and demand of ICT specialists are shown on the Figure 3. Each line represents the gap between supply and demand of ICT specialists on the Figure 3.

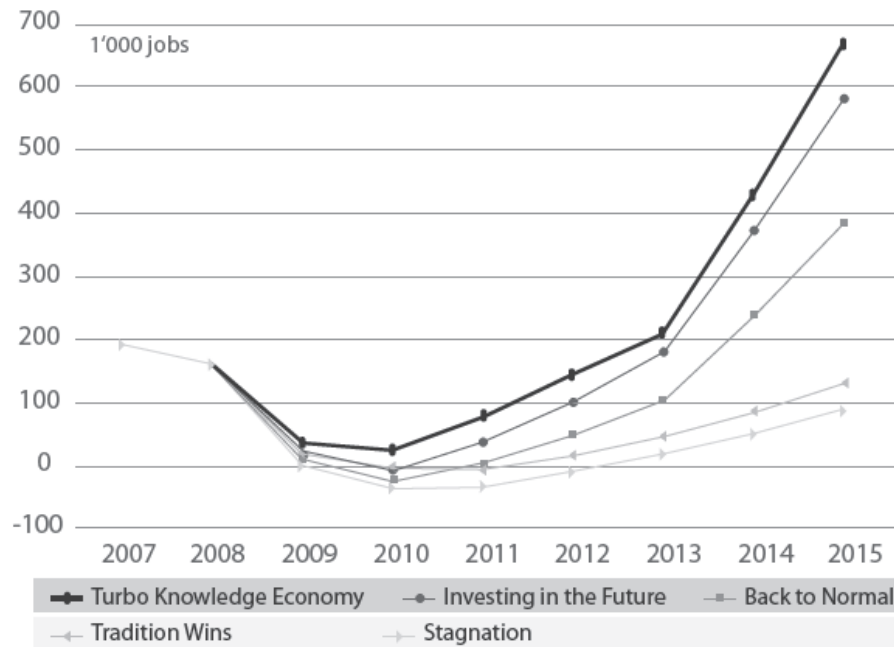


Figure 3: e-Skills Demand and Supply Gaps in the EU27 from 2007 to 2015 (McCormack, 2010)

The legend to Figure 3 is followed from (McCormack, 2010):

- **Turbo knowledge economy.** Take off in Europe, thanks to a virtuous circle of productivity and economic growth driven by widespread diffusion of ICT-based innovation.
- **Investing in the future.** Return to moderate growth, accompanied by acceleration of ICT investments and innovation.
- **Back to normal.** A return to the historical development trajectory experienced before the crisis, in terms of growth rates and IT innovation.
- **Tradition wins.** After the crisis, export-driven recovery favors traditional industries, rather than high-tech and innovative industries, resulting in moderate economic growth with low ICT growth. Relocation of the ICT industry outside Europe accelerates.
- **Stagnation.** Very slow recovery, accompanied by domestic protectionism in most important countries, discouraging innovation investment. The European socio-economic system struggles to keep up with emerging economies and tends to close itself off. Low ICT investments and growth in IT off-shoring lead to reduction in demand for e-skills and potentially over-supply.

This “Gap Figure” warns before extremely increasing requirements on number of ICT experts in economies in the future without changing education systems. In his work, McCormack (2010) also notes that countries have one of last opportunity to make arrangements to prevent the lack of ICT specialists in their economies. In the case that they do not find out solutions, they can expect difficulties in providing ICT services in the future and the efficiency of the whole economy will decrease.

What are the best ways how to assure:

- enough qualified ICT experts with appropriate knowledge, skills and abilities in our economies?
- the adequate knowledge?
- adequate effectiveness and efficiency of ICT industry?

3. How to Assure the Competitiveness of the Czech Economy Applying ICT Sector?

Future scenarios offer a plenty of different ways in further development of our society. Let us escape the catastrophic scenario of fully crashing of the European civilization, but let us try to analyze ways how to assure competitiveness of European economy. We tried to identify main competitiveness factors on example of the Czech Republic. There are following factors according to our analysis.

- To identify requirements on new knowledge profile by ICT professionals.
- Capacity and ability to pass the ICT education system.
- Effectiveness of ICT industry.

3.1. Identify the New Requirements on Knowledge Profile

What are main new requirements on ICT professionals in the comparison to classic skills and abilities? The main goal of actual period is to align supply with demand between e-skills. Governments, industry and academia alike should work closely to ensure that Europe has the advanced ICT skills needed in emerging areas such as Cloud computing (Veber, 2010), Green IT, Cyber-security, Interoperability and e-Health. Skills for success in the ICT industry will have to evolve and align to new streams of growth. The impact of e-skills upon sectors such as health will have the capacity to change and improve the way we address some of society's biggest challenges. Except of e-health (especially in the transition countries) were identified following new requirements on ICT skills during our surveys:

- Interdisciplinary and systemic abilities and knowledge (Mulej, 2009), (Oskrdal, Jelinkova, 2010).
- Emergency situation solving (Skrbek, Kviz, 2010).
- Aspects of education in special parts of ICT (Gala, Jandos, 2010), (Kunstova, 2010), (Pavlicek, 2010).
- System science and disciplines of system thinking (Potuzakova, Mildeova, 2011), (Rosicky, 2010).
- Measurement of general contributions of ICT sector to the whole economy on macroeconomic level - (Hubacek, 2010), (Sudzina, Kmec, 2006), (Sabol at all, 2006) and on corporate level (Maryska, Novotny, Doucek 2010), (Maryska, 2009a), (Maryska, Helfert, 2009b), (Novotny, 2009), (Svata, 2010), (Hanclova, Doucek 2011).

3.2. Capability of ICT Education

The Czech education system in ICT area is very strong limited. The first limit is actual number of HEIs realizing ICT study programs. From other point of view this fact represents a lack of ICT teachers in ICT tertiary education.

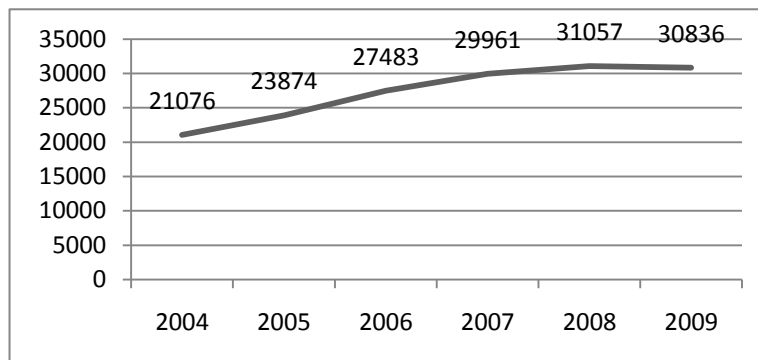


Figure 4: Comparison of Number of Students in ICT Related Study Programs (MŠMT, 2010; UIV, 2010; Doucek, Maryska, Kunstová, 2011)

Progress in number of students in ICT related bachelor and master study programs is shown on Figure 4.

One aspect of ICT education is number of students, but other, more important fact is the number of students entering the labor market for the first time after finishing their study period (Figure 5).

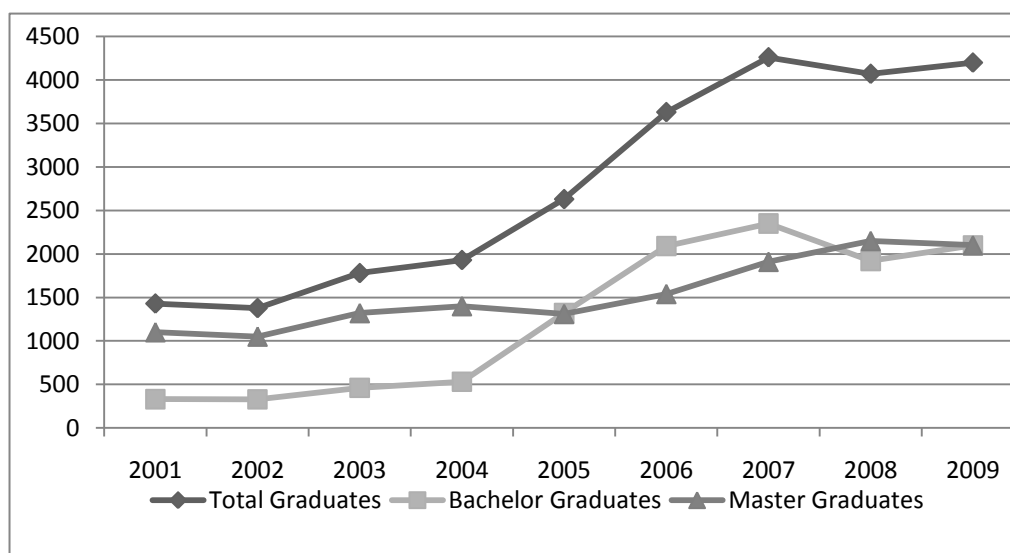


Figure 5: Numbers of New ICT Specialists Entering Labour Market – Czech Republic (UIV, 2010; Doucek, Maryska, Kunstova, 2010)

These findings confirm relative positive trend in number of ICT graduates. From (Doucek at al, 2007) is necessary for Czech economy to accept 4200 ICT graduates annually. The problem is hidden in another fact – this fact is that bachelor level of education in ICT is not acceptable for practice in business informatics (Doucek, at al., 2007). Another also negative fact is that approximately one half of bachelor graduates studies further in master study programs (it does represent -1000 graduates entering the labor market). It decreases the total number of graduates entering the labor market approximately on 3200 graduates. Stagnating number of ICT graduates since 2007 evokes alert for ICT professionals in practice and for responsible persons in education

sector as well (Dorcak, Delina, 2011). Around 3200 ICT graduates (2009) annually do not offer any larger space for massive boom in ICT sector in the Czech Republic in near future. This fact should warn in relation to expected further scenarios for society development. Clear visible higher incomes in ICT sector (Marek, 2010), (Hanclova, 2006) do not enough motivate students for ICT study and cannot remove this lack of well educated and skilled ICT graduates entering on labor market (Ministr, Štefko, 2010). These numbers do not give us any positive perspectives for the future in comparison to expected development of requirements on qualified ICT work force (Figure 3).

3.3. Effectiveness of ICT Industry

ICT industry is driver of total factor of productivity in European Union (European Commission, 2010). How does it look with effectiveness of ICT industry and its components (ICT manufacturing and ICT service) for selected European countries is presented in following text.

3.3.1. ICT Manufacturing Effectiveness Index

The European ICT manufacturing industry represents 13% of value added by total manufacturing and it is one of the largest industrial sectors. ICT companies have often global character in nature. The most knowledge intensive part often remains domestic (ICT services). European ICT industry has 25% share of total business R&D. But how does it look in central Europe with effectiveness of ICT industry. The actual situation in this factor is shown on Figure 6 by ICT manufacturing index. This indicator is calculated as share of percent of countries GDP contribution in ICT manufacturing divided by percents of global workforce employed in ICT manufacturing.

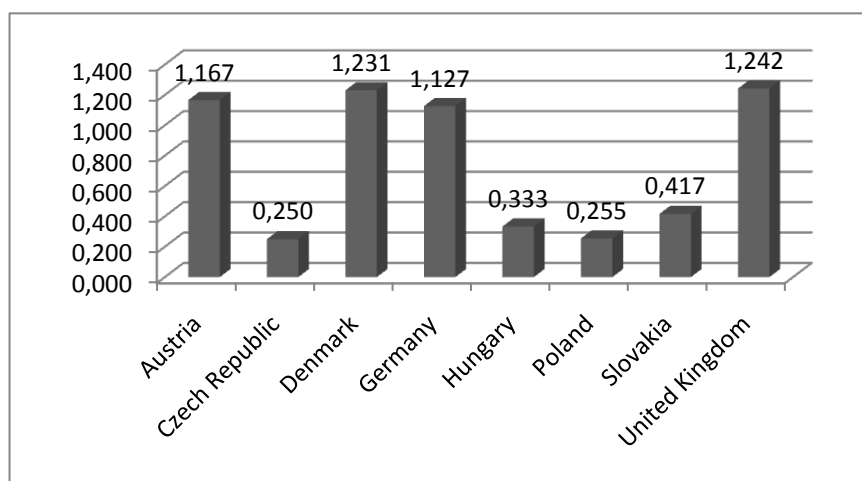


Figure 6: ICT Manufacturing Effectiveness Index 2007 (Data: European Commission, 2010)

New European countries have visible lower effectiveness of ICT manufacturing then older countries. The Czech Republic problem is hidden in fact, that components of ICT product are imported into country, here they are assembled and they leave countries border very soon without larger share of high qualified work.

3.3.2. ICT Services Effectiveness Index

The situation in ICT services is more optimistic for new countries, but they are still lagging behind the old European members (Figure 7). This indicator is calculated as share of percent of countries GDP contribution in ICT services divided by percents of global workforce employed in ICT services.

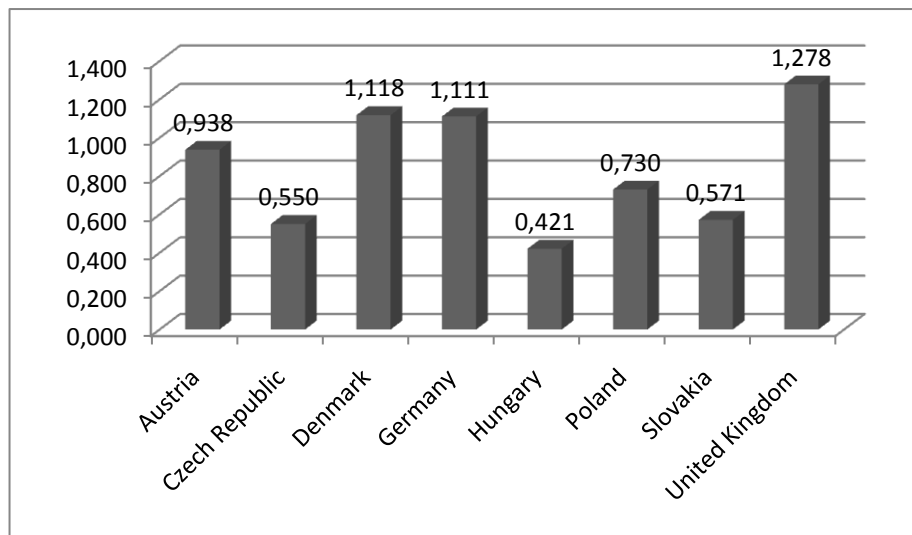


Figure 7: ICT Service Effectiveness Index 2007 (Data: European Commission, 2010)

Situation in ICT services mirrors former massive investments into education of ICT skills in transition economies. But all these investments did not move the level of effectiveness of ICT services on old countries level.

3.3.3. ICT Industry Effectiveness Index

The ICT industry effectiveness index (Figure 8) reflects two before presented indexes and represents synthesis of them. This indicator is calculated as share of percent of countries GDP contribution in ICT industry divided by percents of global workforce employed in ICT industry.

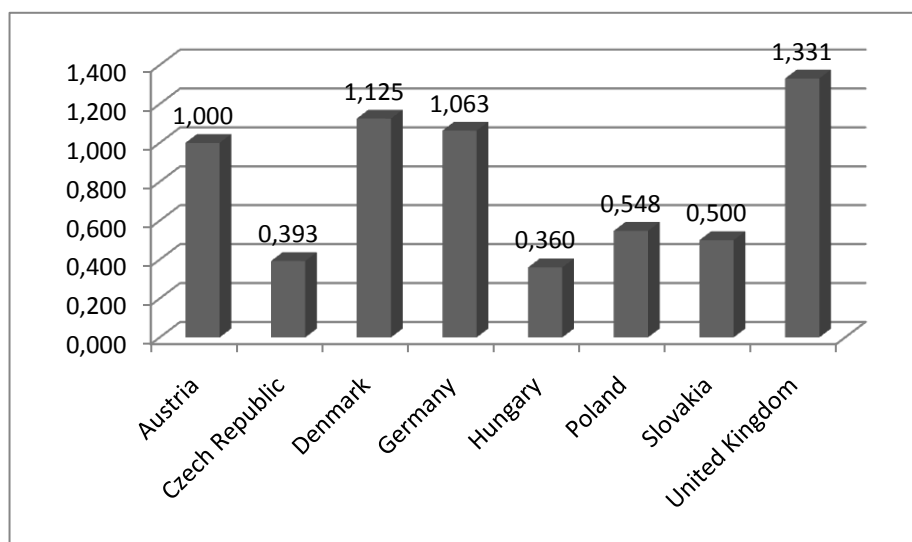


Figure 8: ICT Industry Effectiveness Index (Data: European Commission, 2010)

Czech Republic hand in hand with Hungary reports the lowest ICT industry effectiveness index from selected European countries.

4. Conclusions - What can be Impacts of Actual Trends

According to Jan Muehlfeit: "In 5 years from now 90% of jobs will require the basic ICT skills, which means that now is the time to start creating higher levels of awareness and preparing for a better skilled population and workforce. Europe is at a crossroads. Emerging economies are investing heavily in talent for the knowledge economy. For Europe to be relevant, Europe needs to fulfill the EU 2020 Vision and put human capital at the centre. As it is rightly recognized in the Digital Agenda, e-skills - innovation skills and digital competencies - are a necessary component to implement this vision of a smarter, greener and more inclusive society. They are also core to creating the future talent pipeline of those who will make this transformation happen." (McCormack, 2010)

Facts presented in this contribution could cause large impact on the population in all European countries in longer period. Lagging in investments into research and development and into education especially in area of ICT is hard risk, because:

- the absence of well educated and skilled professionals (not only in ICT) in each economy devaluates the majority of employees in the whole country only on the level of cheap work force without innovation potential and without ambitions and abilities to occupy managerial positions (especially in international corporations),
- the most ambitious professionals will go abroad,
- it could cause damage of existing research institutions (universities included), or their key competencies could be moved to another institutions even to abroad,
- the quality of university education will derogate and best students will want to study abroad.

This lack of ICT educated professionals could cause decreasing competitiveness of the whole economy, decreasing global innovation potential and these two facts with their impacts could start pilgrimage to oncoming poverty of nations.

European countries have large opportunity to change education system with accent on tertiary education in order to prepare ICT professionals in ICT business and for roles of key users in public administration (e-Government base) and in business corporations.

Acknowledgement

Paper was processed with contribution of GAČR by handling tasks GAČR 402/09/0385 "Human Capital in IS/ICT Operations and Development: Competitiveness of Czech Tertiary Education Graduates".

5. References

- Dorcak, P., Delina, R. (2011). Impact of E-marketing Services on Economic Performance, In: Ekonomicky Casopis, Vol: 59, No: 1, Pages: 44-58, 2011, ISSN 0013-3035
- Doucek, P., Maryska, M., Kunstová, R. (2011). Do We Have Enough ICT Specialists in the Period of eDependency? eFuture: Creating Solutions for the Individual, Organisations and Society, Bled, 2011, ISBN 978-961-232-247-2
- Doucek, P., Novotný, O., Pecáková, I., Voříšek, J. (2007). Lidské zdroje v ICT – Analýza nabídky a poptávky po IT odbornících v ČR. 1. ed. Praha : PROFESSIONAL PUBLISHING, 2007. 202 p. ISBN 978-80-86946-51-1 (In Czech)
- European Commission (2010). Europe's Digital Competitiveness Report, ISBN 978-92-79-15829-2

EIU, 2010 EIU Country data , GDP – citation 15.2. 2011

Gala, L., Jandos, J. (2010) Enterprise Architecture Based Innovations: Competencies Perspective. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 33–40. ISBN 978-3-85499-760-3

Gartner, (2009). Gartner http://www.gartner.com/it/themes/economy/economy_100.jsp?prm=economy – citation 10. 3. 2011

Glaeser, E., 2009. What Happened to Argentina?, New York Times Economics blog on October 6, 2009 – citation 15.2. 2011

Hanclova, J., Doucek P. (2011) Education and ICT sector in the EU (Panel- National Application), In: Efficiency and Responsibility in Education 8th International Conference, Czech University of Life Science Prague, 2011, ISBN 978-80-213-2183-0

Hanclova, J. (2006) Minimum Wage Impact on Wage and Unemployment Distribution in the Czech Republic. In proceedings of the 24th International Conference Mathematical Methods in Economics 2006. Pilsen: University of West Bohemia, 13th-15th September 2006. Pilsen: University of West Bohemia in Pilsen, 2006. pp. 213 – 220. ISBN 80-7043-480-5. UT ISI 000262064700019

Hubacek, J. (2010) The Big Shift in the Czech Republic. Praha 11.11.2010. In: *Systémové přístupy 2010 [CD-ROM]*. Praha : Oeconomica, 2010, pp. 38–42. ISBN 978-80-245-1728-5

Kelly, K.(1998). New Rules for the New Economy, Ten Radical Strategies for the Connected World. Penguin Group, New York USA, 1998. ISBN 067088111-2

Kunstova, R. (2010) Enterprise Content Management and Innovation. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 49–56. ISBN 978-3-85499-760-3

Marek, L. (2010) Analýza vývoje mezd v ČR v letech 1995-2008. Politická ekonomie, 2010, vol 58, No. 2, pp. 186–206. ISSN 0032-3233, (In Czech)

Maryska, M. (2009a) Model for Measuring and Analysing Costs in Business Informatics. Wuhan 30.05.2009 – 31.05.2009. In: *The Eighth Wuhan International Conference on E-Business [CD-ROM]*. Sigillum : Alfred University Press, 2009, pp. 1–5. ISBN 978-0-9800510-2-5

Maryska, M., Helfert, M. (2009b) Analyzing Cost Efficiency of Business Informatics – A Model to Measure Data quality Costs. Jindřichův Hradec 09.09.2009 – 11.09.2009. In: *IDIMT-2009 System and Humans – A Complex Relationship*. Linz : Trauner Verlag universitat, 2009, pp. 25–38. ISBN 978-3-85499-624-8

Maryska, M., Novotny, O., Doucek, P.(2010). ICT Knowledge Analysis of University Graduates. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, 2010, pp. 125–135. ISBN 978-3-85499-760-3

McCormack, A. (2010). The e-Skills Manifesto, The Call to Arms. European Schoolnet, Belgium. ISBN 9789490477301 – EAN: 9789490477301.

Ministr, J., Štefko, M. (2010). Human Resources Requirement For Professional Management of ITSCM Process. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, 2010, pp. 57–64. ISBN 978-3-85499-760-3

Mulej, M., Potocan, V., Zenko, Z., Cancer, V., Hrast, A., Prosenak, D.. (2009). Informal Systems Thinking by Social Responsibility Concerning Information In: IDIMT-2009- Systems and Humans, a Complex Relationship Information Technology Linz : Trauner, 2009, pp. 193–205. ISBN 978-3-85499-760-3, ISBN

Novotny, O., Vorisek, J. et al. Digitální cesta k prosperitě. 1. ed. Praha. PROFESSIONAL PUBLISHING, 2011. 260 pp. ISBN 987-80-7431-047-8 (In Czech)

Novotny, O., (2009). ICT performance reference model in the context of corporate performance management. Jindřichův Hradec 09.09.2009 – 11.09.2009. In: *IDIMT-2009 System and Humans – A Complex Relationship*. Linz : Trauner, 2009, pp. 13–16. ISBN 978-3-85499-624-8

OECD, (2010) OECD Information Technology Outlook 2010, OECD Publishing, ISBN 978-92-64-08873-3, http://dx.doi.org/10.1787/it_outlook-2010-en, cited 25.3. 2011

- Oskrdal, V., Jelinkova, P. (2010) Human resources management in ICT context – the drivers of profesonnel performance. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 145–152. ISBN 978-3-85499-760-3
- Pavliceck, A. (2010) Human Resources in ICT – Information and Technological Literacy as the Qualification Prerequisites. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 153–159. ISBN 978-3-85499-760-3
- Potuzakova, Z., Mildeova, S. (2011) Systémový přístup ke konceptu flexicurity. *Politická ekonomie*, 2011, vol 59, No 2, pp. 224–241. ISSN 0032-3233 (In Czech)
- Rosicky, A. (2010) Complex Nature of Man and ITS Knowing. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 293–302. ISBN 978-3-85499-760-3
- Sabol, T., Hreno, J., Delina, R., Vajda, V., Bednar, P. (2006). Indexes of economic, social and technological development, In: Ekonomický časopis, pp. 685- 698, Bratislava, 2006 ,ISBN 0013-3035 (In Slovak)
- Skrbek, J., Kviz, J. (2010). Critical Areas of Early Warning System. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner Verlag Universitat, 2010, pp. 323–332. ISBN 978-3-85499-760-3
- Sudzina, F., Kmec, P. 2006. The Technological Paradox and Evaluation of the Benefits of In-formatization. In: Ekonomický Casopis, vol. 54, no. 3, pp. 281-293. ISSN 0013-3035WB, 2010 World bank: World Development Indicators, productivity (In Slovak)
- Svata, V. (2010) Recent Change in the IS Audit Environment. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 75–82. ISBN 978-3-85499-760-3
- Veber, J. (2010) Text classification: Classifying plain source files with neural network. *Journal of Systems Integration*, 2010, vol. 1, No 4, pp. 41–46. ISSN 1804-2724

COMPARISON OF THE CZECH AND AUSTRIA EDUCATION SYSTEMS

Miloš Maryška

Department of Information Technology
Faculty of Informatics and Statistics
University of Economics Prague
milos.maryska@vse.cz

Petr Doucek

Department of System Analysis
Faculty of Informatics and Statistics
University of Economics Prague
doucek@vse.cz

Abstract

In present business environment is typical constantly increasing dependence of all our activities and also dependence of whole economic environment on information and communication technology (ICT). Two of the main factors that influence the seamlessly usage of ICT in economy are quality and number of professionals with university education, especially at ICT field. This paper is focused on evaluation and comparison of Austria and Czech Republic from the point of view of number of university graduates (with partially emphasis on ICT education) as driving potential in the economy. We are presenting some proposals and prognosis of further development of educational system in Austria and Czech Republic at the end of the paper.

Keywords

Human Resources, Information Technology, Number of Students, Number of Graduates

1. Introduction

ICT are one of the most important factors for development and economic growth in the globalised economy. Currently is our community solving following questions: How much are we depended upon ICT? What will happen after losing ICT support for our processes?

Massive investments into ICT in the last twenty years started economic growth. The growth was shortly interrupted after the dot com boom in 90's and its intensive reduction at the beginning of the 21st century. For ICT industry was really exciting era from 2000 to 2008. This period we can characterize as nine years of continual and dynamic growth of investments into ICT. This growth had significant impact on the economic growth (Doucek, 2010; Doucek, 2010a).

Although the global economic crisis was the reason for disinvestment into ICT in 2009 (OECD, 2010), McCormack expects (McCormack, 2010) that ICT will generate almost 5.8 million of new jobs till the year 2013. These new jobs will have to be saturated by adequately qualified ICT specialists. Parts of these new jobs will be saturated through new employee entering into the ICT sector. Differences among future scenarios of economic growth with impact on the gap between supply and demand of ICT specialists are shown in (McCormack, 2010) and (Doucek, Maryska, Kunstova, 2011)

In McCormack book (McCormack, 2010) is also noted that countries have one of the last opportunities to make arrangements to prevent the lack of ICT specialists. In the case that they find out no solutions, they can expect difficulties in providing ICT services in the future.

In the context of the current situation we can say that the information society requires sufficient number of ICT specialists with adequate knowledge and education. Schools and educational institutions can reduce the gap between supply and demand of ICT specialists via combination of these three factors (Doucek, Maryska, Kunstova, 2011):

- People – to make an ICT related study programs more attractive for students,
- Knowledge – to better up and raise up knowledge of people working in ICT and also people working in other sectors. This is closely connected with the third factor - education,
- Education – this is the most important opportunity to change current trend and the fill the gaps that were shown in (Doucek, Maryska, Kunstova, 2011). Education can be provided in various forms:
 - Lifelong learning.
 - University education at public and private universities.

2. Tertiary Education in the Austria and Czech Republic

The Austria and the Czech Republic have started, keeping with Bologna declaration, transformation of their tertiary education systems in year 1999 (Austria) and 2000 (Czech Republic). (EC (2010)) Both countries changed their systems to three level education system presented by bachelor, master and doctorate level of study. Now days are 22 public universities, 2 states universities, 4 art academies and 46 private higher education institutions (HEIs) in the Czech Republic (MSYS, 2010). There are 44 universities and 21 private HEIs in the Austria (EC, 2010). We do not want to make comparison of education systems in both countries only through absolute numbers, because both countries have different attributes, for example population, area, culture etc. The Czech Republic is smaller than Austria but has more inhabitants and universities than Austria (see Table 1). The population in the Czech Republic is 1.25 times greater than in the Austria.

	Total Area (km2)	Total Population	Number of Universities
Austria	83 879	8 355 260	75
Czech Republic	78 866	10 506 813	76
Ratio CZE/SI	0.94	1.25	0.96

Table 1: Basic Characteristics of the Austria and Czech Republic (Eurostat, 2010a)

From previous analysis presented for example in (Doucek (2009)) we find out that the changes in numbers of students in ICT related study program compared with number of population are

dramatic and really important for economic growth. We started from this reason at the Faculty of Informatics and Statistics, University of Economics in Prague research project at Czech Science Foundation under number 402/09/0385 „Human Capital in IS/ICT Operations and Development: Competitiveness of Czech Tertiary Education Graduates“ in year 2009.

Our research is not focused only on comparison of number of universities, faculties and study programs in selected countries but also on comparisons of trends and relations among selected study programs in both countries. We are taking into account characteristics in this chapter and we use for comparison and reviewing how tertiary education system in ICT related study programs react on increasing dependency on ICT.

We have realized five surveys during the last five years. Three surveys were realized among universities and HEIs in year 2006, 2009 and 2011. They were focused on investigation of knowledge of graduates in ICT study programs. Another two surveys were realized among companies in year 2006 and in December 2010. The aim of these surveys was find out requirements on numbers and knowledge quality future employees in ICT position. Results of these surveys were published in (Doucek et al., 2007; Doucek, 2010; Maryska, 2010; Doucek, Maryska, Kunstova, 2011).

We can divide results of these surveys into two parts. The first part is focused on knowledge of graduates (more in Maryska, 2010) and the second part of it is about quantitative characteristics of tertiary education in the Czech Republic. We are presenting only the second part in this paper – quantitative characteristics of students, graduates, unsuccessful students etc.

Countries of EU27 have almost 500 million inhabitants. There are studying more than 18.5 million students at the universities and HEIs in EU27 countries. The number of students in tertiary education has been increasing in the Czech Republic and other countries since year 2000, but there are also other countries in the EU27 which number of students in tertiary education system is decreasing (Doucek, Maryska, Kunstova, 2011). The number of students is still increasing in the Czech Republic and it was increasing from 2.53 % to 3.98 % between years 2001 and 2009. It means that the growth was more than 1.45 percentage point (difference between 3.98 % and 2.53 %). The number of students increased only by 0.35 percentage point - from 3.30 % to 3.65 % in the Austria.

Although both of compared countries have their tertiary system based on Bologna system, we can't make pinpoint comparison.

Classification of study programs in the Austria is different from classification in the Czech Republic. Especially are known professional study programs in the Austria that are called *fachhochschulen* (Universities of Applied Sciences). This type of study was introduced in Austria in the 1990s. The specialties of the universities of applied sciences are their training that is tailored to practically applicable professional skills. This type of study program is usually three years long and their graduates receive bachelor's degree.

Numbers of Students at the Universities in the Austria and in the Czech Republic

In the Czech Republic live approximately 10,510,000 inhabitants (CSU, 2010). We compared this number with number of studying students at the universities and HEIs. We found out, that are studying less than 4.00% of population in the Czech Republic. There are study approximately 86.78% students at the public universities and at the HEI study 13.20% students from total number of students there. 3,105,000 inhabitants younger than 26 years live in the Czech Republic (CSU, 2010) which represents 29.54 % of population. At all universities is studying 13.38% of all inhabitants younger than 26 years in the Czech Republic.

An approximately 8,355,260 inhabitant is living in the Austria and 308,150 inhabitants visit universities in the role of students that means 3.68% of total population in year 2009. 2,506,777 inhabitants are in the Austria, they are younger than 26 years (Eurostat, 2010) and it represents 30.00% of total population. At all universities is studying 12.29% of all inhabitants younger than 26 years in the Austria.

The evolution of the twenty-six-year population (see Figure 1) is quite stable in Austria for the whole analysed period (2001-2009). There are approximately 2,500,000 people that are younger than 26 years. Situation is absolutely different in the Czech Republic where this number is still decreasing from more than 3,500,000 to 3,100,000 people younger than 26 years during period 2001 and 2009. Let's compare this trend with the evolution in population in both countries. As is presented in the Figure 1, population is in both analysed countries increasing during analysed period.

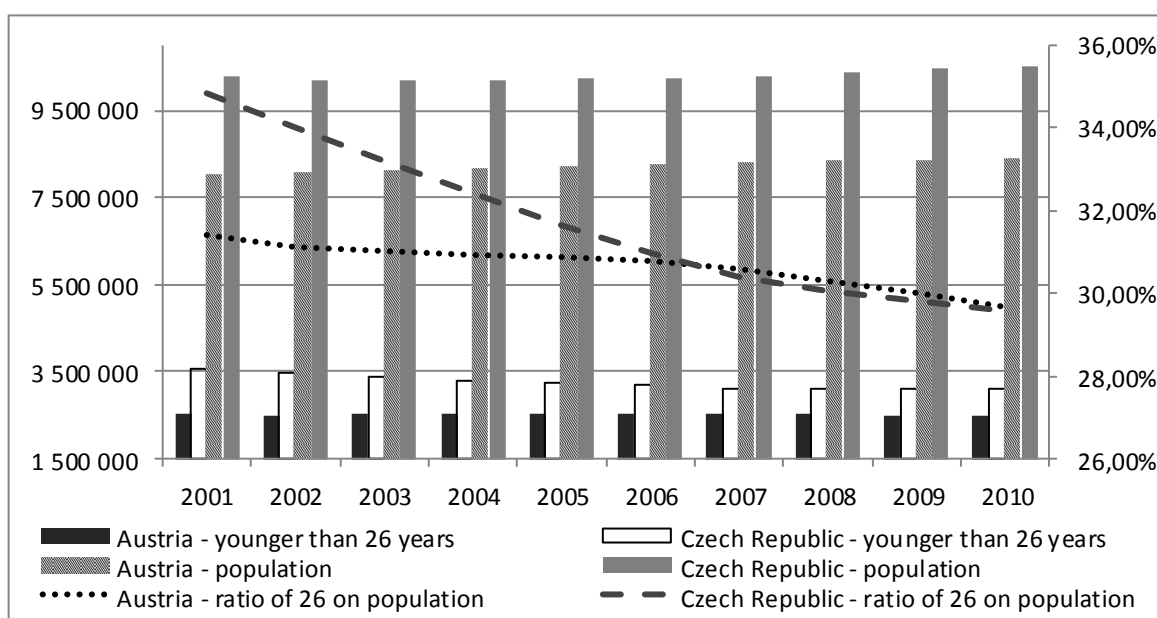


Figure 1: Comparison of population, 26 year old and their ration on population (Eurostat, 2010; CSU, 2010; authors)

For following analysis is important ratio of 26 years old on population. This ratio is decreasing in booth analysed countries (see Figure 1), but the rate of decreasing is much higher in the Czech Republic than in Austria. We see that in year 2001 was this ratio in the Czech Republic approximately 35% and in Austria approximately 31%, but in years 2006 were this ratio same in both countries at the level of 30.50% and in year 2010 is this ratio in Austria 29.68% and in the Czech Republic 26.56%. This finding, that the absolute number of younger than 26 years is decreasing, doesn't provide positive information for future situation in tertiary education.

We are solving the question how the education system responses to the requirements of the market. Comparison of the evolution of potential university students with number of students visiting universities and HEIs is analysed in the Figure 2. We are comparing absolute number of students in booth analysed countries and their portion on 26 years old. Absolute number of all students at the level of tertiary education is increasing in long period in the Czech Republic and in Austria. The increasing trend is in the Czech Republic for the whole analysed period. Situation in Austria is different.

As we see in the Figure 2 the number of students at tertiary education level was rapidly decreasing between years 2001 and 2002. The decrease was for more than 15% and in absolute number 40,000 students. In the following 5 years we expect recovering from this decreasing back on the level of the year 2001. Total increase in this indicator between years 2001 and 2009 was increased for 16.5% in Austria. Situation in the Czech Republic can be described as continual increase in absolute number of students with really dynamical trend. The difference in number of students in year 2001 and 2009 is more than 60% (from 260,000 to 417,000 students).

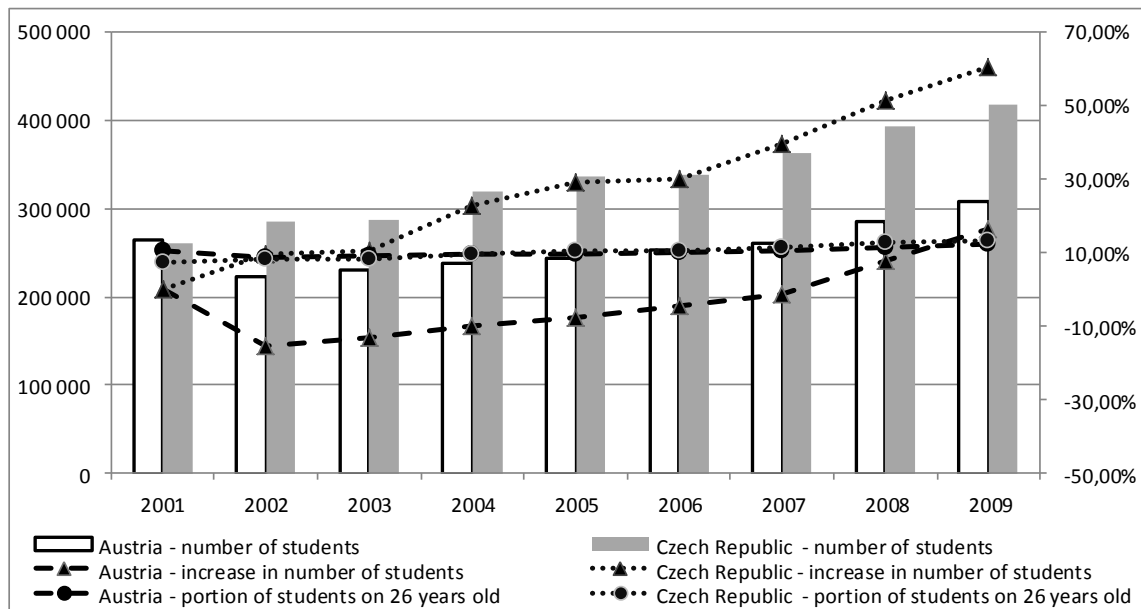


Figure 2: Changes in Numbers of Students in Tertiary Education (Eurostat, 2010, authors)

Detailed information about numbers of students is shown in Table 2 and in Table 3.

The Table 2 is presents detailed information about number of students in different types of study and different study level in Austria. Acceptation of the Bologna declaration resulted in increasing numbers of students in Bologna-aligned study programs and decreasing numbers in other study programs. Total number of students (TS) in Austria in master level is increasing in last nine years. Different situation is at bachelor and doctorate level. There was significant decrease in number of students at bachelor level between years 2001 and 2003. Other year can be characterised as permanently increasing numbers of bachelor students. The same evolution is also at doctorate level.

Austria	2001	2003	2005	2006	2007	2008	2009
TS – bachelor	235 241	208 332	220 229	225 783	229 723	248 390	264 479
TS – master	4 285	6 032	8 344	10 537	13 101	19 113	25 200
TS – doctorate	25 143	15 438	15 837	16 819	18 151	17 288	18 471

Table 2: Trends in Numbers of Students in Tertiary Education System in Austria (Eurostat, 2010; authors)

Situation is different in the Czech Republic (see Table 3). We have to mention important information on this place. We have two different data sources UIV (2010) and Eurostat (2010). These two information sources provide different information about numbers of students. We prefer information from UIV (2010) because this information source takes data directly from the special database in which all students are recorded.

Czech Republic	2001	2003	2005	2006	2007	2008	2009
TS – bachelor	44 583	94 606	162 730	192 993	222 362	246 110	262 552
TS – master	167 326	157 599	134 348	130 885	129 796	131 210	135 179
TS – doctorate	16 671	20 288	22 536	23 494	24 144	24 716	25 859

Table 3: Trends in Numbers of Students in Tertiary Education System in the Czech Republic (Eurostat, 2010; authors)

Differences between both analysed countries in indicator number of graduates are shown in the Figure 3. We see that the trend in increasing number of graduates is lower in Austria.

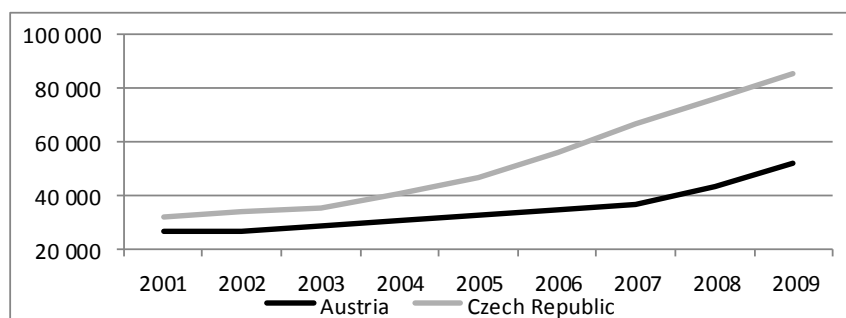


Figure 3: Number of Graduates in Czech Rep. and Austria (Eurostat, 2010, authors)

Numbers of graduates (TG) are shown in Table 4. They are segmented according to the level of study in the Czech Republic and Austria. Numbers in this table confirm actual trends in the tertiary education. The number of students and also graduates is permanently increasing.

Austria	2001	2003	2005	2006	2007	2008	2009
TG - bachelor	24 843	26 486	29 658	31 069	32 063	36 126	43 153
TG – master			1 039	1 598	2 281	5 313	6 720
TG - doctorate	1 871	2 197	2 228	2 158	2 085	2 205	2 284

Czech Republic	2001	2003	2005	2006	2007	2008	2009
TG - bachelor	7 835	8 588	18 356	25 342	33 607	39 856	46 359
TG – master	23 001	24 953	26 298	28 638	31 013	34 241	36 713
TG - doctorate	1 090	1 542	1 972	2 093	2 288	2 370	2 346

Table 4: Numbers of Graduates Segmented According to the Level of Study (Eurostat, 2010, authors)

Economic indicators influence tertiary education

In the Figure 4 are presented basic economic indicators that influence tertiary education system and give information about the importance of the tertiary education system among others government task.

There are presented two indicators in the Figure 4. The first indicator presents information about **expenditures on the tertiary education system** as per cents of GDP. We see that situation in Austria is better than in the Czech. Except period 2001-2002, when the expenditures were decreasing in Austria, investments into the tertiary education system are still increasing in Austria.

During period 2001-2007 has increased expenditures on tertiary education system as per cents of GDP from 1.4 to 1.6 GDP in Austria.

Situation in the Czech Republic is much worse. There are expenditures on tertiary education only 1.1% from GDP in the Czech Republic. The evolution of this indicator between year 2001 and 2006 were from 0.8% GDP to 1.2% GDP in year 2006. In the context of political and economic changes in the Czech Republic were expenditures on tertiary education system cut down to 1.1% GDP.

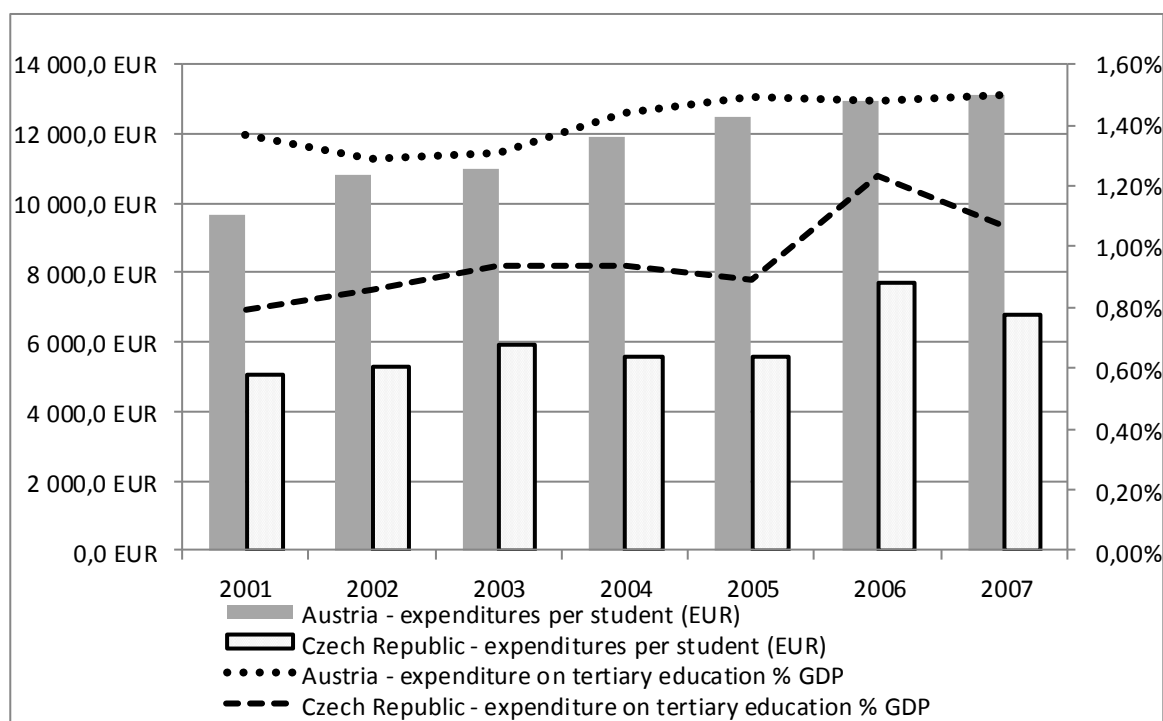


Figure 4: Expenditures on Tertiary Education System and Students (Eurostat, 2010, authors)

The second one indicator complements information from the first one indicator. The second indicator is total expenditures per one student in EUR. We can see that expenditures in Austria are during analysed period increasing. Their increase is from 9,600 EUR in year 2001 to more than 13,000 EUR in year 2007. In the Czech Republic have expenditures per one student the same trend that was mentioned by the first one indicator. Expenditures per one student in the Czech Republic were increasing during period 2001-2003, than were slowly decreasing during period 2003 and 2005 and 2006-2007. The last period (2005-2006) can be characterised as dynamical increase in the sum of EUR invested into the education per one student. Although price level in the Czech Republic were increasing during this period for more than 20% (CSU, 2010), expenditures in current prices were increasing only for 34% during analysed period. In the Austria were increase 36%, but the absolute number of expenditures is much higher in Austria than in the Czech Republic.

Partial conclusion

Population in the Czech Republic is getting old faster than in Austria (see Figure 1). This fact is attended by the reducing number of young people that can be potential students at tertiary level of education. Although number of potential student is degreasing in both countries. The number of students is still increasing but in the Czech Republic with much dynamically trend than in Austria and the same situation is in the comparison of graduates. In the context of this information is important finding that the education in Austria prefers less number of student per lecturer.

The last fact that should be taken into account by the Czech government is findings that expenditures on education in the Czech Republic are substantially lower than in Austria. This is valid for both analysed economic indicators. In this context could be discussed impact of ICT into the economy growth (see Novotny, 2010).

3. ICT Related Study Programs in Tertiary Education

ICT specialist is a general term that includes many professions. (Doucek, 2009) These specialists are usually prepared at the ICT-related study programs for business practice. A lot of them try to receive any form of certification. Study programs with the topic of ICT are offered at almost all of the universities. Some of them are offered only at bachelor level and others are offered at master and doctorate study level also.

Faculties at public universities and also HEIs that offer ICT-related study programs were identified. The number of students, graduates and other interesting characteristics for both countries was performed and analysed. The most important information sources for this analysis were (MSYS, 2010; UIV, 2010; CSU, 2010; Eurostat, 2011; Eurostat, 2011a). These information sources are not explicitly cited in the following text.

3.1. Students in ICT Related Study Programs

Current situation in the Czech Republic can be described as lack of ICT specialists as were described for example in Doucek (2007). In the context of this fact we want to compare situation in the Czech Republic and Austria and compare the numbers of students in ICT related study programs.

Numbers of students in ICT-related study programs are presented in Table 5 and Table 6. This data are published only for the Czech Republic because Eurostat and any other institution, for example Austria statistic, don't provide detailed information about number of students in ICT related study programs. If we compare the numbers in the year 2009 we can see that there are 1.60 more students of all levels in the Czech Republic than in Austria, although the Czech Republic has population higher only 1.25.

Czech Republic	2004	2005	2006	2007	2008	2009
TS – bachelor	14 124	16 994	20 336	22 488	23 334	22818
TS – master	6 952	6 880	7 147	7 473	7 723	8 018
TS – doctorate	1 137	1 190	1 164	1 272	1 425	1 583

Table 5: Number of Students in ICT-related Study Programs in the Czech Republic (MSYS, 2010; UIV, 2010)

Austria	2002	2003	2004	2005	2006	2007	2008
TS – bachelor	14 113	11 972	12 833	13 512	14 051	13 826	14 271

Table 6: Number of Students in ICT-related Study Programs in Austria (Eurostat, 2011; authors)

As we noted above we need to normalise these values through number of population. The ratio is 3 ICT students per one thousand inhabitants in the Czech Republic and 1.70 ICT students per one thousand inhabitants in Austria. This finding is interesting because the same ratio is for example in comparison with Slovenia (see Doucek, Maryska, Kunstova, 2011).

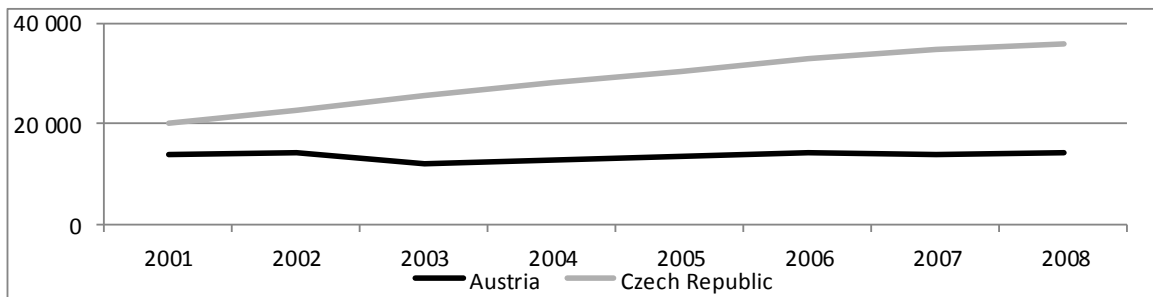


Figure 5: Trends in Number of Students in ICT Related Study Programs (UIV, 2010; Eurostat, 2011)

The trends in number of ICT students and the trends in total population and their ratio had to be compared (see Figure 5). While the population of both countries is slightly increasing, the number of ICT students' increases significantly in the Czech Republic for the whole analysed period. Different situation is in Austria where the number of ICT students is decreasing during period 2001-2003. After this year is the number of ICT students increasing but the number of ICT students in Austria in year 2008 is lower than in year 2001.

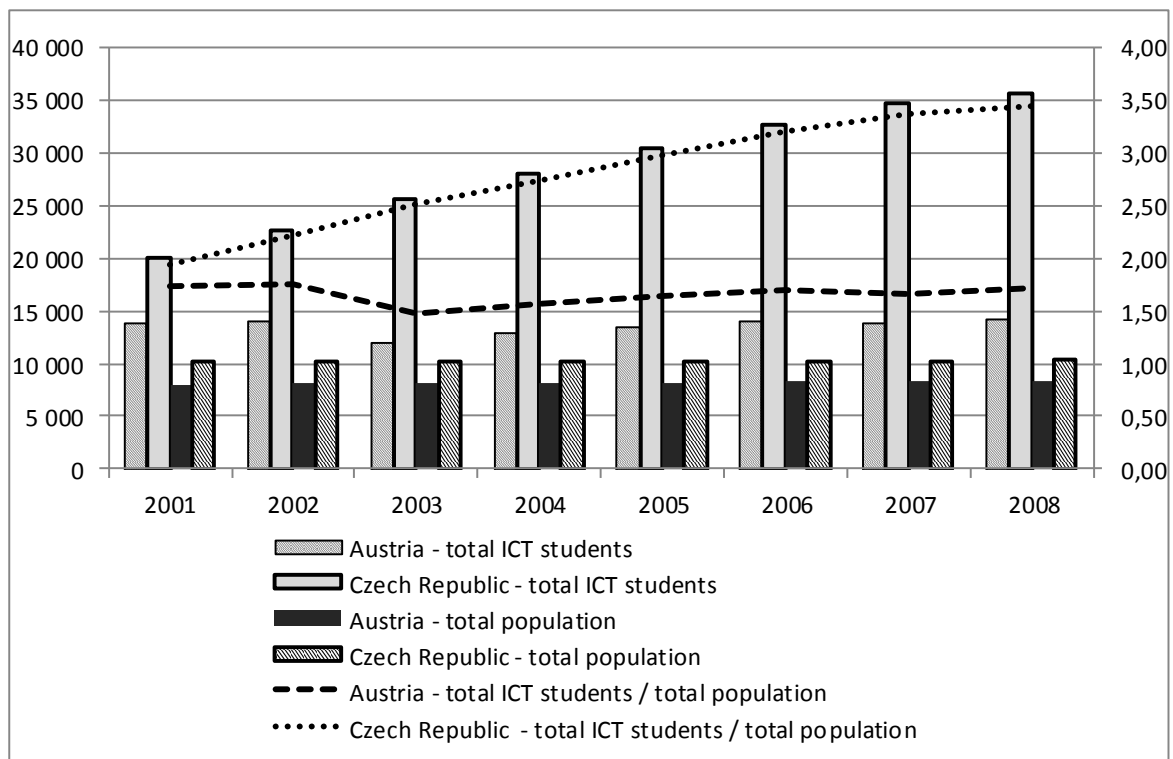


Figure 6: Comparison of Number of Students in ICT-related Study Programs with Total Population and Their Ratio in the Czech Republic and in Austria (UIV, 2010; Eurostat, 2011)

Figure 6 compares situation in ICT university education from the view of number of ICT students and compare this data with total population (in the graph is total population 1:1000). The problem with absolute values is the difficultness of their comparison. This can be solved through their normalisation that is in the Figure 6 presented through in the form of ratio where in the numerator is placed number of ICT-related students and in denominator is number of population in the analysed country. As is shown in Figure 6 the ratio of ICT students in the population raises significantly more in the Czech Republic than in Austria.

Trends identified from data sources tell us that the situation in Austria is still stable. There are only minimal changes in the Austria numbers' and ratio's mentioned in Figure 6. The ratio of numbers of students and numbers of ICT-related students in Austria is smaller in all analysed years in comparison with previous years in the Czech Republic. This was caused by dynamically increasing number of students in all study programs and decreasing number of students in ICT-related study programs in the Czech Republic. Although the decrease is not too big, it is not good news for universities providing ICT-related study programs and also for the economy that still needs others ICT specialists (see Doucek et al., 2007; Maryska, 2010).

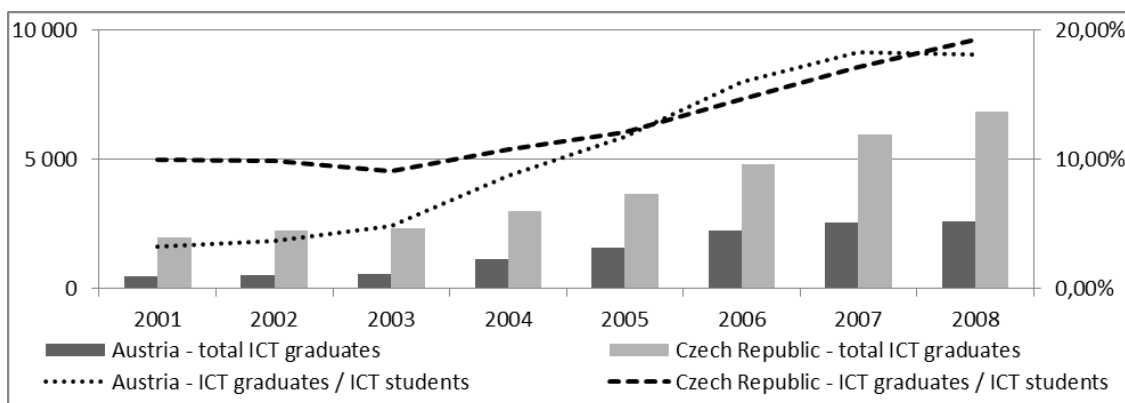


Figure 7 Numbers of ICT Graduates and Their Ratio on Total ICT Students

In the Figure 7 is presented comparison of trends in numbers of ICT graduates and their ratio on total ICT students. There is obviously that number of graduates has more dynamical trend in Austria than in the Czech Republic for the whole analysed period till year 2007. In the year 2007 was the increase stopped and followed by the decreasing value of the ratio that lead to intersect with the line presents values of the same ratio in the Czech Republic. The number of graduates increase more than six times in Austria in comparison to the Czech Republic where the increase was only three times between years 2001 and 2008. The reality is that the number of graduates in Austria in year 2001 was significantly lower (only 500 graduates) than in the Czech Republic (2,000 ICT graduates). From this reason we have prepared comparison of ratio of ICT graduates on total ICT students. This comparison is presented by the dotted lines with number on the right axis in the Figure 7. Trends are almost the same between years 2007 and 2009, although the trend is more positive for the Czech Republic where the ratio is still increasing according to the Austria.

4. Conclusions

Results we have found out in our last research in the field of supply and demand of ICT specialists confirm trends we have found out in previous researches in years 2006 and 2009. Findings confirm that universities expected that number of graduates required by labour market in ICT will be increasing during last ten years. Other universities' expectations are mentioned for example in (Doucek et al., 2007; Doucek, 2009; Doucek, 2010; Maryska, 2010).

The universities' reactions on the initial expectations are presented through graphs that show increase in numbers of graduates entering labour market in the Czech Republic. This fact is important in the context of the gap between supply and demand of ICT specialists. In the case the companies have the same requirements on number of new employees as specified for example in (Doucek et al., 2007) the gap will not exist and the demand for ICT specialists will be fully covered by the supply of new ICT specialists.

Our analysis presented in this contribution identified following trends:

- Changes in demographic trends in both countries signalise decreasing population that causes decreasing number of potential participants in tertiary education system in oncoming period.
- Relative indexes of numbers of students and ICT students to thousands of population for the Czech Republic (qualitative aspects of tertiary education are not investigated in this contribution) are more convenient.
- The Czech Republic, although has only 1.25 times more inhabitants, has 1.35 time more students than Austria. But in the context of this is spent in the Czech Republic much less money (1.05% GDP) on tertiary education than in Austria (1.60% GDP).
- Future situation in ICT graduates is better in the Czech Republic where the number of ICT graduates and students is still increasing compare to Austria where the number of ICT graduates is decreasing.

Acknowledgement

Paper was processed with contribution of GAČR by handling task GAČR 402/09/0385 "Human Capital in IS/ICT Operations and Development: Competitiveness of Czech Tertiary Education Graduates".

5. References

- CSU. (2010). Czech Statistical Office Demografická ročenka 2009. Retrieved 4.1.2011, from <http://www.czso.cz/csu/2010edicniplan.nsf/p/4019-10>. (In Czech)
- Doucek, et al. (2007). Lidské zdroje v ICT. Praha : Professional Publishing, 2007, pp. 179 202. ISBN 978-80-86946-51-1. (In Czech)
- Doucek, P. (2009). ICT Human Capital – Research and Development work in ICT. Jindřichův Hradec 09.09.2009 – 11.09.2009, In: IDIMT-2009 System and Humans – A Complex Relationship. Linz : Trauner Verlag universitat, 2009, pp. 83–94. ISBN 978-3-85499-624-8.
- Doucek, P. (2010). Human Resources in ICT – ICT Effects on GDP. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 97–105. ISBN 978-3-85499-760-3.
- Doucek, P., Nedomová, L., Novotný, O. (2010a). How ICT Affect the Czech Economy. Ostrava 07.10.2010 – 08.10.2010. In: Informační technologie pro praxi. Ostrava : TU Ostrava, 2010, pp. 14–23. ISBN 978-80-248-2300-3. (In Czech)
- Doucek, P., Maryška, M., Kunstova, R. (2011). Do We Have Enough ICT Specialists in the Period of eDependency? eFuture: Creating Solutions for the Individual, Organisations and Society, Bled, 2011, ISBN 978-961-232-247-2
- European Commision (2010) European Commision. Focus on Higher Education in Europe. Education, Audiovisual and Culture Executive Agency. Brussel : 2010. ISBN 978-92-9201-086-7
- Eurostat. (2010). Eurostat, statistics. Retrieved 18.1.2010, from <http://epp.eurostat.ec.europa.eu/portal/page/portal/education/data/database>.
- Maryška, M., Novotný, O., Doucek, P. (2010). ICT Knowledge Analysis of University Graduates. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 125–135. ISBN 978-3-85499-760-3.
- McCormack, A. (2010). The e-Skills Manifesto, The Call to Arms. European Schoolnet, Belgium. ISBN 9789490477301 – EAN: 9789490477301.
- MSYS. (2010). Ministerstvo školství, mládeže a tělovýchovy, Akreditované studijní programy vysokých škol. Retrieved 15.8.2010, from <http://www.MSYS.cz/vzdelavani/akreditovane-studijni-programy-vysokych-skol-s-uvvedenim-kodu-studijnich-programu-a-oboru>. (In Czech)

Comparison of the Czech and Austria Education Systems

- Novotný, O., Doucek, P., (2010). Impact of the ICT Sector on Economic Growth. Portorož 24.03.2010 – 26.03.2010. In: Človek in organizacija [CD-ROM]. Maribor : Univerza v Mariboru, 2010, pp. 999–1006. ISBN 978-961-232-238-0. Abstrakt ISBN 978-961-232-237-3.
- OECD. (2010). Information Technology Outlook 2010, ISBN 978-92-64-08873-3.
- UIV. (2010). Institute for information in education. databáze studentů. Retrieved 7.1.2011 from <http://www.uiv.cz>. (In Czech)

COMMUNICATION AND HUMAN RESOURCES MANAGEMENT WITHIN VIRTUAL ORGANIZATION

Jan Čapek

Institute of System Engineering and Informatics
Faculty of Economics and Administration
University of Pardubice
capek@upce.cz

Jana Holá

Department of Informatics
Faculty of Health Studies
University of Pardubice
jana.hola@upce.cz

Abstract

A virtual organization or enterprise removes many barriers, such as time and location. Virtual enterprises are such entities, which, from the point of view of their service to the customer, appear to be one entity, but in fact are formed from several autonomous entities or partners. Virtual enterprises start from remote workers to fully distributed firms. Virtual enterprise operations group their activities into projects where teams work in an interactive and parallel way, thus forming management change. It emphasizes concentrating on new services and products, especially those where intensity of information and knowledge increasing. Management of virtual enterprises and organizations supports these teams by communication and security in such organizations. One of the nowadays techniques of the sharing information's within virtual enterprises seem to be cloud computing.

Keywords

Virtual Enterprise, Virtual Organization, Management, Communication, Cloud Computing

1. Introduction

New renaissance and wide spreading old ideas of the domestic work was supported by technical progress in Information and Communication Technologies (ICT) and today's view on the business organizations and knowledge of their needs. It should be noted that the concept of virtual organization was not unknown in the former Austria - Hungarian Empire. It was domestic workers (namely textile workers) who put their products on the market usually by middlemen. It was a remote working from today's view. As an industrial revolution increased these organization types has been suppressed. Geographically dispersed members of a virtual enterprise collaborate on the

basis of their core strengths from wherever they are and whenever they are able to do so, and may become competitors in pursuit of another opportunity.

1.1. Related works

Basic definition of a virtual enterprise can be found in the Business dictionary (2010), but much work has been done to highlight the gathering of people with shared interests and the development of this process Dirksen & Smith (2002), Prusak (1997), Kisielnicki (2002), Pankowska (2007). A problem with sharing of information is partially solved by Zhang Y. & Xiao (2009), Čapek and Holá (2010), Čapek (2007), and communication problems are partially described in Miller (2009) and Yates, K, (2006). The communication from next generation network point of view is shown by Pallis, G. (2010).

The risks were discussed by Zhang H, (2008). The trusts and threats were discussed by Zejda (2010) and Valasek (2007). Duranske (2008) covered the complexity of virtual worlds, virtual reality, and virtual law. More about modeling of virtual companies can be found in Yang Y., Ji T (2009) and Wang G., Wang D., & Song B. (2001).

Relatively a new technologies (Grid and cloud computing) was introduced in last year's by many authors for example Pallis, G. (2010), Murphy M.A., at all (2010) Rimal at all (2011) these techniques of course are not dedicated for virtual enterprise, only but nowadays starting their wide application namely from economical point of view.

2. Specialities of virtual organization management

Virtual organization offers reduction of costs, increases of productivity, and use of skills, knowledge and competencies of human resources without spatial constraints and may be the answer to the search for new organizational models in traditional competition. The Internet and its convergence with other information and communication technologies provide unique opportunities for entrepreneurship. Its contribution is mainly in marketing and communications. It has become a powerful management tool. The management of collaborative teams uses the Internet and determines the content of a remote management team. The management of virtual organization must focus on maximizing the advantages of the Internet and minimizing its inadequacies. Nowadays the leading remote teams programme focuses on developing the necessary skills to build a high performance team, especially by emphasizing the communication competencies. Basically, virtual organizations form value-added partnerships of units, which are autonomous but depend on their purposes and given circumstances. Lewis and Weigert (1985) state that the pillars of virtual organizations comprise: 1) standardizing interactions, 2) standardizing metadata 3) treating knowledge separately from the individual 4) abstracting information from operations. Virtual organizations are the ideal form for optimal knowledge sharing and innovation. According to Dirksen & Smith (2002), Prusak (1997) and Kisielnicki (2002), the real value of the virtual organization is in the spontaneous gathering of people with shared interests and aims emerging during the development process. Pankowska (2007) gives an example of Virtual University as virtual organization governance. The virtual organization technologies are important, but equally important is management. Settings of processes, communication, and cooperation must focus on eliminating the weaknesses of virtual organization. Weaknesses in the system are based on the lack of social and face to face contact. Therefore, human resource management is very important for the functioning of virtual organizations. Therefore, communication is of the utmost importance in virtual organization. The situation of isolated member of a virtual team was described by Brake (2008). Each member is subjected to isolation. The member's work is only a fragment and must fit

into the team's work (overall goal). It is dependent on electronic communication and, unless it is clear and unambiguous, it can often be confusing. Following are the three biggest challenges for management: isolation, fragmentation, and confusion. To overcome these challenges, Brake (2008) makes these recommendations for management of virtual organization:

1. Corporation. Building trust within the organization is one of the main tasks for management. People never meet face to face but they have to rely on each other. All members need to feel that their work is important for the organization's success.
2. Convergence. It is necessary to combine individual efforts throughout the organization.
3. Coordination. It is important to create conditions for overcoming the barriers of differences of place and time. The work flow system can eliminate delay in time and shorten distance in the space.
4. Capability. The total capability of the organization is the sum of individual talents. This idea is important for the selection of individual talent, which should complement each other, and enhance and create good base for operating of the organization.
5. Communication. It is necessary for all members to share the same understanding
6. Cultural Intelligence. All members must feel respected in a team culture.

Brake (2008) identifies and summarizes the main task of management of virtual organization. He also shows important keywords in the context of virtual organization: discipline, teamwork, mutual respect, work effort, and the joy of shared success-guiding principles that set the relationship of the members. Communication has an important role for management of virtual organizations.

3. Human resources management

From a HR perspective, virtual team can be composed of specialists working from home or small office. They work together for the purpose of project. Selecting, managing and assessing the performance of virtual team members is different work and requires new approaches. Teams dissolve on completion, to reappear in new combinations for other task. The Virtual organization redefines the human resources management, it places greater demands on management of people than other types of organizations. The lack of social face-to face contact requires very clear and practical rules for managing people, strong corporate culture built on mutual trust, independence and common goals. Recruitment and selection of co-workers must reflect the work of the virtual organization. Defined powers and responsibility, organization structure, division of labour, job description and setting rules of communication have greater significance in virtual organization. The support and assist the lead manager has also huge importance for work of each member.

Main task of the virtual HR organization is to create trust between the members and management and among members and to set cooperation rules. Trust and the rules define "virtual reality organizational culture" in which members work. The creation of suitable organizational culture can substitute the lack of social contact and create a basic framework for cooperation.

The base of organizational culture and the base of team cooperation is effective communication. Communication is the bridge between management of people and business strategy; it is the bridge between mutual expectations of people and organization and between their mutual requirements. Virtual context complicates communication in every conception. For example, the lack of social contact clearly eliminates the opportunity for feedback which is a very important part of communication because it offers clarification and explanation. Lacking face to face contact,

communication in virtual organization is mostly dependent on electronic communications. Even video-conferencing is not as effective as face to face communication. Communication in virtual concept is extremely important and thus needs to be more sophisticated. In virtual enterprise, information sharing is the basis of cooperation. Information sharing can increase partners' ability for collaboration and timely response, lower management costs, enhance market competitiveness, and expand profit margins Zhao & Xiao, (2007).

Effective communication can only be achieved in an environment where there is mutual trust. Trust in the workplace influences work attitudes and behaviour Čapek and Holá (2010), Čapek, (2007), it strengthens organizational identification, which will help organizations meet some of the most critical challenges given the virtual context, such as ensuring coordination and control. Organizational identification accomplishes these feats through its influence on employee's expectation, motivation, and consequent behaviours Wiesenfeld et al. (1998). Effective internal communication proceeds in company's environment that is designed by concrete conditions. These conditions are the premise of effective communication is explained by Holá (2011): (1) The corporate strategy and the resulting communications strategy. (2) The corporate culture based on ethics and morale values. (3) Full management responsibility. (4) Unified management team must be engaged in a new set up. (5) Defined work organization and organizational structure. (6) Personnel policy based on mutual respect between company and employee. (7) Effective internal marketing, mainly internal Public Relations. (8) Setting communication standards that integrate new employees into the organization, explaining the company's business, providing information on key targets and financial performance of the company, staff evaluation and career management and more. (9) The communication abilities and skills (competencies) of the managers. (10) Technology - to set the organization information and communications infrastructure meets the needs of communication.

The company management must accept responsibility for correct communication process. The level of communication can be improved by setting communication standards, internal marketing, and the use of information and communication technologies. It is more important to set the rules and principles of organizational communication in virtual context than common business Sproul & Kiesler (1991). For practice communications one must take into account the geographical placed of the members of virtual organizations.

4. The communications – base success

According to various research papers of managers' views, the 60 % of problems in the organization are caused by incorrect communication. Watson Wyatt's latest research has found convincing evidence that the companies with highly effective internal communication practices produce superior financial results and enjoy greater organizational stability. This study provided proof of the strong correlation between communication effectiveness, organizational turnover, and financial performance on base of survey and analysis of responses from 335 participants (260 U.S and 75 Canadian companies). The Figure 1 reflected the relationships between internal communication and financial performance and organizational stability.

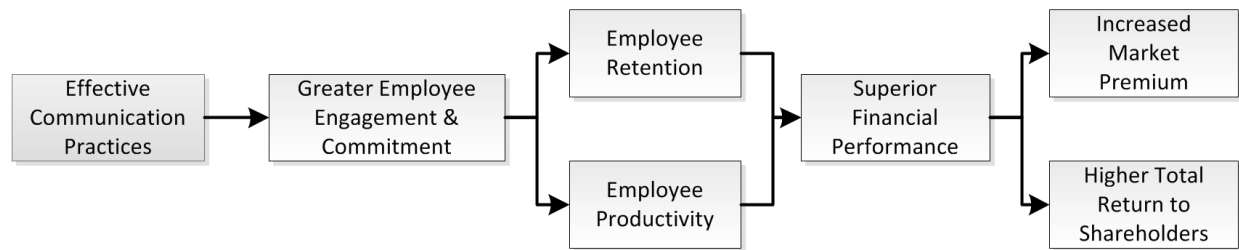


Figure 1: Communication Effectiveness Drives Superior Financial Performance (Yates, 2006)

Watson Wyatt, according Yates (2006), calls the effective communication practices the “Hierarchy of Effective Communication” shown in Figure 2. There is also shown the effect of each communication practice on market premium. Research brings important results that the companies can reach 19.4 percent higher market premium. These companies are able to drive behavioural change in their employees – change that produces positive business and financial results. Watson Wyatt defines a base of the effective communication organization in the eight areas: (1) organizational culture and values; (2) understanding the business; (3) customer needs; (4) financial information and objectives; (5) information of total rewards programs; (6) promoting of new programs and policies; (7) integrating new employee; (8) strong leadership. (Yates, 2006)

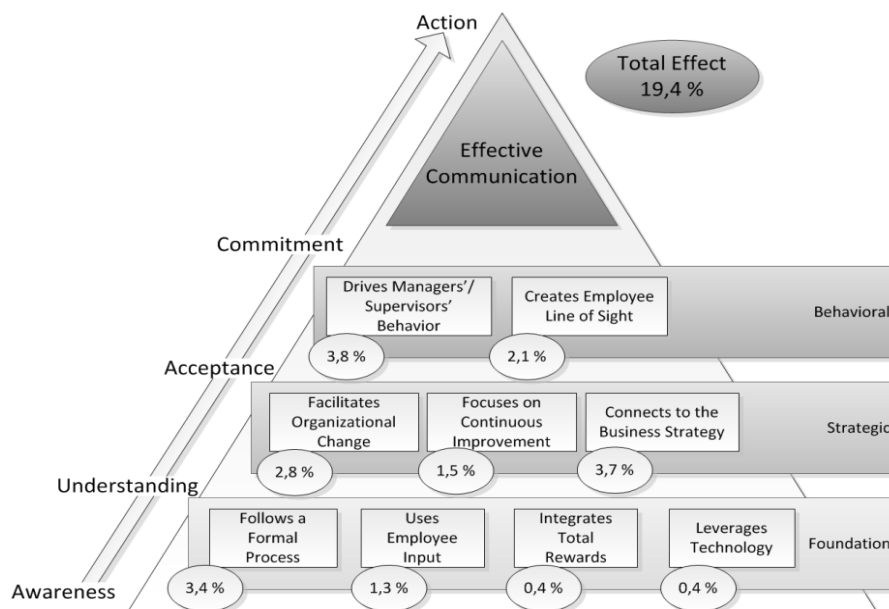


Figure 2: Hierarchy of Effective Comm. and Impact of comm. Practices on Market Premium (Yates, 2006)

All recent authors agree that the comprehensive content of internal communication is realized within leadership e.g. Wright at al. (2009). The main challenge of leadership is to achieve mutual benefit for the company and its employees. The fulfilling of mutual expectation (company's employees' results requirements and on the other side the employees' requirements) is a very important premise which leads to overall company prosperity. When employees work results or their work behaviour and attitudes are not in accordance with the company's aims, the management can find reasons in three problem areas: (1) they do not know what course of action to take due to the lack of information; (2) they cannot achieve the company's goals because of their lack of skills or because the workplace conditions are inadequate; (3) they do not deliver because they are not motivated enough to achieve the work target. Holá, (2006)

The personnel management can prevent the all category problems. The job description including work requirements creates a good framework for an effective recruitment process. The personnel

management sets a basic frame to meet the requirement of mutual understanding. (Armstrong, 2008) From the above mentioned the main objectives of internal communication can be summarized: (1) information and motivation connection; (2) mutual understanding and cooperation; (3) forming desired working positions (of performance and behaviour); (4) effective feedback for continuous evaluation. After defining the main objectives the content (tasks) of internal communication can be determined:

(1) providing information for employees' needs (information necessary for job duties); (2) internal marketing, e.g. public relations (communication necessary for employees' work behaviour and attitudes); (3) consolidation of employees' stability and loyalty (communication necessary for company activities coordination, processing, standards, building of company culture); (4) set up of feedback.

Communication penetrates the whole organization. The process of internal communication involves personal management, internal marketing, managerial communication abilities and skills and finally company information and communication infrastructure. Only the synergy of all of the above-mentioned activities can guarantee effective internal communication as the base of company management.

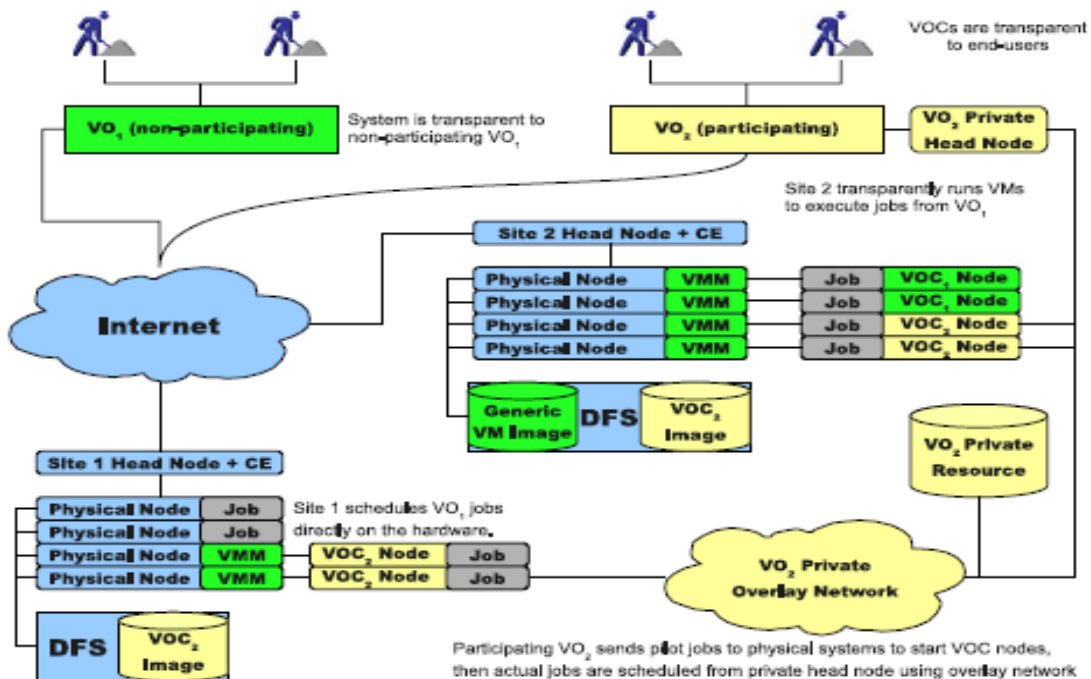


Figure 3 Virtual Organization Clusters by Murphy at all (2010)

4.1. Communication technology

Within the virtual organizations is widely used electronic communication in different ways. From technology point of view it is from telephone devices through computer based networking communication (LAN, WAN, Internet), videoconferencing to cloud computing. The cheaper way of videoconferencing is for example using Skype for communication. But still the enterprises must be equipped with hardware and software corresponds to tasks of the enterprises business. Nowadays is possible to save investment money and hire this one as a service. According Murphy at all (2010) "Cloud computing provides a means by which organizations may have dedicated customized computational environments without the associated hardware and infrastructure costs." It means that is possible to hire not only hardware and software but also space for firm's data. An

example of joined virtual organizations into cluster is shown in Figure 3 where virtual organization cluster provide a mechanism that enables participating virtual organizations to develop private cloud environments, while simultaneously remaining transparent to end users and non-participating entities. This relatively new technological phenomena will be deeply discussed within presentation.

5. Conclusions

Clear virtual organizations are still not frequently found in the Czech market. Technology development especially mobile one, allowed establishes so called virtual work positions. There are for example sales agent's positions. But still there are many barriers, including legislative ones. All of them come from traditional cultural and historical-social conditions.

- The discipline of employees and their willingness to sell their own work. There are necessary arrangements "worker offers and sells its own workforce" in Czech labour market must be set up.
- High demands on computer literacy.
- High demands on personnel issues (it is important to built and develop employees' loyalty and organizational identification) bring new forms of management. The departments of human resources have to work differently, more focusing on people than personal agenda and the managers must change their own attitude for control; the physical inspection is necessary to replace the control results and objectives.

The management of virtual organization must focus not only on utilization of technology but also on management of human resources and communication issues.

6. References

- Armstrong, M. (2008): Human Capital Management: Achieving Added Value Through People, Kogan Page, London.
- Brake T.(2008), Where is the world in my team? Chichester: John Willey & Sons Ltd. 2008
- Byrne, J.,A., Brandt, R., & Port, O. (1993),The virtual corporation: the company of the future will be the ultimate in adaptability, International Business Week, pp.36-40. ISSN 0007-7135
- Business Dictionary (2010) on line <http://www.businessdictionary.com/>(accessible 2.5.2011)
- Čapek J. Holá J. (2010) Virtual enterprise management – some remarks. In. Doucek P., Chroust G., Oskrdal V., (Eds.) - IDIMT – 2010, Information Technology- Human Values, Innovation and Economy, Proceedings of the 18th Interdisciplinary Talks September 8-10, 2010 Jindřichův Hradec. pp107-117, ISBN 978-3-85499-760-3
- Čapek J. (2007), Security of the Information Systems. In.Strategic Management and Its Support by the Information Systems Ostrava September 4-6, 2007 ISBN 978-80-248-1458-2
- Duranske B., T. (2008) Virtual Law, Navigation the Legal Landscape of Virtual Worlds, ABA Publishing, ISBN 978-1-60442-009-8
- Dirksen V, & Smith B. (2002) Exploring the Common Ground of Virtual Communities: Working Towards a "Workable Definition" In: Kisielnicki J (ed) Modern Organizations in Virtual Communities. IRM Press Hershey, pp 67-76
- Holá J. (2006),.Internal communication within firm (originál in Czech) Brno, Computer Press, 2006, ISBN: 80-251-1250-0
- Holá, J. (2011) How improve internal communication (original in Czech) 1. vyd. Brno: Computer Press, 2011. ISBN: 978-80-251-2636-3

- Jackson, P. (1987), *Corporate Communication for Managers*, 1st ed. London: Financial Times/Prentice Hall Books, 1987. ISBN: 0273026887
- Katzy B. R. & Schuh G. (1999), *The Virtual Enterprise* accessible (2.5.2011) http://portal.cetim.org/file/1/68/KatzySchuh-1999-The_virtual_enterprise.pdf
- Kisielnicki J. (2002) *Virtual Organization as a Chance for Enterprise Development* In: Kisielnicki J (ed) *Modern Organizations in Virtual Communities*. IRM Press Hershey, pp 100-115
- Lewis JD, & Weigert A. (1985) *Trust as a Social Reality*, *Social Forces*, (63)4: pp 967-985.
- Miller, K. (2009), *Organizational Communication. Approaches and Processes*, 5th ed. New York: McGraw-Hill, 2009. ISBN: 0-495-56551-2
- Murphy at all (2010) Murphy M.A., Liton A., Fenn M. and Goasguen S.: *Autonomic Clouds on the Grid*. *Journal of Grid Computing* Volume 8 No 1 2010 pp 1-18 ISSN1570-7873 (Print) 1572-9184 (Online)
- Pankowska M. (2007), *Virtual Organisation Governance by Example of Virtual University* In. *Advances in Information Systems Development, New methods and Practice for the Networked Society*, Eds. Magyar G., Knap G., Wojtkowski W., Wojtkowski W., G., Zupančič J., Springer US ,2007, pp 409-419, ISBN 978-0-387-70801
- Prusak L. (1997) *Knowledge in Organizations*, Butterworth-Heinemann, Boston MA
- Pallis, G. (2010) *Cloud Computing: The New Frontier of Internet Computing* *Internet Computing*, IEEE 2010 Vol. 14 Issue 5, ISSN 1089-7801
- Rimal at all (2011) Rimal B., P., Jukan A., Kastros D. and Goeleven Y., *Architectural Requirements for Cloud Computing Systems: An Enterprise Cloud Approach*. *Journal of Grid Computing* Volume 9 No 1/ 2011 pp 3-26 ISSN1570-7873 (Print) 1572-9184 (Online)
- Sproul, K., & Kiesler S. (1991), *Connection: New ways of working in the networked organisation*. Cambridge, MA: MIT Press. ISBN: 0-26269158-2
- Valášek J. (2007), *Critical infrastructure and potential threats* In: *Proceedings from protecting the population conference 2007 VŠB-TU Ostrava, FBI, Ostrava 2007* (original in Czech). ISBN 80-86634-51-5
- Yang Y., Ji T. (2009), *Study on Cooperation Model in Virtual Enterprise*, *SSME*, pp.378-380, 2009 IITA International Conference on Services Science, Management and Engineering, 2009, ISBN: 978-0-7695-3729-0
- Yang X., Yu G., Wang G., Wang D., & Song B. (2001), *Constraints for information cooperation in virtual enterprise systems* In. *The Proceedings of the Third International Symposium on Cooperative Database Systems for Advanced Applications* Beijing, China April 23-24, 2001 ISBN 0-7695- 1 128-7
- Yates, K. (2006), *Internal Communication Effectiveness Enhances Bottom-Line Results*, *Journal of Organizational Excellence*, 25(3), pp.71-79. 2006. ISSN:1932-2054
- Wiesenfeld at all (1998), Wiesenfeld, B. M. Raghuram S., & Garud R., *Communication Patterns as Determinants of Organizational Identification in a Virtual Organization*. *Journal of Computer-Mediated Communication*. Vol 13, issue 4. 1998. on line <http://jcmc.indiana.edu>
- Wright, M. (2009) *Gower Handbook of Internal Communication*. 2nd. ed., Farnham: Gower Publishing Limited, 2009. ISBN: 978-0-566-08689-2
- Zeida D. (2010), *From Subjective Trust to Objective Trustworthiness in On-line Social Networks: Overview and Challenges*, *Journal of Systems Integration* 2010/1-2, pp 16-22, ISSN: 1804-2724
- Zhang Y., & Xiao R.. (2009), *Research on simulation of information sharing in virtual enterprise based on Multi-Agent*, In. *CCDC '09, Control and Decision Conference*, 2009. 17-19 June 2009 Guilin China, pp 5691 – 5694, ISBN: 978-1-4244-2722-2
- Zhang H. (2008), *Study on Knowledge Transfer Risks between Member Enterprises of Virtual Enterprise*, In. *PACIIA '08, Pacific-Asia Workshop on Computational Intelligence and Industrial Application*, 2008. 19-20 Dec. 2008 Wuhan, China, pp 909 - 913 ISBN: 978-0-7695-3490-9
- Zhao Q. & Xiao, R., B. (2007), *Game analysis and mechanism design on information sharing in virtual enterprise*, *Computer Integrated Manufacturing Systems*, Vol.13, No.8, 566-571, 2007 ISSN: 0951-5240

MEASURING RETURNS ON INVESTMENTS IN HUMAN CAPITAL BY MINCER MODEL AND ITS IMPACT ON CZECH HIGHER EDUCATION SYSTEM

Savina Finardi

Department of Public Finance
Faculty of Finance and Accounting
University of Economics, Prague
savina.finardi@vse.cz

Jakub Fischer

Department of Economic Statistics
Faculty of Informatics and Statistics
University of Economics, Prague
fischerj@vse.cz

Abstract

The aim of this paper is to verify if the investments into the human capital are returnable. We judge just public investments. Current economic analyses prove that this investment is returnable but it differ study field by study field. Therefore we will analyse the data from research called REFLEX, which divides incomes of graduates by study fields. This paper also analyses the value added of master degree in higher education system. Paper is based on the estimation of tax duty on personal income tax and direct public expenditures into higher education system. The following experimental computations may affect the future higher educational policy. We are close to quantification of the real value added of the study fields from the state point of view. This could lead to changes in funding of higher education institutions.

Keywords

Human Capital, Mincer Model, Higher Education

1. Introduction

Funding of higher education institutions (HEIs) is a current topic in many countries including the Czech Republic. A funding principle slightly changes from quantity to quality, which is realized by adding so-called qualitative criteria to funding scheme. However, the main part of the scheme is based on number of students adjusted of so-called coefficients of economic difficulty for individual study fields. It means the costs of study from the budget point of view are different for different study fields. On the other hand, the average wages of graduates also depend on study field. Although we already estimated return on investment in higher education at our previous research,

different costs and benefits allows us to answer the question if there is a significant difference in these returns between individual study fields. We will analyze it using Mincer model.

2. Methodology

For our experimental computations, we consider the differences between the net wages of the tertiary-educated person and the net wages of the upper-secondary-educated person with the General Certificate of Education (GCE) at the side of benefits and the expert estimation of costs of studies in the tertiary stage as costs. We do not consider the risk of unemployment and the consequent losses at the side of benefits (construction of probabilistic model is a very complicated task due to the necessity of solving the issue of the different wages and the probability of unemployment among the different age groups) but we consider the differences at a level of the retirement pensions (it is necessary to say that the degressive model is used at the process of computation of retirement pensions). The pensions in the Czech model (the Pay-as-You-Go model is currently used) depend on the number of years of the productive activity and on the amount of wages paid, but the amount of wages paid is reduced for the highest levels. On the other hand, when we used the model for computing returns, the pensions are received after 45 years and later from the decisive-moment. We do not consider the non-economic cost and benefits of the tertiary education (such as better health state).

For the wages, we compare the two individuals, making the decision about their future in year 1996. They have completed their upper secondary studies and one of them will attend the 5-year tertiary education level and the second one will join the labour market. We use the data from the Czech Statistical Office on distribution of wages by age and the highest level of education (two-dimensional cross table), published for years 2001 and 2006 as well. From these tables, we can use the levels of wages for upper-secondary-educated person after 5-year-practice (he finished his secondary studies in 2001 and has 5 years of practice in 2006) and the starting wages for tertiary-educated person in 2006. We can also estimate future development of the wages of both individuals using the longitudinal analysis of the wages, which are depend on the age and on the education level as well.

Study Fields	Monthly Wage (CZK)		Average Annual Growth (2001-2006)
	2006	2001	
Natural Science	29 790	14 812	1.1500
Technical	29 898	14 932	1.1490
Agricultural	21 755	11 715	1.1318
Medical	28 072	12 007	1.1851
Economic	32 530	15 854	1.1546
Humanitarian	25 234	13 492	1.1334
Pedagogical	21 855	11 572	1.1356

Table 1: Wage development between 2001 and 2006, tertiary-educated (reflex data); Source: REFLEX, computations of authors

2006		2001		Average Annual Growth (2001-2006)
Age Group	Monthly Wage (CZK)	Age Group	Monthly Wage (CZK)	Nominal Wages
30-34	42 107	25-29	22 315	1.135
35-39	46 640	30-34	28 313	1.105
40-44	43 814	35-39	28 720	1.088
45-49	42 092	40-44	28 466	1.081
50-54	42 479	45-49	30 322	1.070
55-59	42 573	50-54	30 318	1.070
60-64	42 056	55-59	29 670	1.072

Table 2: Wages development between 2001 and 2006, tertiary-educated; Source: Czech Statistical Office, computations of authors

2006		2001		Average Annual Growth (2001-2006)
Age Group	Monthly Wage (CZK)	Age Group	Monthly Wage (CZK)	Nominal Wages
25-29	22 798	20-24	13 281	1.114
30-34	25 519	25-29	16 393	1.093
35-39	24 621	30-34	16 456	1.084
40-44	24 151	35-39	16 446	1.080
45-49	24 212	40-44	16 679	1.077
50-54	24 526	45-49	17 341	1.072
55-59	25 281	50-54	17 567	1.076
60-64	26 785	55-59	18 928	1.072

Table 3: Wages development between 2001 and 2006, upper-secondary-educated; Source: Czech Statistical Office, computations of authors

We have to discount the nominal wages by risk-free interest rate¹, which is the best way, how to quantify the real wages during the time. The other methods are not suitable for our aim. The following table includes interest rates of middle-term and long-term bonds issued by the Czech National Bank. The final annual average risk-free interest rate is 1.05869.²

¹ Risk-free interest rate is mainly used for computations, which are connected with public sector. Rate of inflation is mostly used for computations of purchasing power of consumers.

² Fischer, J., Finardi, S., Mazouch, P., (2008)

Risk-Free Interest Rate (%)			
2006	3.766	2001	5.432
2005	3.615	2000	7.376
2004	4.140	1999	7.630
2003	4.821	1998	11.540
2002	4.147	1997	12.200

Table 4: risk-free interest rate; Source: Ministry of Finance of the Czech Republic, Czech National Bank

The costs are expressed by the normative funding of Czech higher education institutions. This method is used for more than 10 years and it is based on the inputs, which are quantified by the number of accepted students. The normative funding has some special characteristic and study fields are separated into the six different categories with their own coefficient of economic difficulty. The most cheap study fields are economic study fields, which have coefficient 1.0 and the most expensive are art study fields, which have coefficient 5.9.

Study Fields	Coefficient of Economic costingness	1996	1997	1 998	1 999	2 000	Σ
Humanitarian, economic	1.00	20 927	22 768	24 704	28 148	27 620	124 167
Pedagogical	1.20	25 112	27 322	29 644	33 777	33 145	149 000
Technical	1.65	34 529	37 568	40 761	46 444	45 574	204 875
Agricultural	2.25	47 085	51 229	55 583	63 332	62 146	279 375
Medical	2.80	58 595	63 751	69 170	78 813	77 337	347 667
Veterinary	3.50	73 244	79 689	86 463	98 517	96 672	434 584
Art	5.90	123 468	134 333	145 751	166 071	162 961	732 584

Table 5: economic costingness of study fields (1996-2000, CZK)

The most important part of our further research is to estimate income function, which is also called Mincer's function³. This approach includes estimation of regression analysis by which we can quantify⁴ the returns on investment into the human capital.

The Mincer's formula is following:

$$\ln Y_s = \ln Y_0 + r s$$

where Y_s and Y_0 are the expenditures before and after, r is a discount rate and s is a duration of education.

This relation we can write more precisely as follows:

$$\ln W = a + bS + cEXP + dEPX^2 + Xf + e$$

³ Heckman, J. (2005)

⁴ See also Urbánek, V. (2007)

Where:

- W** wages
a the absolute term
S the duration of education
EXP the duration of working experiences (in years)
X vector of other factors, which affect wages
e random factor
b, c, d the regressive coefficients

3. Results

The following figure includes results about real tax liability on personal income tax by the study fields during the productive life of HEI graduate. We can observe big differences among observed study fields. These results are first part of our research and will be used for the future computations of the Mincer's equation.

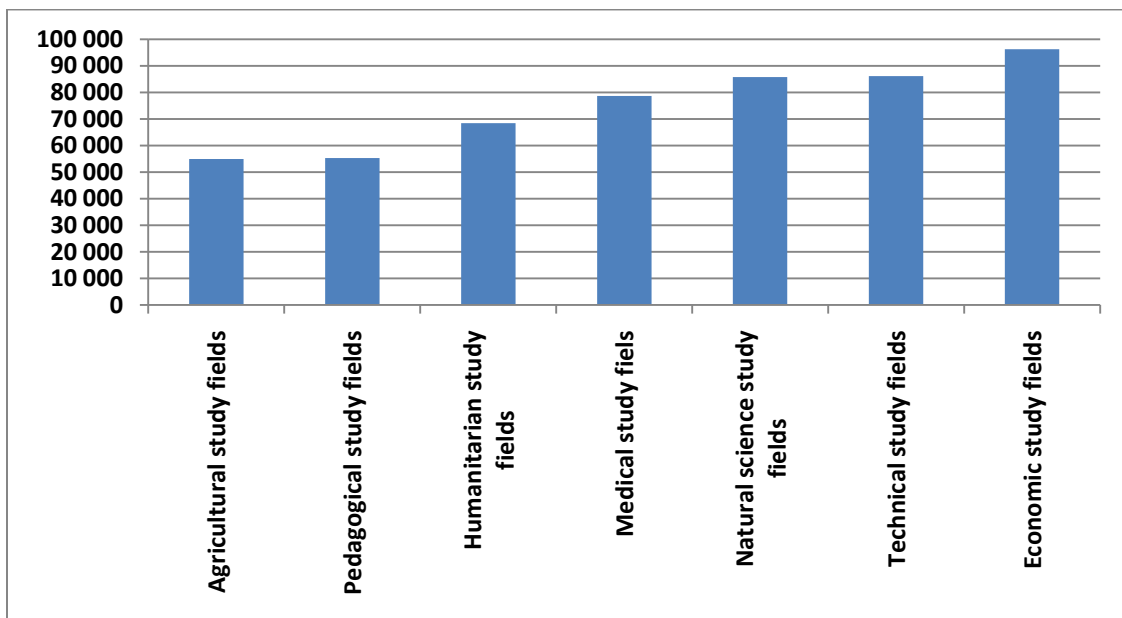


Figure 1: The real liability on personal income tax by study fields (after 45 years, in EUR); Source: Computations of authors

The Figure 2 describes the return of public investments on human capital by study fields. This figure incorporates all the previous computations into the one figure.

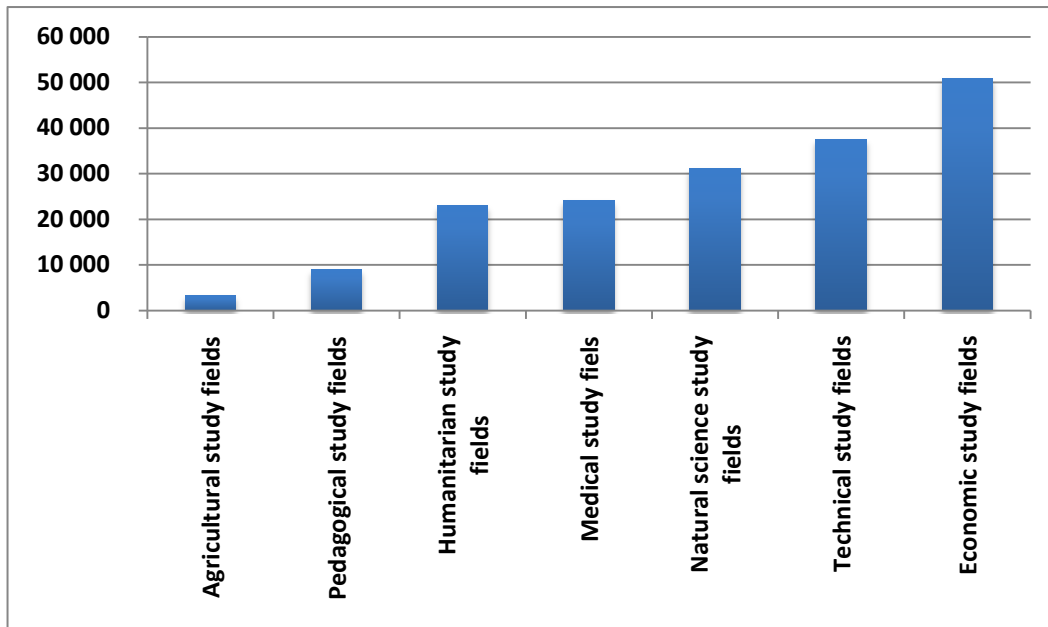


Figure 2: Returns of public investments on human capital by study fields (after 45 years, in EUR); Source: Computations of authors

4. Conclusion

The paper estimates returns into the human capital from the state point of view. The results provide us that the returns differ by the study fields. For the future research it is necessary to reflect the impact of tuition fees, which will influence the rate of return.

These results can be used for the future computations of the Mincer Model and its application on the Czech Republic conditions. Mincer Model is one of the most popular ways how to estimate the real returns on the human capital. Czech Republic has some features of the developing and young economy and they are especially seen in the tertiary education system. During the last year the Ministry of Education made some steps to enhancing quality at the Higher Education Institutions.⁵ All these interventions will influence the final Mincer Model as well as the hypothetical tuition fees.

Mincer Model can be useful for the Ministry of Education and for the active actors of the educational policy (management of HEIs) and also for the passive actors – students.

Acknowledgement

This paper has been prepared under the support of the project of Internal Grant Agency of University of Economics, Prague, project. No MF/28/2010 "Economic and Demographic Aspects of Tertiary Education".

5. References

Collins, K. A., Davies, J. B. (2002). Measuring Effective Tax Rates on Human Capital: The Canadian Case.

⁵ For example Ministry has reduced the number of financed students in the masters study programmes.

- Davies, J., Whalley, J. (1989). Taxes and Capital Formation: How Important is Human Capital? cit. 2011-04-15]. Available on: <http://www.nber.org/papers/w2899.pdf?new_window=1>.
- Fischer, J., Finardi, S., Mazouch, P. (2008). Current Value of Money in Relation to Public Investment Return On Human Capital. In: International Days of Statistics and Economics, p. 1–7. ISBN 978-80-86175-62-1.
- Heckman, J. J., Lochner, L. J., Todd, P. E. (2008). Earnings Functions and Rates of Return. [cit. 2011-04-15]. Available on: <<http://ftp.iza.org/dp3310.pdf>>.
- Heckman, J. J., Lochner, L. J., Todd, P. E. (2005). Earnings Functions, Rates of Return and Treatment Effects: The Mincer Equation and Beyond [cit. 2011-04-15]. Available on: <<http://ftp.iza.org/dp1700.pdf>>.
- Psacharopoulos, G. (1995). The Profitability of Investment in Education: Concepts and Methods. [cit. 2011-04-15]. Available on: <<http://www.c3l.uni-oldenburg.de/cde/econ/readings/psacharo.pdf>>.
- Urbánek, V. (2007). Funding of Czech Tertiary Education, Prague: Oeconomica, ISBN 978-80-245-1313-3.
- Final report of the REFLEX survey in the Czech Republic. Center of Educational Policy, [cit. 2011-04-15]. Available on: <<http://www.strediskovzdelavacipolitiky.info/download/ZavZprReflex.pdf>>.

ICT EXPERTS IN THE CZECH REPUBLIC – DEVELOPMENT IN THE PAST AND FUTURE PROSPECTS

Tomáš Fiala, Jitka Langhamrová

Department of Demography
Faculty of Informatics and Statistics
University of Economics, Prague
fiala@vse.cz, langhamj@vse.cz

Abstract

This paper concerns a short overview of the past development and the demographic projection of ICT experts computed by the classical component method. The number of ICT experts grew in the past and will probably grow in the next decades. But their age structure will change and they will be ageing more rapidly than the total population of productive age.

Keywords

Population Projection, Population Ageing, ICT Experts.

1. Introduction

The phenomenon of population ageing concerns all economic developed countries, including the Czech Republic. At the same time, the labor force will be ageing as well which can result in a lack of employees in some professions. Therefore not only projections of the whole population but often special projections of the development of the number and age structure of employees of various professions are computed. One of the most important professions at present time and in the future is undoubtedly the ICT sector – see, e.g. Doucek (2010). This paper concerns a short overview of the past development and a demographic projection of the number and age structure of ICT experts based on latest available data. It is an updated and extended version of the former prognoses of such type, see, e.g. Fiala & Langhamrová (2010).

2. Methodology

The over view of the number and age structure of the ICT experts in the past is based on the data of the Czech Statistical Office. The projection of the ICT experts has been derived from the projection of the whole Czech population computed by the classical component method – see, e.g. Bogue, Anderton & Arriaga (1993) – with simplified migration (no emigration supposed, immigration equal to net migration). Latest available data of the Czech Statistical Office have been used for computations. The initial sex-and-age structure of the Czech population was that of 1st January 2010. Main assumptions of the projection are very similar to those of the latest population

projection of the Czech Statistical Office but they are upgraded according to the latest demographic development in the Czech Republic.

The increase of the life expectancy is supposed to continue all the time but will not be as rapid as in the last years. The life expectancy in 2060 is supposed to be about 86 years for males and about 90 years for females. The difference between the life expectancies of females and males is therefore supposed to diminish.

After several years of relatively rapid fertility growth in the Czech Republic the latest data indicate stagnation. In the last two years 2009 and 2010 the value of total fertility rate has been approximately just on the level of the year 2008 or even a little bit lower. The fertility scenario was therefore based on the assumption that the total fertility rate will in next 50 years continue to grow very slowly from present value about 1.49 only to the value 1.65. The fertility structure is supposed to converge to the fertility of the Netherlands' females. (In this country the transition of the fertility to higher age has been finished and the fertility seems to be relatively stable.)

At the present time it is very hard to predict the future development of migration. See, e.g. Arltová & Langhamrová (2010). While in the years 2007 and 2008 the annual net migration in the Czech Republic had been more than 80 000 and 70 000 thousands, respectively, its value in 2010 was only a little higher than 15 000 persons. One of the main reasons for this rapid drop may be the economic crisis. Because of this fact the projected annual net migration is supposed to be only 20 000 persons per annum. The demographic structure of immigrants is supposed to converge to the net migration structure of the EU.

The projection of ICT experts has been based on the projection of the whole Czech population mentioned above and on latest available data of ICT experts from Labour Force Sample Survey (See Table 1).

Age Group	ICT Experts	Total population	Proportion (in %) of ICT Experts in the whole population
20–24	9 663	704 121	1.37
25–34	52 881	1 706 771	3.10
35–44	28 638	1 524 519	1.88
45–54	14 370	1 383 070	1.04
55–61	8 689	1 066 647	0.81
Total 22–61	114 242	6 385 127	1.79

Table 1: ICT Experts in the Czech Republic in 2009 (Czech Statistical Office, Labor Force Sample Survey)

In the projection we have supposed that in each age cohort of the Czech population born after 1985 the proportion of ICT experts will (at the age of 25 years of the cohort) reach the value of the present proportion of ICT experts in the age group 25–34 years, i. e. the value of 3.1 %. At the same time we are assuming that every ICT expert works in his profession until he dies or until he reaches the retirement age; emigration or immigration of ICT experts has not been taken into consideration. Because of this assumption the proportion of ICT experts in each cohort will remain at the level of 3.1 % until reaching the retirement age.

The proportion of men among information scientists is about 90 % at present, which is of course very much higher than the proportion of men in the population. On the other side the life expectation of persons with higher education is somewhat higher than the life expectation of the whole population (regardless of education). In particular, the life expectation of men with

secondary or tertiary education is roughly at the level of the life expectation of women (regardless of education). For the projection of the mortality of information scientists there has been therefore used the scenario of mortality for women in the CR (regardless of education).

3. Main results

3.1. The past and present situation

The following tables bring a short overview of the development of the number and sex and age structure of the ICT experts in the last almost 20 years.

The number of ICT experts almost doubled in the period observed. But nevertheless the number of females in ICT profession almost halved while the number of males at present is almost 2.7 times higher than in 1993. The proportion of females among ICT experts has dropped from more than 36 % to less than 11 %.

thousands of persons

Year	Males	Females	Total	Age group				
				15–24	25–34	35–44	45–54	55+
1993	38,0	21,8	59,8	9,1	20,2	17,4	10,4	2,6
1994	36,7	22,2	57,9	18,7	17,3	14,7	5,1	2,1
1995	39,2	20,4	59,5	21,1	16,2	14,0	5,7	1,8
1996	40,5	17,9	58,4	21,9	16,6	12,7	5,4	1,8
1997	46,7	17,3	64,0	12,5	22,6	13,7	12,6	2,6
1998	47,7	13,7	61,5	12,6	21,5	13,2	12,4	1,7
1999	51,8	16,3	68,1	10,2	26,9	15,5	13,1	2,4
2000	55,4	17,1	72,5	9,9	30,7	15,6	13,8	2,5
2001	65,8	20,2	86,0	12,2	34,4	19,7	15,8	3,9
2002	71,0	20,2	91,2	14,1	37,7	19,8	14,0	5,6
2003	66,5	14,7	81,3	10,5	36,9	14,9	14,0	5,0
2004	61,0	11,9	72,8	8,8	31,6	17,3	10,9	4,4
2005	66,1	12,6	78,7	7,1	34,5	19,2	12,7	5,2
2006	74,6	13,0	87,6	6,9	42,3	21,2	10,6	6,5
2007	84,1	12,2	96,3	9,1	42,6	23,4	15,3	5,9
2008	96,1	14,7	110,8	12,2	50,6	25,6	16,8	5,5
2009	101,8	12,4	114,2	9,7	52,9	28,6	14,4	8,7

Table 2: Development of the Number of ICT Experts in the Czech Republic since 1993 (Czech Statistical Office, Labor Force Sample Survey)

The ICT experts at present are relatively young. Their age structure is quite different in comparison with the age structure of total employed population. More than half of ICT are younger than 35 years (in the total employed population only about one third is of this age), the proportion of

ICT experts older 55 is only about 8 % (in the total employed population more than 15 %). See the Table 2 and the Figure 1.

%

Year	Males	Females	Total	Age group				
				15–24	25–34	35–44	45–54	55+
1993	63,54	36,46	100,00	15,26	33,74	29,19	17,44	4,36
1994	63,38	38,28	100,00	32,31	29,81	25,40	8,85	3,62
1995	65,78	34,22	100,00	35,46	27,22	23,46	9,60	3,06
1996	69,41	30,59	100,00	37,48	28,38	21,72	9,27	3,11
1997	72,96	27,04	100,00	19,59	35,36	21,44	19,60	4,01
1998	77,66	22,34	100,00	20,50	35,01	21,56	20,21	2,72
1999	76,10	23,90	100,00	14,93	39,49	22,77	19,22	3,59
2000	76,44	23,56	100,00	13,62	42,35	21,57	18,98	3,47
2001	76,53	23,47	100,00	14,20	39,96	22,93	18,38	4,53
2002	77,89	22,11	100,00	15,49	41,30	21,68	15,38	6,16
2003	81,85	18,15	100,00	12,92	45,37	18,36	17,20	6,15
2004	83,71	16,29	100,00	12,08	43,33	23,77	14,96	5,99
2005	83,93	16,07	100,00	9,05	43,83	24,42	16,08	6,61
2006	85,17	14,83	100,00	7,91	48,36	24,17	12,14	7,42
2007	87,37	12,63	100,00	9,41	44,29	24,28	15,88	6,14
2008	86,72	13,28	100,00	11,03	45,65	23,13	15,18	5,00
2009	89,14	10,86	100,00	8,46	46,29	25,07	12,58	7,61

Table 3: Development of the Number of ICT Experts in the Czech Republic since 1993 (Czech Statistical Office, Labor Force Sample Survey)

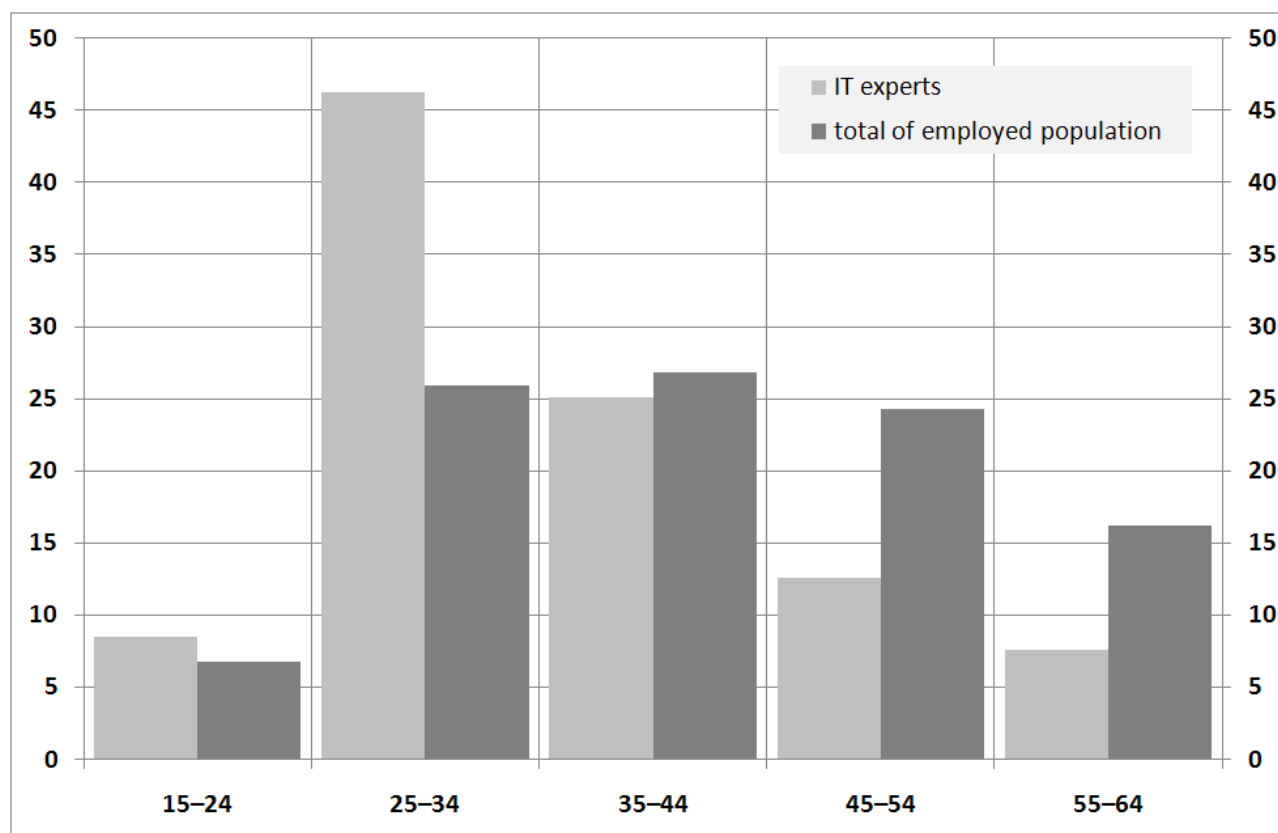


Figure 1: Age structure of ICT experts and the total employed population (Author)

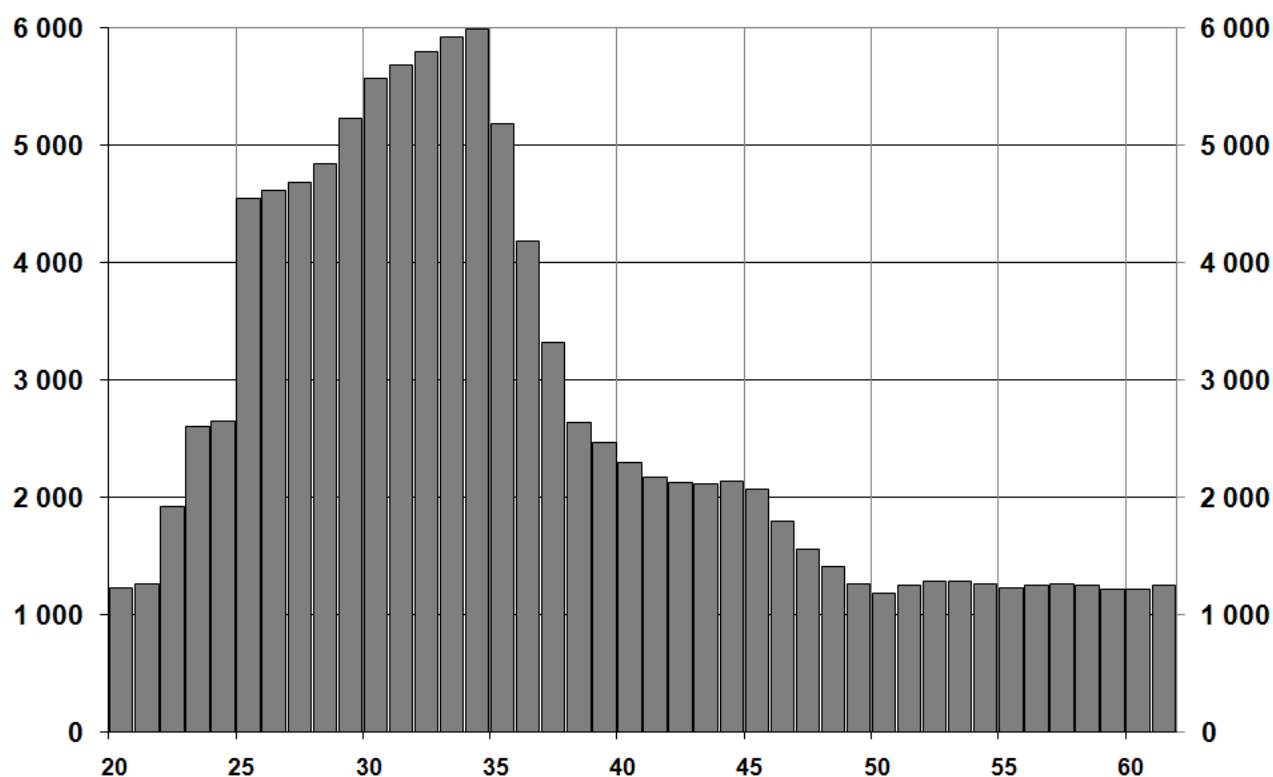


Figure 2: Estimate of the age structure of ICT experts (Author)

Estimate of the more particular age structure of ICT experts is shown at the Figure 2.

3.2. Prospects of the future development

The relatively young age structure of the ICT experts is the main reason that despite the expected relatively low fertility and low net migration in the Czech Republic the total number of ICT experts is going to grow in the next three decades from the present value of about 115 thousands to almost 180 thousands of people. Of course, it will be so only under the assumption that the proportion of ICT experts in young generations will remain at the present level about 3.1 % of the total population of appropriate age.

In the second half of the thirties the number will probably subsequently decline. But even in 2060 there will be about 140 thousands ICT experts in the Czech Republic which is several thousand higher than today's number. See the Figure 3.

The population of ICT experts will be (like the whole population) ageing. The rapid decline of the number of young people in the Czech population in the following years will result in the drop of the proportion of young ICT experts (see the Figure 4). The proportion of ICT experts younger than 25 years will halve during the next two decades and will be stabilized at the level of about 25 %. On the other hand, about one quarter of ICT experts will be older than 55 years since the thirties.

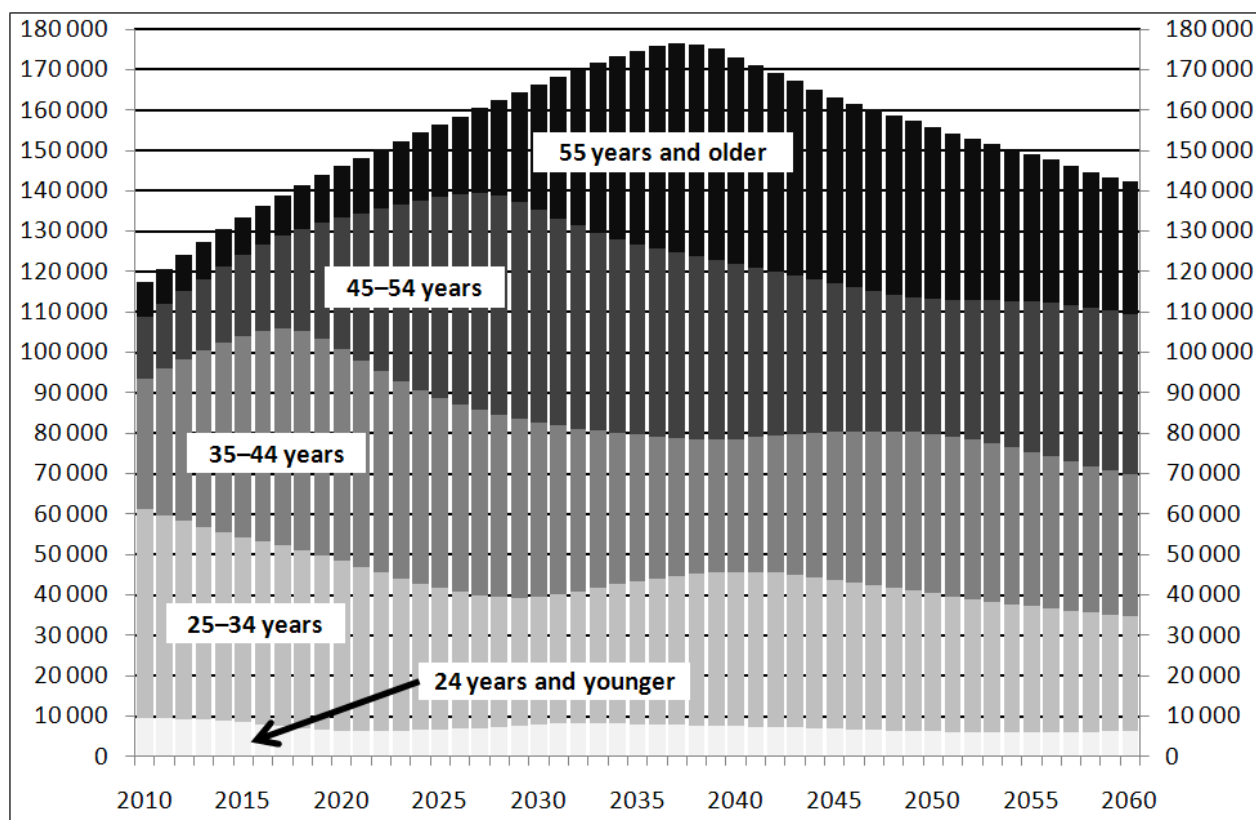


Figure 3: Expected development of the number of ICT experts and in the next 50 years (Author)

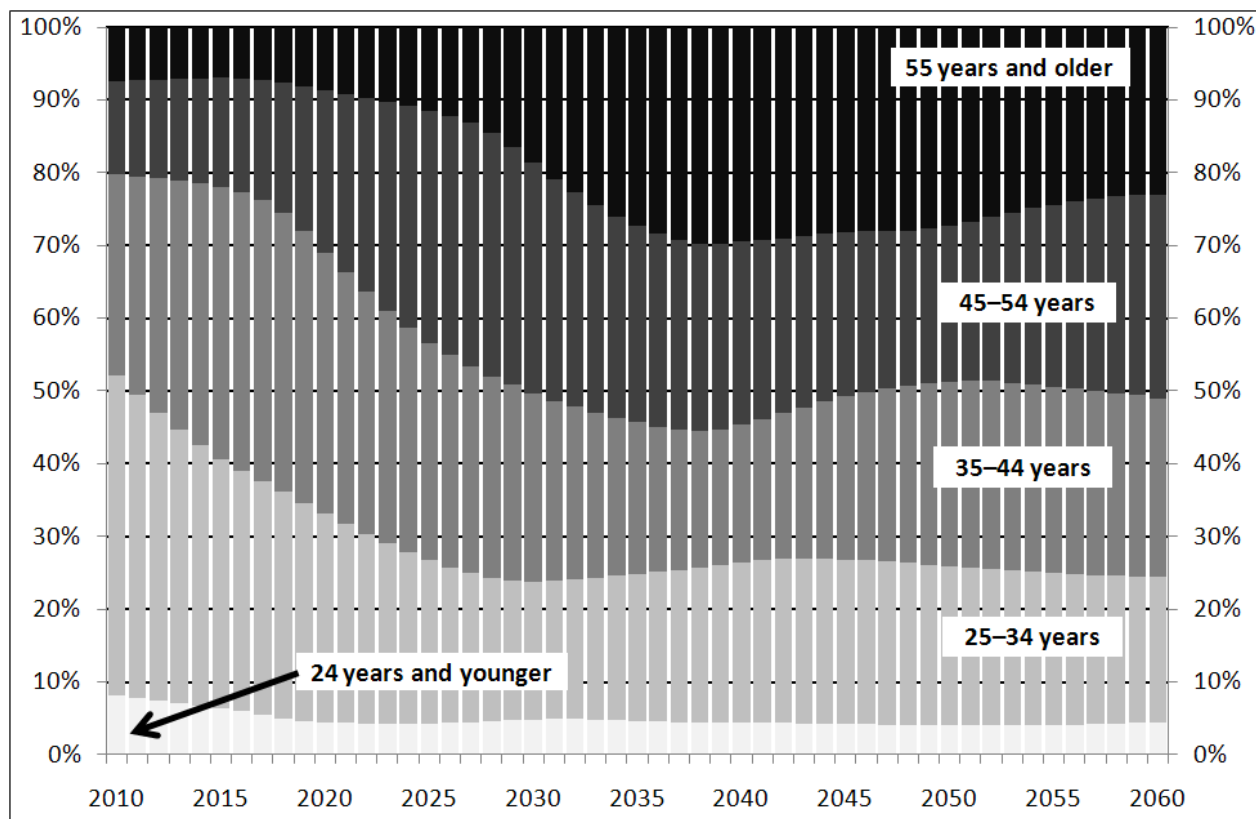


Figure 4: Expected development of the age structure of ICT experts and in the next 50 years (Author)

4. Conclusions

Under the assumptions of the projection (i.e. stable proportion of ICT experts in all future age cohorts and no migration of ICT experts) the number of ICT experts can grow in the next two or even three decades by about 60 thousands. But their age structure will change; they will be ageing more rapidly than the whole population of productive age.

The real development will probably be not as simple as the assumptions of the projection. There arise many important questions.

How many ICT experts are really needed in the Czech Republic? And how many of them will be necessary for the future decades?

Will be fulfilled the assumption of stable proportion of ICT students and graduates? How will the universities take into account the relatively rapid decrease of the number of young people in our population in the following years? Probably the number of admitted students will be proportionally reduced. If it be to the contrary we may face the risk of the drop of the quality of the university graduates. Not only the number the graduates but mainly their knowledge profile is of importance. See, e.g. Maryška, Novotný & Doucek (2010).

The present level of immigration into the Czech Republic is relatively low. But maybe the migration trends will change in the near future. May the migration significantly change the number and age structure of ICT experts? Migration can be an important source of missing employees – see, e.g., Kačerová (2008).

In any case the projection indicates that in the next three decades the number of ICT experts in the Czech Republic will probably grow. But already at present time it is necessary to seek measures how to face the expected ageing of ICT experts and their numerous retiring in the later thirties and later decades.

Acknowledgement

This article came into being within the framework of the long-term research project 2D06026, "Reproduction of Human Capital", financed by the Ministry of Education, Youth and Sport within the framework of National Research Program II.

5. References

- Arltová, M. & Langhamrová, J. (2010). Migration and ageing of the population of the Czech Republic and the EU countries. *Prague Economic Papers*, 19(1), 54–73. ISSN 1210-0455.
- Bogue, D. J., Anderton, D. L. & Arriaga E. E. – project editors (1993). *Readings in Population Research Methodology. Vol. 5. Population models, Projections and Estimates*. United Nations Social Development Center, Chicago.
- Doucek, P. (2010). Human Resources in ICT – ICT Effects on GDP. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, p. 97–105. ISBN 978-3-85499-760-3
- Fiala, T. & Langhamrová, J. (2010). Population Projection of the Number and Age Structure of ICT Experts in the Czech Republic. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, s. 115–123. ISBN 978-3-85499-760-3.
- Kačerová, E. (2008). Migration – Source of Human Resources. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, 2010, s. 213–218. ISBN 978-3-85499-760-3.
- Maryška, M., Novotný, O. & Doucek, P. (2010). ICT Knowledge Analysis of University Graduates. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, p. 125–135. ISBN 978-3-85499-760-3.
- <http://www.czso.cz/csu/2009edicniplan.nsf/p/4020-09>
- http://www.czso.cz/csu/redakce.nsf/i/it_odbornici_v_ceske_republice
- http://www.czso.cz/csu/redakce.nsf/i/lidske_zdroje_v_informacni_spolecnosti_it_odbornici

ON THE RELATIONSHIP BETWEEN PERCEIVED IMPORTANCE OF ERP SYSTEMS SELECTION CHARACTERISTICS AND SATISFACTION WITH SELECTED ERP SYSTEMS

František Sudzina

Aarhus School of Business and Social Sciences
Aarhus University, Aarhus
fransu@asb.dk

Andreja Pucihar

Faculty of Organizational Sciences
University of Maribor, Kranj
andreja.pucihar@fov.uni-mb.si

Gregor Lenart

Faculty of Organizational Sciences
University of Maribor, Kranj
gregor.lenart@fov.uni-mb.si

Abstract

Enterprise resource planning (ERP) systems have been widely adopted not only by large but still more even by small and medium enterprises. Although there had been some research conducted in ERP systems selection criteria and ERP systems satisfaction characteristics, very little was done in research of the relationship between the two. The paper focuses on the correlation between importance of ERP system selection criteria and the level of satisfaction with the chosen ERP systems in these characteristics. The research hypothesis is that there exists a correlation between the two. The analysis presented in the paper explains that the situation is not so straightforward.

Keywords

Enterprise Resource Planning Systems, Satisfaction, Selection

1. Introduction

Enterprise resource planning (ERP) systems consists of an integrated set of programs that provides support for core business processes, such as production, input and output logistics, finance and accounting, sales and marketing, and human resources. An ERP system helps different parts of an organization to share data, information to reduce costs, and to improve management of business

processes (Aladwani, 2001). According to Wier, Hunton et al. (2007), ERP systems aim to integrate business processes and information technology into a synchronized suite of procedures, applications and metrics that goes over organizations' boundaries.

According to Peslak (Peslak, 2006), ERP systems have become the de facto standard for large and medium companies to run all their major functional and process operations. Kumar and van Hillegersberg (Kumar and van Hillegersberg, 2000) go even further and describe ERP systems as the price of entry for running a business. Or as (Doucek, 2010) puts it in general, "increasing impact of the ICT sector on the whole world economic is more and more visible in our period".

There is a body literature on ERP system selection criteria (reviewed e.g. in (Sudzina, 2007)) and on ERP system satisfaction characteristics (e.g. (Zviran, Pliskin et al., 2005; Wu and Wang, 2006; Hsu, Lai et al., 2008; Longinidis and Gotzamani, 2009)). But only a few papers focus on the relationship between the two (e.g. (Wei, 2008)).

The aim of the paper is to investigate the correlation between the importance attributed to certain ERP system characteristics in the selection process and the extent, to which companies are satisfied with chosen ERP systems in these characteristics. The analysis is based on data gathered from Slovak companies. At least one other relevant reasonably extensive research was conducted in Slovakia (Kokles and Romanova, 2004) but it focused rather on the financial side, not on motives for selection nor satisfaction with purchased ERP systems.

The paper is structured as follows. The next section describes the data and methodology. The third section provides results from the analysis. The fourth section discusses these results. The results are summarized in the last section.

2. Data and Methodology

The paper is based on a questionnaire survey conducted in Slovakia. Questionnaire forms accompanied by cover letters were mailed to randomly selected companies. Lists of addresses and information about the number of employees were retrieved from the Statistical Bureau. Regarding the random sample, 600 questionnaires were sent to small, 300 to medium enterprises, and 300 to large companies. The number of questionnaires mailed to small companies was double the number of medium and large companies because small companies constitute the highest proportion of companies and based on the prior personal experience, they are less likely to respond. In total, there were 112 responses out of 1200 mailings, i.e. the return rate was 9.3 %.

According to the European Commission (European Commission, 2003) definition of SMEs, companies with 10 to 49 employees are considered to be small, companies with 50 to 249 employees are considered to be medium enterprises, and companies with 250+ employees are considered to be large companies. According to this definition, there were 34 small, 27 medium, and 51 large companies in the research sample.

Considering the number of respondents with ERP system – 11 small, 10 medium, and 32 large companies – and the ERP systems usage in Slovak companies of different sizes assessed by Eurostat (Eurostat, 2009) – 10.8042 % in small, 23.0769 % in medium, and 47.2690 % in large enterprises – the response rate is 19.2 %.

Companies were asked to rate importance of ERP systems characteristics (proposed in (Bernroider and Koch, 2001)) in the selection process and the satisfaction level with their chosen ERP systems in these characteristics. A Likert scale from 1 to 5 was used in both cases (1 – low importance, low satisfaction, 5 – high importance, high satisfaction). Satisfaction will be used as a dependent

variable and importance will be used as an independent variable, assuming that the selection preceded the actual use (i.e. the basis for satisfaction evaluation).

Additional independent variables include information strategy (meaning that the company has a formal information strategy) and representation of the IT department on the board level (meaning that there is a CIO or alike director for IT on the board level). The latter will be addressed as having a CIO. Company size, information strategy and CIO were included into the model because company behavior and expectations change as the company grows, as described e.g. in (Antlova, 2009).

The research model, which will be evaluated by analysis of variance (ANOVA), and whose results will be described in the third section, is described in Figure 1.

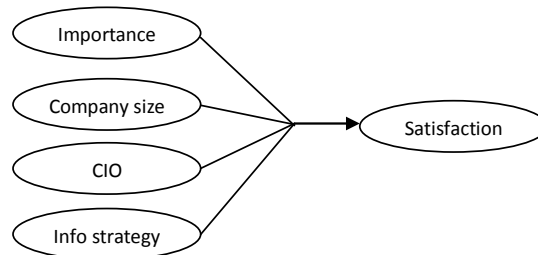


Figure 1: Research model

In the forth section, ANOVA will be used to compare evaluation of importance criteria by companies with and without ERP systems. Additionally, Pearson's correlation coefficient will be used to evaluate several relationships. Since Spearman's correlation is not used in the paper, the term correlation will be used for Pearson's correlation.

All the p-values in this paper will be commented at the significance level $\alpha = 0.05$. Significant p-values are marked with an asterisk (*).

3. Results

This section provides results from the research model illustrated in Figure 1 for all (12) ERP systems satisfaction characteristics, which are influenced by any of the independent variables.

The analysis of satisfaction with reduced cycle times is provided in Table 1. There is a significant impact of importance on satisfaction, the relationship is positive.

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	2.648009	2.648009	5.59	0.022907*
Company size	2	0.2587562	0.1293781	0.27	0.762460
CIO	1	0.6559091	0.6559091	1.38	0.246196
Info strategy	1	0.02938847	0.02938847	0.06	0.804584
S	41	19.42993	0.4739007		
Total (Adjusted)	46	23.10638			
Total	47				

Table 1: Satisfaction with reduced cycle times

The analysis of satisfaction with e-business enablement is provided in Table 2. There is a significant impact of importance on satisfaction, the relationship is positive.

On the Relationship between Perceived Importance of ERP Systems Selection Characteristics and Satisfaction with Selected ERP Systems

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	5.246517	5.246517	5.88	0.019915*
Company size	2	0.1837655	0.09188276	0.10	0.902374
CIO	1	0.6902317	0.6902317	0.77	0.384337
Info strategy	1	2.964859	2.964859	3.32	0.075786
S	40	35.68595	0.8921489		
Total (Adjusted)	45	44.95652			
Total	46				

Table 2: Satisfaction with e-business enablement

The analysis of satisfaction with increased organizational flexibility is provided in Table 3. There is a significant impact of importance on satisfaction, the relationship is positive.

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	6.676448	6.676448	12.51	0.001020*
Company size	2	0.177517	0.0887585	0.17	0.847329
CIO	1	0.01834404	0.01834404	0.03	0.853820
Info strategy	1	0.01487486	0.01487486	0.03	0.868221
S	41	21.87778	0.5336044		
Total (Adjusted)	46	29.95745			
Total	47				

Table 3: Satisfaction with increased organizational flexibility

The analysis of satisfaction with increased customer satisfaction is provided in Table 4. There is a significant impact of importance on satisfaction, the relationship is positive.

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	2.919028	2.919028	6.40	0.015353*
Company size	2	2.351324	1.175662	2.58	0.088223
CIO	1	0.7680962	0.7680962	1.68	0.201652
Info strategy	1	0.1918649	0.1918649	0.42	0.520233
S	41	18.70104	0.456123		
Total (Adjusted)	46	24.93617			
Total	47				

Table 4: Satisfaction with increased customer satisfaction

The analysis of satisfaction with improved innovation capabilities is provided in Table 5. There is a significant impact of importance on satisfaction, the relationship is positive.

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	4.952367	4.952367	11.38	0.001662*
Company size	2	0.7048007	0.3524004	0.81	0.452258
CIO	1	0.8457053	0.8457053	1.94	0.171086
Info strategy	1	0.00519037	0.00519037	0.01	0.913599
S	40	17.41421	0.4353552		
Total (Adjusted)	45	23.65217			
Total	46				

Table 5: Satisfaction with improved innovation capabilities

The analysis of satisfaction with software costs (licenses, maintenance, etc.) is provided in Table 6. There is a significant impact of representation of IT department on the board level on satisfaction, companies with CIOs are less satisfied (3.04 on average) than companies without any CIO (3.53 on average).

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	0.1725657	0.1725657	0.34	0.563777
Company size	2	1.090927	0.5454633	1.07	0.352210
CIO	1	2.6882	2.6882	5.28	0.026802*
Info strategy	1	2.04355	2.04355	4.01	0.051854
S	41	20.89029	0.5095193		
Total (Adjusted)	46	25.40425			
Total	47				

Table 6: Satisfaction with software costs

The analysis of satisfaction with advanced technology is provided in Table 7. There is a significant impact of representation of IT department on the board level on satisfaction, companies with CIOs are less satisfied (3.17 on average) than companies without any CIO (3.83 on average).

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	0.05424417	0.05424417	0.10	0.756115
Company size	2	0.7341093	0.3670547	0.66	0.521479
CIO	1	4.848226	4.848226	8.74	0.005148*
Info strategy	1	0.4934936	0.4934936	0.89	0.351160
S	41	22.74894	0.5548521		
Total (Adjusted)	46	29.74468			
Total	47				

Table 7: Satisfaction with advanced technology

The analysis of satisfaction with operating system independency is provided in Table 8. There is a significant impact of importance on satisfaction, the relationship is positive.

On the Relationship between Perceived Importance of ERP Systems Selection Characteristics and Satisfaction with Selected ERP Systems

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	8.900793	8.900793	17.55	0.000145*
Company size	2	1.355336	0.677668	1.34	0.274003
CIO	1	1.642237	1.642237	3.24	0.079288
Info strategy	1	0.01461419	0.01461419	0.03	0.866032
S	41	20.79093	0.5070958		
Total (Adjusted)	46	30.46808			
Total	47				

Table 8: Satisfaction with operating system independency

The analysis of satisfaction with system interoperability is provided in Table 9. There is a significant impact of importance on satisfaction, the relationship is positive.

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	5.583228	5.583228	13.88	0.000617*
Company size	2	0.4833957	0.2416978	0.60	0.553443
CIO	1	0.2812934	0.2812934	0.70	0.408192
Info strategy	1	0.136505	0.136505	0.34	0.563621
S	39	15.69304	0.4023857		
Total (Adjusted)	44	21.91111			
Total	45				

Table 9: Satisfaction with system interoperability

The analysis of satisfaction with internationality of software is provided in Table 10. There is a significant impact of importance on satisfaction, the relationship is positive.

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	14.40049	14.40049	21.34	0.000039*
Company size	2	0.03965633	0.01982817	0.03	0.971069
CIO	1	1.133739	1.133739	1.68	0.202373
Info strategy	1	0.113695	0.113695	0.17	0.683674
S	40	26.99624	0.6749059		
Total (Adjusted)	45	43.32609			
Total	46				

Table 10: Satisfaction with internationality of software

The analysis of satisfaction with enabling technology for CRM, SCM, etc. is provided in Table 11. There is a significant impact of importance on satisfaction, the relationship is positive.

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	8.296754	8.296754	13.16	0.000801*
Company size	2	0.1209546	0.06047731	0.10	0.908740
CIO	1	0.08697299	0.08697299	0.14	0.712287
Info strategy	1	0.02459653	0.02459653	0.04	0.844422
S	40	25.21848	0.630462		
Total (Adjusted)	45	33.91304			
Total	46				

Table 11: Satisfaction with enabling technology for CRM, SCM, etc.

The analysis of satisfaction with connectivity (intra/extranet, mobile comp., ...) is provided in Table 12. Satisfaction depends on importance (the relationship is positive) and on representation of IT department on the board level (companies with CIOs are less satisfied (2.81 on average) than companies without any CIO (3.40 on average)).

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
Importance	1	21.85097	21.85097	27.29	0.000006*
Company size	2	0.7422118	0.3711059	0.46	0.632420
CIO	1	3.823943	3.823943	4.78	0.034777*
Info strategy	1	0.00515864	0.00515864	0.01	0.936425
S	40	32.02707	0.8006766		
Total (Adjusted)	45	58.97826			
Total	46				

Table 12: Satisfaction with connectivity

To sum up, satisfaction depends on importance in ten cases and on representation of IT department on the board level in three cases. Regarding the latter, companies with CIOs were uniformly less satisfied. Regarding the former, the next section will discuss why satisfaction depends on perceived importance in several ERP system characteristics, while it does not in others.

4. Discussion

It may be surprising that there is a significant relationship between importance and satisfaction in 10 cases, while there is none in another 16 cases. It may look even more surprising when looking at average importance and satisfaction evaluations in Table 16 because there is an obviously positive relationship between the two.

The values in the importance column of Table 16 differ from ones presented in (Sudzina 2007) because the latter are averages for companies both with and without ERP systems. There is a significant difference between companies with and without ERP systems only in the following three ERP systems selection characteristics:

The analysis of importance of flexibility, as a selection characteristic, is provided in Table 13. There is a significant difference in perceived importance between companies with and without ERP

systems. Companies with ERP systems perceive it less important (3.57 on average) than the companies without ERP systems (4.08 on average).

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
ERP	1	5.328219	5.328219	5.01	0.027541*
Company size	2	2.016167	1.008084	0.95	0.390964
CIO	1	0.3313889	0.3313889	0.31	0.577874
Info strategy	1	2.081519	2.081519	1.96	0.164973
S	92	97.74909	1.06249		
Total (Adjusted)	97	108.1225			
Total	98				

Table 13: Importance of flexibility

The analysis of importance of independency, as a selection characteristic, is provided in Table 14. There is a significant difference in perceived importance between companies with and without ERP systems. Companies with ERP systems perceive it less important (3.00 on average) than the companies without ERP systems (3.67 on average).

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
ERP	1	8.954754	8.954754	11.46	0.001060*
Company size	2	4.981164	2.490582	3.19	0.046044*
CIO	1	2.369835	2.369835	3.03	0.085062
Info strategy	1	0.8440298	0.8440298	1.08	0.301495
S	89	69.54919	0.7814516		
Total (Adjusted)	94	88.58947			
Total	95				

Table 14: Importance of independency

The analysis of importance of connectivity, as a selection characteristic, is provided in Table 15. There is a significant difference in perceived importance between companies with and without ERP systems. Companies with ERP systems perceive it less important (3.32 on average) than the companies without ERP systems (4.02 on average).

Factor	DF	Sum of Squares	Mean Square	F-Ratio	P-value
ERP	1	9.544875	9.544875	7.55	0.007307*
Company size	2	1.299103	0.6495517	0.51	0.600007
CIO	1	0.5313928	0.5313928	0.42	0.518473
Info strategy	1	0.00921755	0.00921755	0.01	0.932147
S	86	108.7096	1.264065		
Total (Adjusted)	91	120.7283			
Total	92				

Table 15: Importance of connectivity

It is worth noting that in all three cases, companies with ERP systems consider the ERP systems selection characteristics to be less important.

Average importance and satisfaction, and the correlation between the importance and satisfaction are summarized in Table 16. The correlations are not equal to standardized regression coefficients from the third section because they do not account for the remaining independent variables.

It is worth mentioning that although the correlation between average importance and average significance in Table 16 is high ($r = 0.894$; $p\text{-value} < 0.000001$), the individual correlations range from -0.099 to 0.613, with average of 0.256.

The fact that the ERP system characteristics importance is highly and negatively correlated ($r = -0.638$; $p\text{-value} = 0.000455$) with correlation between importance and satisfaction can be interpreted as that the more important the criterion is, the harder it is to satisfy it. On average, the important criterion is satisfied better but in individual cases, the satisfaction with the ERP characteristics differs more when it comes to more important criteria.

Evaluation Characteristics	Importance	Satisfaction	Correlation
Reduced cycle times	3.383	3.146	0.253
Enhanced decision making	4.049	3.383	0.346
Improved service levels/quality	4.000	3.383	0.204
Incorporation of business best practices	3.689	3.043	-0.042
Business process improvement	4.267	3.478	0.031
Integrated and better quality of information	4.444	3.667	-0.099
E-business enablement	2.787	2.609	0.324
Increased organizational flexibility	3.556	3.149	0.513
Increased customer satisfaction	3.887	3.255	0.334
Improved innovation capabilities	3.419	3.087	0.447
Enabler for desired business processes	3.790	3.447	0.233
Organizational fit of system	4.377	3.468	0.198
Software costs (licenses, maintenance, etc.)	4.066	3.277	0.101
Functionality of the system	4.541	3.532	0.122
System flexibility	4.180	3.426	0.009
Systems reliability	4.590	3.702	0.288
Advanced technology	3.983	3.511	0.127
Operating system independency	2.933	2.894	0.459
System interoperability	3.276	3.156	0.501
Internationality of software	3.203	3.283	0.591
System usability	4.300	3.660	0.282
Vendor reputation	3.750		
Vendor support	4.333	3.422	0.144
Market position of vendor	3.186		
Availability of an industry focused solution	3.700	3.413	0.101

Short implementation time	3.683	3.149	0.085
Enabling technology for CRM, SCM, etc.	2.948	2.957	0.499
Connectivity (intra/extranet, mobile comp., ...)	3.305	3.022	0.613

Table 16: Evaluation characteristics

Although the satisfaction is also significantly correlated with correlation between importance and satisfaction ($r = -0.471$; $p\text{-value} = 0.015199$), there is a significant difference between the correlation coefficients (i.e. between -0.638 and -0.471 , $p\text{-value} = 0.026542$). So, it is not possible to say that respondents simply rated characteristics, with which they are not satisfied.

5. Conclusions

The analysis of ERP systems characteristics has shown that there is a significant relationship between attributed importance to the ERP systems characteristics in the selection process and the satisfaction with chosen ERP systems in the following 10 (out of 26 investigated) characteristics: reduced cycle times, e-business enablement, increased organizational flexibility, increased customer satisfaction, improved innovation capabilities, operating system independency, system interoperability, internationality of software, enabling technology for CRM, SCM, etc., and connectivity.

This may seem to be surprising, since there is obviously a high correlation between average importance and satisfaction. A deeper investigation uncovered that average ERP system characteristics importance is highly and negatively correlated with correlation between importance and satisfaction. In other words, the more important the criterion is, the harder it is to satisfy it. On average, the important criterion is satisfied better but in individual cases, the satisfaction with the ERP characteristics differs more when it comes to more important criteria.

6. References

- Aladwani, A. M. (2001). Change management strategies for successful ERP implementation. *Business Process Management Journal* 7(3), 266-275.
- Antlova, K. (2009). Motivation and Barriers of ICT Adoption in Small and Medium-Sized Enterprises. *E & M Ekonomie a Management* 12(2), 140-155.
- Bernroider, E. & S. Koch (2001). ERP selection process in midsize and large organizations. *Business Process Management Journal* 7(3), 251-257.
- Doucek, P. (2010). Human Resources in ICT - ICT Effects on GDP. in IDIMT-2006, 14th Conference on Interdisciplinary Information Management Talks, Sept, 2010, Jindrichuv Hradec, pp. 97-104, Universitätsverlag Rudolf Trauner 2006, Linz.
- European Commission (2003). SME Definition: Recommendation 2003/361/EC Regarding the SME Definition.
- Eurostat. (2009). "Statistics on enterprises 2006-2007." Retrieved 14 September 2009, from http://epp.eurostat.ec.europa.eu/portal/page/portal/information_society/documents/ENT%202006-2007%20EXCEL_0.zip.
- Hsu, L. L., R. S. Q. Lai, et al. (2008). Understanding the critical factors effect user satisfaction and impact of ERP through innovation of diffusion theory. *International Journal of Technology Management* 43(1-3), 30-47.
- Kokles, M. & A. Romanova (2004). Exploitation of information systems in Slovak enterprises. *Ekonomicky Casopis* 52(8), 1009-1026.
- Kumar, K. & J. van Hillegersberg (2000). ERP experiences and evolution. *Communications of the ACM* 43(4), 22-26.

- Longinidis, P. & K. Gotzamani (2009). ERP user satisfaction issues: insights from a Greek industrial giant. *Industrial Management & Data Systems* 109(5-6), 628-645.
- Peslak, A. R. (2006). Enterprise resource planning success: An exploratory study of the financial executive perspective. *Industrial Management & Data Systems* 106(9), 1288-1303.
- Sudzina, F. (2007). Importance of EPR selection criteria in Slovak companies. *Manažment v teórii a praxi* 3(4), 4-20.
- Wei, C. C. (2008). Evaluating the performance of an ERP system based on the knowledge of ERP implementation objectives. *International Journal of Advanced Manufacturing Technology* 39(1-2), 168-181.
- Wier, B., J. Hunton, et al. (2007). Enterprise resource planning systems and non-financial performance incentives: The joint impact on corporate performance. *International Journal of Accounting Information Systems* 8(3), 165-190.
- Wu, J. H. & Y. M. Wang (2006). Measuring ERP success: the ultimate users' view. *International Journal of Operations & Production Management* 26(8), 882-903.
- Zviran, M., N. Pliskin, et al. (2005). Measuring user satisfaction and perceived usefulness in the ERP context. *Journal of Computer Information Systems* 45(3), 43-52.

CHANGES IN POSITION OF THE IT DEPARTMENT IN ORGANIZATIONS

Renáta Kunstová

Department of Information Technology

Faculty of Informatics and Statistics

University of Economics

kunstova@vse.cz

Abstract

This paper focuses on the status of ICT in organizations. In this case ICT means the whole area of management and operations of information systems and information and communication technologies. The positive development of ICT industry is emphasized in the introduction of the paper. The main part of the paper is focused on the survey. The goal of the survey was to collect data about a position of IT department in organizations. The survey was conducted during autumn 2010 in 225 organizations in the Czech Republic. The paper contains key findings.

Keywords

ICT Industry, Digital Competitiveness, ICT Human Resources, IT Department, Survey

1. Introduction

Commission of the European Communities published the Europe's Digital Competitiveness Report in August 2009 (COM, 2009). The report characterizes all twenty seven European countries in following areas:

- Broadband – an availability of internet connection, a broadband penetration, percentage of enterprises and percentage of households with a broadband connection etc.,
- Internet usage – frequency of Internet use, percentage of Internet services using (e.g. reading and sending emails, looking for information about goods and services, reading online newspapers or magazines, internet banking, listening to the web radio or watching web TV, ordering goods or services, downloading computer or video games or their updates),
- eGovernment indicators – percentage of basic public services for citizens and for enterprises fully available online, percentage of population and percentage of enterprises using eGovernment services,
- eCommerce – eCommerce as percentage of total turnover of enterprises, percentage of enterprises selling or purchasing online,
- eBusiness – using applications for integrating internal business processes, exchanging automatically business documents with customers or suppliers, sending or receiving

e-invoices, sharing information electronically with customers or suppliers on Supply Chain Management, using analytical Customer Relationship Management,

- Indicators on the ICT sector, ICT skills and R&D – ICT sector share of total GDP and of total employment, percentage of ICT exports on total exports, percentage of persons employed with ICT user skills and with ICT specialist skills.

The Czech Republic scores well in the area of eCommerce (with 15% of total turnover coming from eCommerce ranks 4th) and in the use of applications for integrating internal business processes (with 85% of using applications for integrating internal business processes in large enterprises also ranks 4th). These results are from 2008.

This paper relates mainly to the sixth area – Indicators on the ICT sector, the area of ICT employment. The Czech Republic has very good position concerning ICT specialists. The percentage of highly skilled ICT professionals lies above average of EU27 (COM, 2009). The Czech Republic ranks 2nd in the share of ICT specialists in the total economy (OECD, 2010) – see Figure 1.

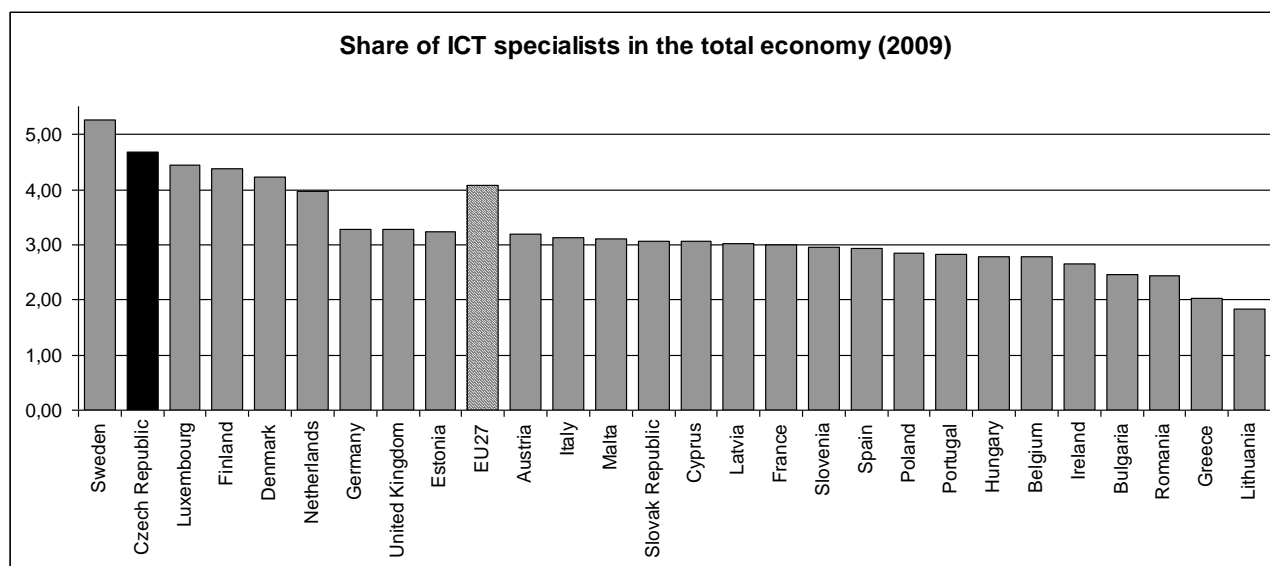


Figure 1: Share of ICT specialists in the total economy in 2009 (Source data: OECD)

The growth of the ICT employment in the Czech Republic between 1995 and 2008 was the third fastest from EU27 (OECD, 2010). It corresponds to development of ICT graduates (see Figure 2).

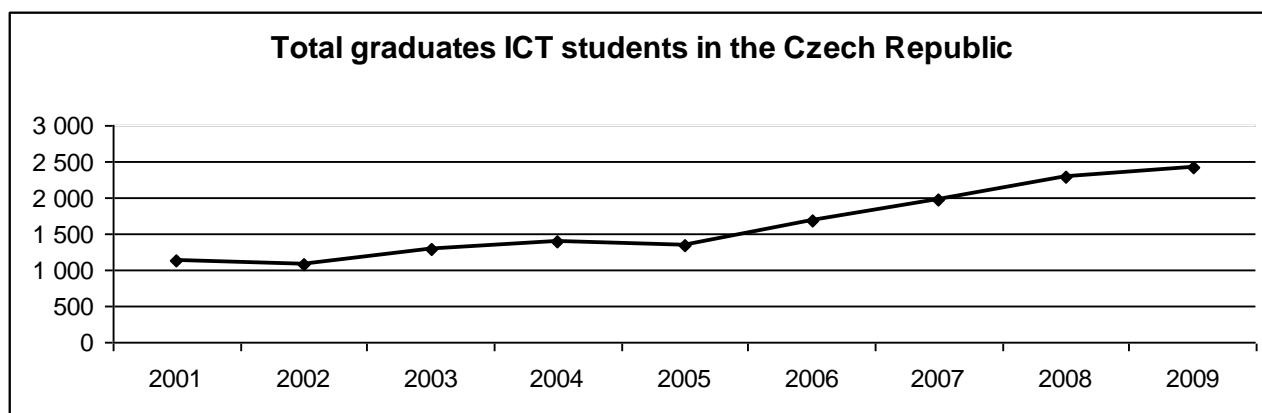


Figure 2: Development of ICT graduates in the Czech Republic (Source data: CZSO)

Not only this data but other studies (for example Doucek, 2010a) show the positive development in the share of added value of the ICT sector on the whole GDP. ICT plays the central role as a driver of innovation, productivity and growth (i2010 HLG, 2006). Current trends in ICT allow creating new business models with greater emphasis on human capital which enable to support organizational change, to increase productivity and in general increase benefits from ICT.

2. Background of Survey

The author is working on two grant projects. The first project "Human Capital in IS/ICT Operations and Development: Competitiveness of Czech Tertiary Education Graduates" is focused on new requirements for tertiary education of ICT specialists. The second project "Advanced Principles and Models for Enterprise ICT Management" deals with new principles and models for enterprise IT management. Both projects are complementary, especially in the area of human resources.

Results of analytical works and realized surveys in the area of ICT human resources, which were published for instance in (Doucek, 2009; Doucek, 2010a; Doucek, 2010b; Maryška, 2010; Novotný, 2010) shows that a demand for ICT specialists will continue to grow in subsequent years. The second project examines changes in the business environment and their impact on the enterprise ICT management. The economic crisis increased emphasis on the management of the ICT investments returns and demands to reduce the risk of an ICT initiatives and investments and to assure profitability. Global ICT trends, such as sourcing and ICT services orientation, change management processes of the enterprise informatics. Our enterprise ICT management model is based on best practices model ITIL (ITIL, 2007), audit model CobiT (COBIT, 2007), enterprise architecture framework (Zachman, 1987) and styles of IT Management (Weill, 2004). The model was described in (Voříšek, 2008) and in many other publications focusing on various aspects of the model (Basl, 2009; Kunstová, 2010a; Maryška 2009; Novotný, 2009; Voříšek, 2009; Buchalceková, 2008; Kunstová, 2010b; Kunstová, 2010c). The model emphasizes close integration of ICT with business processes, because the business/IT alignment is an important prerequisite of a competitive advantage.

The question is, how well-educated should be ICT specialists in order to be able to manage enterprise IT in a new business environment and how well-educated should be ICT users in order to be able to communicate business requirements and to be able to fully use the available information systems.

Our work is focused on skills of ICT specialists. We do not deal generally with informatics knowledge and skills. Definition of required skills of ICT specialists and ICT users is now under investigation and it is a subject of an extensive research.

Another question is how many ICT specialists will be needed. It is influenced by contemporary trends such as moving towards the SaaS (Software as a Service), IaaS (Infrastructure as a Service) and PaaS (Platform as a Service) models.

These trends maybe mean that ICT specialists will move in larger scale from business enterprises to ICT organizations which will provide different services. In any event, organizations will have to decide about purchased services, about new applications provided as a service, about changes of business processes. Therefore every organization will need at least one person with certain level of ICT skills.

It can be expected that changes in delivering of IS/ICT services will lead to changes in organizational structure and also to more differentiated ICT knowledge and skills. So we decided to explore, what status has ICT in organizations now.

3. Survey of the IT position in Czech organizations

3.1. Implementation of the Survey

The survey passed in October 2010 within the author's course "Collaboration Support Systems" which is annually offered to students at the University of Economics in Prague. The data were collected through a questionnaire, but the questionnaire was completed on the basis of a personal interview. In an interview a student (inquirer) and a respondent (representative of the organization) participated. An interview was one of the practical tasks which were important for further coursework. Each student had to complete the questionnaire and to write a short report containing findings from three organizations. This method had the following advantages:

- students were encouraged to submit well completed questionnaires,
- students received a recommendation to ask for an interview people from their neighborhood (parents, friends, colleagues from part-time job etc.),
- high return of the completed questionnaires was achieved.

Data from questionnaires were manually transcribed on to Microsoft Excel software. The data analysis was performed using statistic functions. Main results are presented in the following text.

3.2. Structure of the Questionnaire

The questionnaire had two parts. The first part included an identification of the student (name and surname), a relationship to the respondent, a date of the interview, a city where the organization is located and the first four digits of organization's identification number (in order to eliminate duplication).

The second part included ten questions to obtaining the following information:

1. Establishment of the organization.
2. Number of geographically separated locations, which organization has in the Czech Republic.
3. Number of employees working in the Czech Republic.
4. Number of ICT employees working in the Czech Republic.
5. Industry sector.
6. Job position of the respondent in the organization.
7. Position of IT department in the organization structure.
8. Senior executive to whom CIO (chief information officer) reports.
9. Who decides on financial investments in the ICT.
10. Who decides on the application architecture, i.e. which applications will be developed and purchased.

All questions were closed questions with the list of answers. Respondent selected just one item from the list.

3.3. Sample of Interviewed Organizations

The total number of surveyed organizations influenced the number of students (77) and the number of realized interviews (maximum 3). Questionnaires were collected after four weeks from their distribution and explanation of their purpose. The total number of received questionnaires was 230 and the number of reports was 77. The unique company identification number made possible to find duplicates among organizations. No duplication was found but 5 questionnaires were poorly filled. The total number of analyzed organizations was 225.

3.4. Characteristics of Interviewed Organizations

Characteristics of organization were detected through the questions 1, 2, 3 and 5. Following four paragraphs summarize recognized results.

The largest portion (64%) were original Czech organizations, without offices abroad, 29% of organizations were affiliates of multinational organizations and the remaining 8 % were Czech organizations now with offices abroad.

Most organizations (43%) were dispersed across 2 – 10 locations, approximately the same group of organizations (40%) was located only in one location and 17% of organizations were dispersed across more than 11 locations.

The largest group of respondents (37%) was from large-sized organizations (251+ employees), 25% of respondents were from medium-sized organization (51 – 250 employees), and 21% of respondents were from organizations with maximum 20 employees. The remaining 17% of respondents were from organizations with 21 – 50 employees.

The survey involved representatives from different industry sectors. These sectors were divided into three groups: ICT industry (HW, SW, ICT services), highly depended sector on ICT and others. Distribution of respondents by industry sectors is showed in Table 1.

	Total	Percentage	Group
ICT industry (HW, SW, IT Services)	40	18%	18%
Banking, Insurance	24	11%	25%
Telecommunication Services	16	7%	
Government and Public Services	14	6%	
Utilities	3	1%	
Culture and Recreation	9	4%	57%
Retailing, Transportation, Stocking	44	20%	
Manufacturing, Construction	37	16%	
Real Estate	7	3%	
Accommodation and Catering	3	1%	
Education	15	7%	
Healthcare	9	4%	
Agriculture, Forestry and Fishing	4	2%	
Total	225	100%	

Table 1: Distribution of respondents by industry sectors

3.5. Key findings

One centralized unit providing services to the whole organization still dominates from the view of the IT department position in the organization structure. But the survey showed that IT department is replaced by ICT specialists especially in small and medium Czech organizations. The position of

ICT in organizations and the detailed view on organizations without IT department is shown in Figure3.

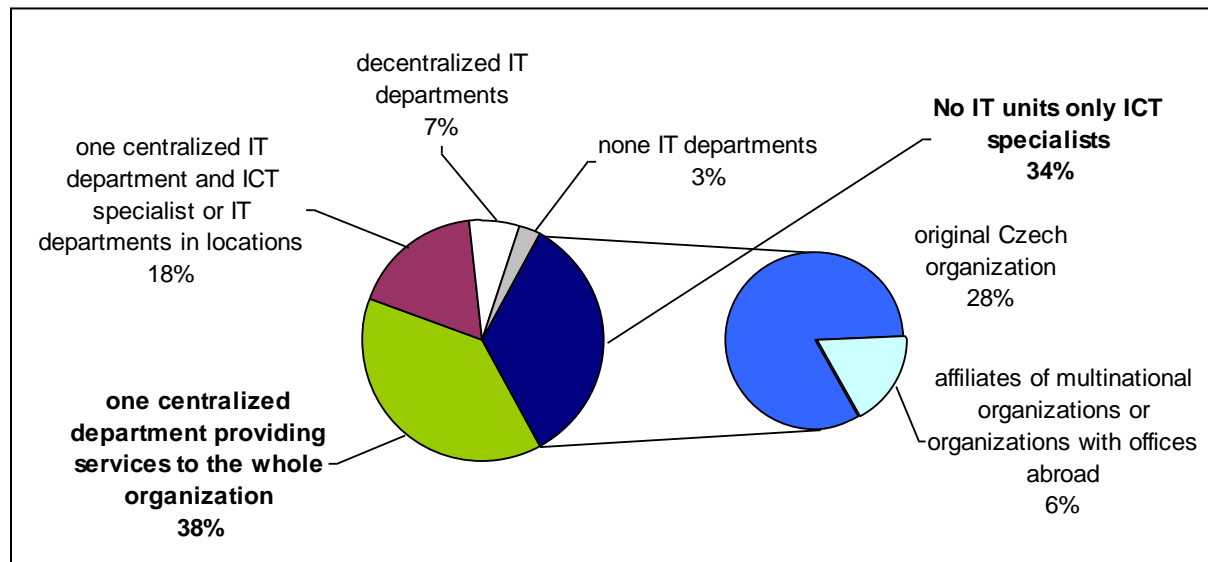


Figure 3: Status of ICT in Organizations

The cloud computing solutions leads to differently thinking about ICT sources delivery. Organizations can buy ICT services as necessary rather than owning the assets themselves. The following analysis is focused on two groups of organizations divided by status of ICT. The first group is organizations with centralized IT department and the second group are organizations without IT department.

At the beginning the variability rate of the data set was verified. For measures of variability was used normalized Gini coefficient and normalized entropy. These measures reflect the degree of concentration of a variable in a distribution of its elements. The measures of variability quantify the degree to which they differ. If values of a variable are not the same they differ and variability exists, normalized coefficient. The coefficients range between 0 and 1 (1 corresponding to high variability). The characteristics, which could influence results of the survey, are position of respondent and industry sector. Calculated coefficients were near the maximum value (0.97 and 0.96) in the case of respondent's position, and they were slightly lower (0.87 and 0.89) in the case of industry sectors, which were merged into three groups as mentioned above.

The dependence of two variables (number of employees and number of ICT employees) was tested by Pearson's chi square test (with result 0.371 from the range 0 to 0.707) and Cramer's coefficient (with result 0.4 from the range 0 to 1). It means that number of ICT employees is independent on number of employees. It is important to note, that the frequency variables were converted into four groups before testing: number of employees below 51 and number of employees 51 and more, number of ICT employees below 11 and number of employees 11 and more. The reason was several lower frequencies than five in a contingency table.

One centralized IT department is typical for organizations with 51 and more employees, number of location or establishment of the organization are not crucial. Organizations without IT department are mostly original Czech organizations with a low dislocation. Dependence on the industry sector was not found, but it was evident, that organizations from ICT sector often belong to organizations without IT department and organizations from industry with a high dependence on ICT belong to organizations with one centralized IT department.

The status of ICT in organizations relates to their management. The CEO is responsible for all decisions on ICT in organizations without IT department. CEO also decides about financial investment into IS/ICT. Decision making about application purchasing is realized more in cooperation of CEO with ICT specialists and business specialists. In organizations with centralized IT department, CIOs assume decision-making power and are often subordinated to other (e.g. finance) senior executives and not directly to the CEO. IT department, especially its CIO, cooperates with CEO and the concerned business department in decision-making about potential ICT investment. CIOs also make proposals and cooperate on decisions about application architecture. These findings resulted from the calculation of relative frequencies in contingency tables of relevant variables.

4. Conclusions

This paper focuses on status of ICT in organizations. The results of the survey show, that IT departments could be represented only by ICT specialists, especially in small and medium organizations. The new trends outlined above, cloud computing and different models of service delivering, have an impact on status of ICT in organizations. But a key factor of a successful organization, in a current dynamic environment, is business/IT alignment, because the most important is not an existence of ICT in organization but how ICT supports business strategies and business processes, other words, if ICT investments generate business value.

Higher specialization and displacement technology services outside the organizations will also change requirements on the skills of ICT specialists in organizations. The highest priority will have business analysis skills, project management and architecture skills, but also communication, leadership and influencing skills.

The survey shows that CIO as well as ICT specialists must communicate well with business managers. In organizations without IT department the CEO assumes all responsibility for ICT. From this follows that CEO in such organizations should have good ICT knowledge and skills for ongoing organization success. In organizations with centralized IT department more responsibility is transferred to the CIO which reports to the CEO or to other senior manager. High quality communication between them is required for the ongoing organization success.

Acknowledgement

This paper was supported by the grant "Advanced Principles and Models for Enterprise ICT Management" under the number P403/10/0092 and the grant "Human Capital in IS/ICT Operations and Development: Competitiveness of Czech Tertiary Education Graduates" under the number GA402/09/0385. Both of them are from the Czech Science Foundation.

5. References

- Basl, J., Gála, L. (2009). The Role of ICT in Business Innovation. In: IDIMT-2009 System and Humans – A Complex Relationship, pp. 67–76. Linz, Trauner Verlag Universitat.
- Buchalceková, A. (2008). Research of the Use of Agile Methodologies in the Czech Republic. Barry, C., Lang, M., Wojtkowski, W., Wojtkowski, G., Wrycza, S., & Zupancic, J. (eds) The Inter-Networked World: ISD Theory, Practice, and Education. Springer-Verlag: New York, ISBN 978-0387304038
- CZSO. Czech Statistical Office. URL: [http:// www.czso.cz](http://www.czso.cz)
- COM. (2009) Europe's Digital Competitiveness Report. Volume 2: i2010 – ICT Country Profiles.

- Doucek, P. (2009). ICT Human Capital – Research and Development work in ICT. Jindřichův Hradec 09.09.2009 – 11.09.2009, In: IDIMT-2009 System and Humans – A Complex Relationship. Linz : Trauner Verlag universitat, 2009, pp. 83–94. ISBN 978-3-85499-624-8.
- Doucek, P. (2010a). Human Resources in ICT – ICT Effects on GDP. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 97–105. ISBN 978-3-85499-760-3.
- Doucek, P., Nedomová, L., Novotný, O. (2010b). How ICT Affect the Czech Economy. Ostrava 07.10.2010 – 08.10.2010. In: Informační technologie pro praxi. Ostrava : TU Ostrava, 2010, pp. 14–23. ISBN 978-80-248-2300-3. (In Czech)
- i2010 HLG. (2006) The economic impact of ICT: evidence and questions. URL: http://ec.europa.eu/information_society/eeurope/i2010/docs/high_level_group/note_on_economic_impact_of_ict.pdf
- COBIT (2007) COBIT 4.1. Rolling Meadows: IT Governance Institute. 2007. 196 p. ISBN 1-933284-72-2
- ITIL. (2007) ITIL: service strategy. London: Stationery Office, 2007. 246 p. ISBN 978-0-11-331045-6
- Kunstová, R. (2010a). Barriers and Benefits of Investments into Enterprise Content Management Systems. Organizacija, Vol. 43, No. 5, pp. 205–213.
- Kunstová, R. (2010b) Enterprise Content Management and Innovation. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, , s. 49–56. ISBN 978-3-85499-760-3.
- Kunstová, R., Potančok, M. (2010c). Analýza efektů digitalizace na radiodiagnostickém pracovišti. Systémová integrace, 2010, roč. 17, č. 4, pp. 86–95. ISSN 1210-9479. URL: <http://cssi.cz/cssi/systemova-integrace-4>. (Analysis of the effects of digitalization on radiodiagnostic workplace).
- Maryška, M. (2009). Model for Measuring and Analysing Costs in Business Informatics. In: The Eighth Wuhan International Conference on E-Business [CD-ROM], pp. 1–5. Sigillum, Alfred University Press)
- Maryška, M., Novotný, O. & Doucek, P. (2010). ICT Knowledge Analysis of University Graduates. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, pp. 125–135. ISBN 978-3-85499-760-3.
- Novotný, O. (2009). ICT Performance Reference Model in the Context of Corporate Performance Management. In: IDIMT-2009 System and Humans – A Complex Relationship, pp. 13–16. Linz, Trauner
- Novotný, O., Doucek, P. (2010). Impact of the ICT Sector on Economic Growth. Portorož 24.03.2010 – 26.03.2010. In: Človek in organizacija [CD-ROM]. Maribor : University in Maribor, 2010, pp. 999–1006. ISBN 978-961-232-238-0. Abstract ISBN 978-961-232-237-3.
- OECD. (2010) Information Technology Outlook 2010. URL: http://www.oecd.org/document/20/0,3746,en_2649_34449_41892820_1_1_1_1,00.html
- Voříšek, J., Feuerlicht, G. (2009). The impact of new Trends in the delivery and utilization of enterprise ICT on supplier and user organizations, in IT Outsourcing: Concepts, Methodologies, Tools, and Application, Edited By: Kirk St.Amant, Infomation Science Reference, 2009, pp 2303-2316, ISBN: 978-1-60566-770-6.
- Voříšek, J. et al. (2008). Principles and Models of Enterprise IT Management. Prague, Oeconomica.
- Weill, P., Ross, J. W. (2004). IT Governance on One Page, Center for Information Systems Research, CISR WP No. 349 and Sloan WP No. 4516-04.
- Zachman, J.A. (1987). A Framework for Information Systems Architecture. IBM Systems Journal, Vol. 26, No. 3.

Systemically Reacting to Regional Emergencies

A SYSTEMIC VIEW OF INTERVENTIONS IN REGIONAL DISASTERS

Gerhard Chroust

Johannes Kepler University Linz, Austria
gerhard.chroust@jku.at

Günther Ossimitz

Alpen-Adria University Klagenfurt, Austria
guenther.ossimitz@aau.at

Abstract

Today's catastrophes (many of them man-made or at least triggered by human activities) frequently endanger a growing number of humans and larger areas in numerous different ways, calling for more attention concerning dependability and resilience of our environment.

A system which in itself is unable to re-establish its reliability, i.e. it is not resilient (any more), needs an external intervention. A complex regional system can be made resilient by the addition of an Intervention System (e.g. fire brigades, ambulances, police, and technical aid teams) which intervenes in the case of loss of reliability. Taking a systemic approach we look at the theoretical background: dependability and resilience of systems, intervention systems. We further look at key aspects of such interventions: the process of Interventions, the Organizational Structures, and the Human aspects. We also consider the possibilities of supporting First Responders by Information and Communication Technology with respect to training and actual interventions.

Keywords:

Catastrophe, First Responder, Systems View, Compensation, Human Aspects

1. Motivation

It seems that regional emergencies and disasters (many of them man-made or at least triggered by human activities) have grown in number, in scale and also in the media coverage. They endanger people, society, environment and economy in complex, interrelated ways and are in most cases multi-faceted, affecting numerous areas in varying ways. Typical examples are the volcanic eruption of Eyjafjallajökull (Iceland 2010) suddenly interrupting air traffic and thus impacting the economy, the local break-down of electric transmission lines due a tsunami (Fukushima, Japan 2011), endangering the cooling and thus the safety of an atomic plant. Society has an interest of ensuring its environment to behave like a dependable system (Figure 2).

From a stakeholder's or a user's viewpoint dependability is a highly desirable property of a system: roughly speaking dependability means that the *system behaves as expected*. If a systems leaves its domain of dependability one has to 'force' it back to a dependable state, not necessarily into the

original state. In regional disasters this is the task of the so-called First Responders (i.e. fire brigades, ambulances, police, technical aid teams, etc.) by staging an *intervention*. Observing past experiences one can say that both the countermeasures and the interplay of several organizations of First Responders can be improved by more effective methods, many of them only having become available by the increased availability of cheap and effective ICT-support.

2. Regional Disasters

In (Wikipedia-e, keyword=Disaster) one finds: "A disaster is a natural or man-made hazard that has come to fruition, resulting in an event of substantial extent causing significant physical damage or destruction, loss of life, or drastic change to the natural environment. A disaster can be ostensibly defined as any tragic event with great loss stemming from events such as earthquakes, floods, catastrophic accidents, fires, or explosions."

There are numerous reasons for the 'growth' of the size and number of disasters: the land has become more densely populated, as a consequence people also live in areas in which centuries ago nobody would have considered/dared to live. Today's catastrophes frequently endanger a growing number of humans and larger areas in diverse ways. Human interference with the natural environment weakens and/or eliminates nature's safety provisions and natural buffer mechanisms (e.g. land for inundation, protective forests). Growing trust in the infallibility of technical systems lets us reduce safety margins. Failures of technical artifacts cause severe catastrophes (Chernobyl in 1986, an exploding oil rig in the Mexican gulf in 2010, failing atomic reactors in 2011 in Japan, etc.). Many of our technical 'achievements' often provide higher efficiency at the cost of reduced robustness (e.g. computer chips affected by solar eruptions ...). Global interconnection and dependencies increase the impact of originally local disturbances (volcanic ash disrupting air traffic). The advances of ICT have created a large number of complex critical embedded systems. The need for dependability on such systems increases rapidly in our days.

With respect to regional disasters, may it be natural ones, triggered by human activity or fully man-made, the classical compensation system are fire brigades, ambulance services, technical support teams, etc. Already the Roman Emperor Augustus acknowledged the need for a 'human' compensation system in case of disasters by establishing in 23 BC an organization of full-time, professional fire fighters (*vigiles*).

2.1. Types of Regional Disasters

Regional disaster can be classified according to many different dimensions. A traditional broad distinction is between man-made and natural disasters. Looking at past catastrophes one has to notice, however, that this criterion has lost most of its distinctiveness: their consequences and the approaches to mitigation seem to be closely interwoven.

There are a number of dimensions along which catastrophes may be classified:

1. along scientific disciplines: volcanology, epidemiology, avalanche research, earthquake research,
2. regional dimension: local – regional – international – global.
3. time dimension: short term – mid term – long term catastrophes (Figure 1)
4. reversibility: reversible vs. irreversible catastrophes

5. “who is to be blamed for”: natural catastrophes (earth-quake) vs. human-made catastrophes (destruction of the twin towers of the world trade center)

These dimensions are usually intertwined and even within a given dimension different aspects may appear: a catastrophe might have both local and international implications; there might be short- and long-term effects of the disaster, for example the volcanic eruption of Mount Eyjafjallajökull was a purely natural disaster but the effect of the volcanic ash was that air traffic was completely interrupted and this had considerable consequences for the economy. Similarly the earthquake in 2011 near Fukushima, Japan, was a natural disaster which triggered a terrible Tsunami, which lead to the Fukushima disaster.

Often catastrophes are “transdisciplinary”. The Fukushima disaster can be seen as a combination of a tsunami, an earthquake and a nuclear power plant accident. The consequences of the Fukushima accident are ecological, medical, involve regional planning, energy production, etc. As a consequence it seems to be helpful to see catastrophes as a systemic cross-disciplinary phenomenon.

An interesting possibility to classify catastrophes is along the behavior of some “system state” (like the water-level in a flood-catastrophe or the number of casualties in an epidemic) over time. Figure 1 displays a number of patterns of how catastrophe scenarios may develop over time. (Mrotzek, 2009).

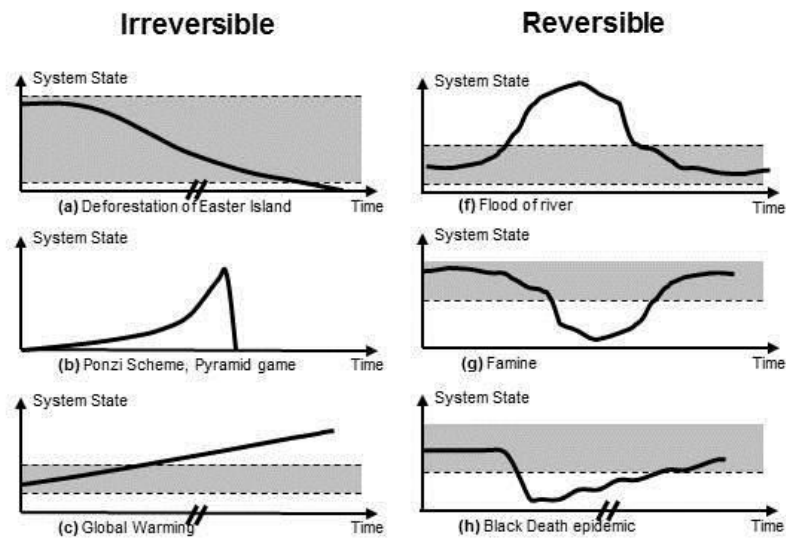


Figure 1: Catastrophe Patterns

The indicated catastrophe patterns may be either irreversible (left) or reversible (right). Often it depends on the point of view which type of catastrophe we have. For a single leaf on a tree losing its contact to its home tree is an ultimate and irreversible catastrophe; for the whole tree losing its leaves in autumn is only apparently a temporary catastrophe, actually assuring the tree’s survival over the cold winter-season.

3. Compensation Systems - a systemic Model

3.1. Dependability

The basic objectives of interventions are (re-)establishing and ensuring system properties which are required from dependable systems, namely ensuring *safety*, *reliability*, *availability*, *security*, *survivability*, and *maintainability*.

The utmost dependability can be achieved if one could *prove* that a system is dependable under *all possible* situations. This may work well within a closed environment which excludes unexpended external influences. This condition cannot be guaranteed in the real world (as many accidents of 'safe-proof' systems show). One might be able to proof that a certain mechanical gadget (e.g. a clock) behaves dependable under all conceivable inputs - but this proof will not extend to breaking it by external force.

Another attempt to achieve dependability is a 'proof by construction'. Using a 'watertight' engineering method one could claim that the resulting product 'must' be dependable - again unexpected or unaccounted external influences invalidate the assumption.

On a philosophical level it is easy to argue why any system beyond abstract mathematical systems (which exist independent of any environment, energy, time and space) is prone to a loss of dependability or a breakdown: a system which is immune against any kind of breakdown would have miraculous properties: it would be "invulnerable" and exist forever. It could neither be deconstructed nor switched off nor destroyed by any kind of sabotage, bombs (even not by nuclear weapons) – in short, such a system would be beyond of human control. We may argue that the course of the planets in our solar system represents such an "eternal" and invulnerable system; yet even in this case Henry Poincare showed in his work on the motion of celestial objects that the gravitational interrelations between just three stellar objects may lead to deterministic chaos, which spoils the order of a planetary system with periodical turns of the planets around the sun. Considering living or human-made systems on earth we have overwhelming empirical evidence that no such system exists forever, which implies that any of these systems is prone to a lethal breakdown at some time.

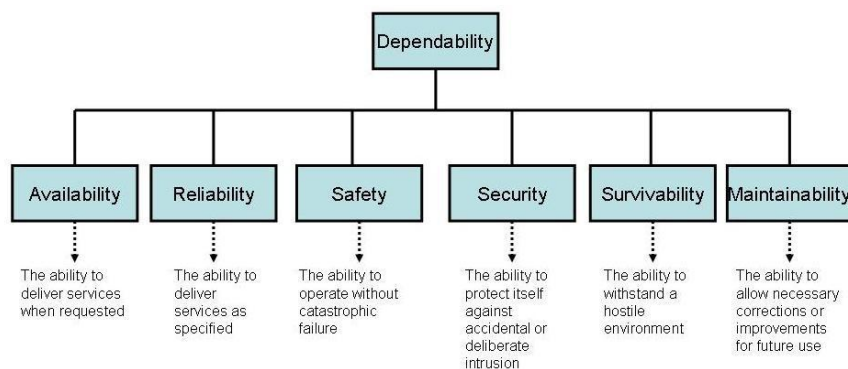


Figure 2: Components of dependability

As a consequence we have to be prepared that even very well-designed and 'proven' systems will eventually lose their dependability, often due to a combination of influences which nobody ever considered in advance. The loss of dependability – in the sense of an "aging" of the system - can be considered an emergent property of the system. It could be a hidden or latent error in the system (often in software) which only appears for a very specific and unusual combination of inputs or the

change of a parameter which was considered irrelevant or constant (e.g. an earthquake of exceptional strength).

Since such loss of dependability can always happen we have to be prepared for the 'the unexpected' (Tierney, 2001) and the 'inconceivable' and trying to bring the system to some 'stable', dependable state, not necessary the original state.

It is known from many technical applications that one is able to construct dependable systems composed of components with less dependability. This is achieved by having several components which interact with one another and 'compensate' undesirable influences. This can be done by providing a 'compensation systems' (see Figure 4). The activation of the compensation system can be considered an intervention with respect to the original system.

For certain classes of system we can use G. Klir's classification of 'goal-oriented systems', see Figure 3 (Klir, 2001, chapter 10), but obviously these simple interaction diagrams are far from the reality a First Responder is confronted with.

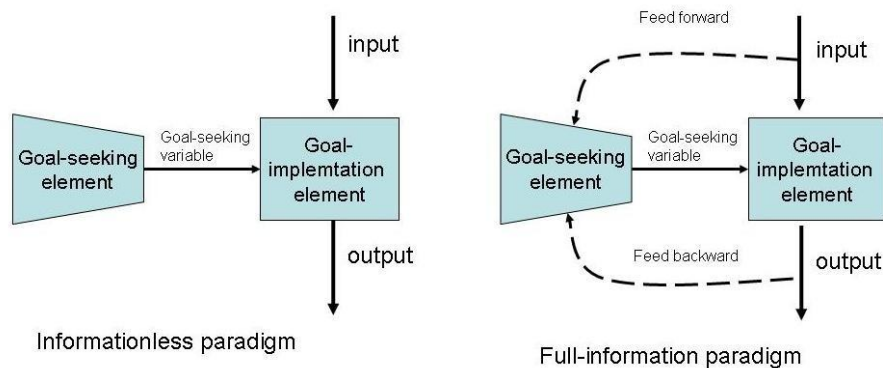


Figure 3: Goal-oriented systems (Klir, 2001, chapter 10)

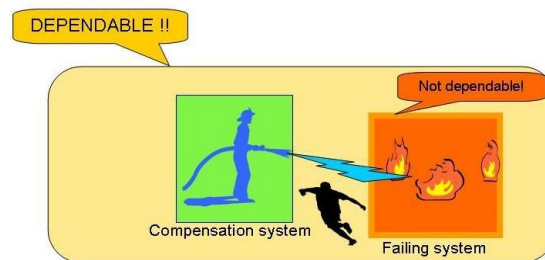


Figure 4: System with compensation system

From a systems point of view we have two systems: a *failing system* and in parallel a *compensation system*, see Figure 4. In this sense we can consider the actions of the First Responders in an emergency as a *compensation* subsystem attempting to reduce/eliminate the undesirable effects of the total system.

With respect to the interaction between the failing system and the compensation system we have to take into account that the failing system may be dynamic, changing over time. This time dependency can be internal (e.g. a chemical source or a house on fire changing its properties over time) and/or due to changes caused by the compensation system, e.g. by neutralizing the chemical substance or fighting the fire.

We can say that such a system exhibits *autopoiesis*: "The condition of a system able to regenerate itself by self-reproduction of its own elements and of the network of their characteristic

interactions" (Francois, 2004, p.52). Autopoiesis was introduced by Humberto Maturana: " ... there are systems that are defined as unities of networks of production of components that ... recursively, through their interaction, generate and realize the network that produces them; ... " (Maturana, 1981, p.21).

An outside stakeholder viewing the whole system might not be interested in how a system manages to achieve dependability. To a certain extent the judgment whether a system is autopoietic depends on what are considered the boundaries of the system.

In order to be successful in view of unknown problems, the Compensation System must be flexible and possess sufficient Requisite Variety. The term Variety was introduced by W. Ross Ashby to denote the count of the total number of states of a system. The condition for dynamic stability under perturbation (or input) was described by his Law of Requisite Variety (Wikipedia-e, keyword=variety (cybernetics)).

Given the variety of regional disasters we have to conclude that the compensation system must possess an equal or larger variety than the failing system (Law of Requisite Variety).

3.2. Compensation Systems in Regional Disasters

Compensation systems in regional disasters have different functions:

1. to minimize disaster damage: e.g. a fire brigade trying to minimize the damage of fire;
2. to save persons and property, e.g. by evacuation of people from flooded regions;
3. to maintain essential services (nutrition, hostage, transport) at least on a basic level: e.g. housing and nutrition for the people who have lost their houses due to the Fukushima disaster.
4. to repair/reconstruct damages, e.g. by pumping water out from a flooded cellar.

In this sense the term "compensation system" stands as an aggregation for several structurally different functionalities. They differ not only in function, but also in their urgency. Minimizing disaster damage and saving persons are usually the most urgent duties of First Responders, with a time-scope of minutes to hours after the outbreak of the disaster. To maintain essential services is a secondary issue, which comes typically after saving lives and property, with a time scope of hours to days. In the case of a big traffic accident in which a truck transporting some problematic chemical is involved, rescuing injured persons and salvaging/isolating the dangerous chemical are the most urgent tasks. Only after this being accomplished, the road is free for normal traffic to flow again. In case of longer-lasting destructions the maintenance of essential services is often provided just on a basic level: people having lost their homes are provided for "housing" with just a mat and a blanket in a tent or public hall (Tierney, 2001).

The repair/reconstruct aspect of damages due to disasters may be in the hand of First Responders or delayed: A cellar flooded by water is pumped out by the fire brigade immediately – if one can expect that the cellar will stay dry afterwards. Sometimes immediate repair is required for limiting the overall damage – as in the case of a leaking dam or pipeline. In many cases repair and reconstruction work lasts for months to years after the disaster, e.g. in the case of repairing transport services after earthquakes or floods. In some cases there is no repair at all, e.g. in the case of airplane crashes, sunk ships or the complete destructions of towns after heavy volcano eruptions – as in the famous case of the ancient towns of Pompeji and Herculaneum that have been completely destroyed after a tremendous outburst of the Vesuv volcano in 79 AD.

An important aspect for First Responders functioning properly is that such a “compensation system” is regionally grounded and autonomous in a sense that it may respond directly and informally to an emergency. It must be organized in a way that allows quick decisions and short ways of communications. Also the tools and technical equipment for first aid must be available ad locum in order to react quickly. A combination of flat hierarchies, short direct communication paths and self-organization is extremely useful for well functioning First Responders.

3.3. Interventions as Compensation Systems - Needs and Objectives

Since disasters have natural and societal components and many unknowns the compensation system must be - in order to provide the necessary Required Variety - also a social system: humans, but supported by technology. As a consequence the challenge for First Responders is to be able to provide the necessary Requisite variety for performing their tasks.

The key to interventions (First Responders!) are humans. This means that the ‘compensation system’ is a socio-technical system. It has to perform numerous activities to achieve its mission, i.e. it is a complex process, which consists of numerous individual processes. Major differences exist between technical Compensation Systems (cf. Figure 4) and First Responders’ interventions:

- The main objective of First Responders is not to bring the system back into its original state but into a state which is acceptable with respect to dependability, security, safety and well-being, at least until further rescue and compensations measures can be organized (see also (Tierneys, 2001)).
- In the case of an emergency usually many teams of First Responders with different methods from different locations and organizations with different (and unknown) knowledge, experience, and background participate.

In the case of an intervention it is also necessary to consider the future in two ways:

- Is the state the system after the intervention acceptable, at least for the near future until other means can be taken?
- Can one learn from the current situation and avoid/prevent future disasters by failure prevention?

4. Process View of Interventions

4.1. What is a Process?

An intervention is a highly complex undertaking. Reasons are the invisibility of dangers and the comparative newness of the challenges. A major step forward in the analysis of systems in business and also in software engineering (Humphrey, 1989) was the introduction of a process view (Chroust, 1996h). A process view, i.e. a view which concentrates on the whole process and its subprocesses to be performed has proven to be effective and helpful in many other complex undertaking like in business (Scheer, 1998b, Ould, 1995) and in software development (Humphrey, 1989, Wang, 2000). The more complex the task is, the more a process view is needed: "Industrial maturity demonstrates itself in the ability to abstract the development process from the specifics related to the production of the individual product. ..." This is also valid for intervention (replacing ‘development’ and ‘product’ by ‘intervention’, and ‘production’ by ‘performance’).

Simple processes like building a chair are usually learnt once and for all in apprenticeship, more complicated ones (e.g. assembling a cupboard from prefabricated parts or cooking an unknown dish) need guidance by a written, formalized description, i.e. a Process Model (Chroust, 1996). Using a process models is actually our daily routine: cooking recipes, instructions on how to operate the video recorder, the car, etc. are essentially process models describing (in more or less detail) a necessary process.

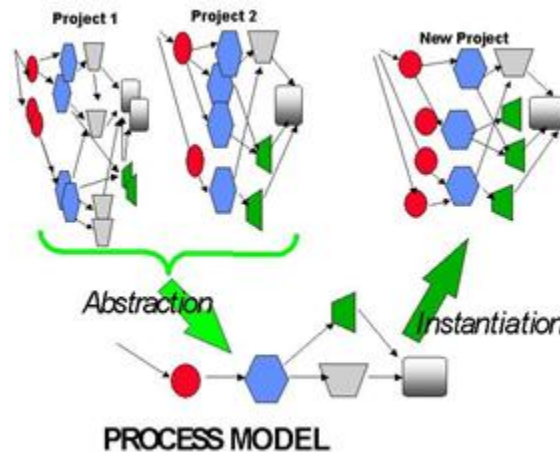


Figure 5: Process Abstraction and Instantiation

A process model is a concise, abstract description of the necessary activities based on the experience with past processes (Figure 5). This abstraction is not straight-forward, since it is necessary to decide which features of the past processes are considered essential and useful and what is considered ancillary. These features are collected in the process model to be used in future processes. It thus acts as a template for future processes, which are "instantiated" from it. Obviously one has to choose a compromise between too general a process description - covering all types of situations but lacking any specifics about an individual situation - and too narrow a description which cannot be applied to a large enough class of situations. For uniformity a standard description language is helpful, e.g. ISO/IEC TR 24774 (ISO24774). Obviously a process model has to provide enough flexibility and freedom to perform the intervention in such a way that one is able to react to unexpected and surprising situations and challenges (Tierney, 2001).

A process model offers numerous advantages:

- All processes, all subprocesses and their interaction can be identified and described to a certain depth.
- The whole intervention, from its very beginning to its (hopefully successful) end can be viewed, taught, and analyzed.
- The same process model can be applied to different interventions.
- One can "reason about the process", about advantages and disadvantages of certain methods and activities.
- One can gradually improve the process based on past experience (Wang, 2000) by adding newly detected process know-how to the process model to be utilized in future interventions.

4.2. Intervention Processes

Interventions by First Responders are processes which usually follow well-established process models. There are definite 'before' and 'after', activities supported by methods (e.g. how to approach a fire) and tool (pumps, ladders, ...). The difference is that the 'product,' if one may say so, is different. They produce a service, not a product (Ing, 2010, Spohrer, 2007, Thomas, 2010).

Following ISO/IEC 12207 (ISO12207, 2007) the processes to be enacted by the First Responders can roughly be classified into three essential categories (Chroust, 2009a, Chroust, 2009b):

Primary Intervention Processes: consist of processes that serve the primary purposes and goals of the intervention

Supporting Intervention Processes: consist of processes that support other processes as an integral part with a distinct purpose and contribute to the success and quality of the intervention.

Organizational Intervention Processes: consist of processes employed to establish and implement an underlying structure made up of associated processes and personnel by continuously improving the structure and processes.

4.3. Capability and Maturity of Processes

An important aspect of process view - especially in view of process models - is that one not only describes the processes to be performed. It is reasonable to ask "How good are the processes of an intervention?" In industry the primary interest is in product quality. It turns out, however, that for any product beyond a minimal sophistication (e.g. software) the quality of a product can only be ensured consistently by establishing and following a quality process. One of the early approaches was the standard ISO 9000. In the software industry, due to the non-physical nature of the products and the complexity of the development process soon further (de-facto and de-jure) standards of process descriptions appeared, of special interest for interventions is a standard for maintenance (ISO14764, 2006).

Once a process is formally defined in an organization, one can also assess how good the organization is for further interventions: What is the maturity of the organization, for details see (Humphrey, 1989) and the various assessment de-facto and de-jure standards, most prominent CMMI (Chrissis, 2006) and ISO 15504 (ISO15504-1, 2004). ISO 15504 characterizes the 'maturity level' of a process by creating a capability profile of the individual partial processes (Figure 6).

On the horizontal axis the processes (or process groups) of the intervention are listed, the vertical bar indicates the capability of the processes: from 'not performed' to 'fully performed and continuously improved'. A further step is the assessment of the *organizational maturity* which is concerned with the capability of an organization to maintain the quality of its processes.

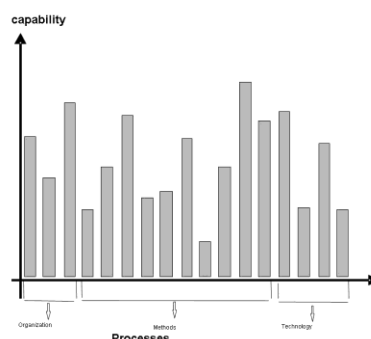


Figure 6: Capability profile

5. Organizational View of Interventions

5.1. Information and Communication

A key to a successful intervention is obviously the communication between First Responders, their command units, even across organizational boundaries. Coordination and team work cannot be achieved without communication.

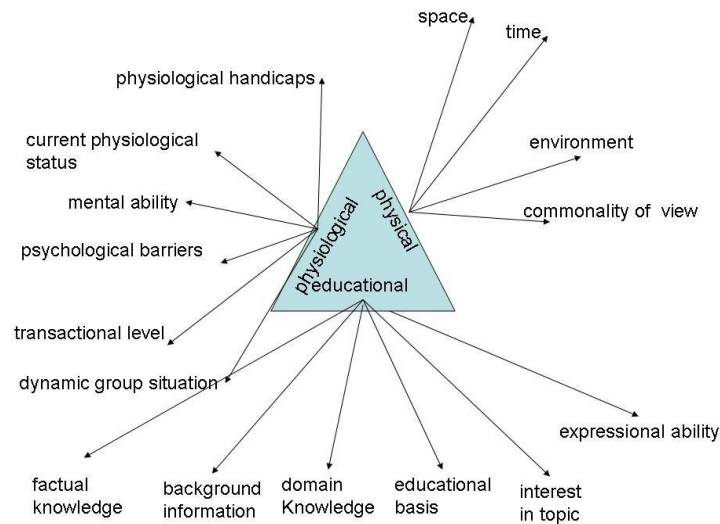


Figure 7: Dimension of gaps in Communication

In an actual intervention direct communication might be hampered or obstructed by physical (noise, smoke, visibility), physiological gaps (hard hearing ...), or cultural barriers (language, taboos, ...). Figure 7 sketches many different influences which potentially create gaps in communication. A fuller discussion can be found in (Chroust, 2008).

5.2. Invisible Dangers

Certain incidents, especially in which chemical, biological, radioactive, nuclear, or electrical causes are involved, often have considerably differing features as compared to other incidents (Chroust, 2009a). As a consequence the Intervention Systems might need a completely different approach from classical interventions and incidents. Some of the properties which have to be considered are:

- The immediately apparent symptoms will often not be indicative; some of the symptoms will emerge seemingly without any fore-warning.
- The dangerous material is in most cases a pollutant (Wikipedia-english, 2005, keyword=Hazardous-materials). It is usually kept in a container and more or less secured against spilling, evasion or harming the outside world.
- Involved materials are often of highly toxic. They often gravely endanger the rescuers, especially First Responders, who might be ignorant of the true cause and type of emergency.
- Some substances are prone to be distributed by meteorologic/geologic events or agents (e.g. wind, water, and weather).
- Sometimes emergencies are the result of a careless, negligent, or over-confident action (e.g. Chernobyl 1986).

- They could also be the result of malicious (e.g. terrorist) action, in which the source of the incident etc. is hidden, camouflaged etc.
- Many incidents arise from semi- or totally automatic plants (e.g. a chemical plant) when human minds do not interfere early enough or where the speed of the development overwhelms humans (e.g. Chernobyl).
- The critical incident could cause contamination of other persons and objects who/which themselves could become carriers of the same danger.
- Some of these emergencies endanger large areas and large populations with the danger of long- lasting consequences.

6. Human View of Interventions

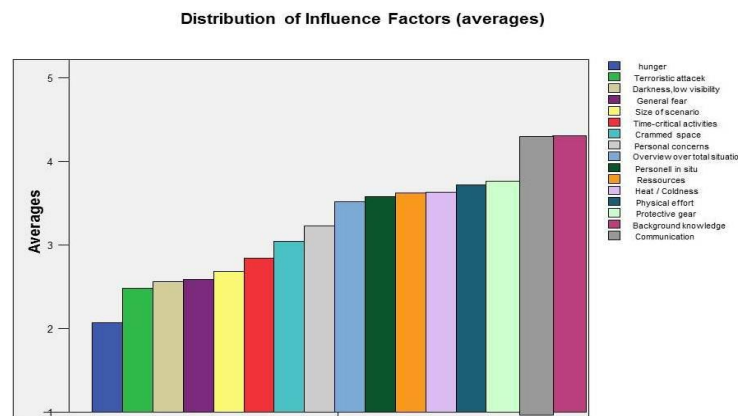


Figure 8: Factors influencing First Responders

6.1. Psychological and physiological Problems

With respect to the First Responders we can observe (Chroust, 2009a):

- Humans do not possess any inborn, natural sensors to recognize some types of dangers (e.g. chemical and radioactive threats) at all or early enough. They are not equipped with natural, semi-autonomous reaction patterns.
- They need to be equipped with special tools to recognize/distinguish the dangers and the real sources. Special training is needed in order to operate these tools appropriately.
- Hazardous material must be recognized (ability to understand labels and markings!).
- Well trained and experienced emergency personnel are a key for a successful intervention.
- Being a First Responder is a stressful experience for many reasons. A survey of influences on First Responders has shown the results as in Figure 8.

6.2. Training

In order to utilize available state-of-the-art tools adequate training is of high importance in order to operate the equipment, to make the correct interpretations of the results, to draw the correct conclusions, and to initiate the appropriate reactions.

It is necessary to obtain the required practice in handling tools, setting correct measures and assessing the situation and its potential dangers. Identification, design, validity and the training of appropriate behaviour must be identified so as to counteract the dangers of the emergency and the intervention. These Best Practices might be counter-intuitive and, if not well chosen, might negatively interfere with one another (again an area for validation).

Modern ICT can today provide training environments with simulated and mixed scenarios (Mixed and Augmented Reality) which are flexible and cost effective (Chroust, 2009a). Virtual Reality and Augmented Reality are one of the key means to achieve training success. Simulation is a highly useful training methodology especially when the training cannot be performed in real environments (Chroust, 2009a, Rainer, 2009, Sturm, 2009s). It is the explicit objective of the SIMRAD projects to utilize the modern technologies to a level of internal sophistication with simple handling externally so that it becomes available to all First Responders. A special advantage is the near-reality hands-on training, which is a key to sustainable learning.

One of the helpful concepts for training (Figure 9) is the substitution of some processes and some/all of the environment by simulated ones whereas other activities are executed in the real environment. Examples are the replacement of a dangerous source of contamination by a harmless one, e.g. an ultrasonic generator, or the body of a victim by a projected image, etc., or virtual colleagues in a field exercise etc.



Figure 9: Process substitution

With this modifications one aims amongst other advantages for a wide range of scalability for training situations. Many of the simulation tools can also be used during a real assignment for planning the next steps, for the assessment of the situations and the effectiveness of different measures taken, e.g. by provision of what-if-analysis, time-series-estimates, sandbox-like support, etc. TheSimRad projects ("Simulation- and Information System to manage Rescue units") aim at creating the foundations for satisfying the current training needs for practice oriented simulation and a communication framework for First Responders in emergencies (Chroust et al., 2008, 2009b).

7. Summary

In this paper we have taken different systemic view of interventions in regional disasters: as a compensation system, a process view, an organizational view and a human view. Understanding of each of these views – having different emphasis – contributes to a holistic view of interventions and will hopefully help improving interventions for all stakeholders.

Acknowledgement

The work reported was funded by project "KIRAS PL3:SimRad.COMP "Simulations- und Informationssystem zum Administrieren von Hilfeinheiten bei Katastrophen - Erforschung von Systemkomponenten zur Überprüfung der Einsatztauglichkeit der SimRad Technologie" Project

number 818784 from Oktober 2009 of "Sicherheitsforschungs- Förderprogramm KIRAS", Austrian Federal Ministry for Transport, Innovation and Technology (BMVIT).

8. References

- Beer, S. *The Heart of Enterprise* John Wiley, London and New York. 1979, reprinted, 1988.
- Chrissis, M. B., M. Konrad , S. Shrum *CMMI: Guidelines for Process Integration and Product Improvement* SEI Series in Software Engineering, Addison-Wesley Longman, Amsterdam 2006, 978- 0321279675.
- Chroust, G. What is a Software Process? G. Chroust (ed.): *Special Issue on ESPITI (European Software Process Improvement Training Initiative, J. of Systems Architecture* vol. 42(1996) no. 8, pp. 591–600.
- Francois, C. *International Encyclopedia of Systems and Cybernetics* 2nd edition, 2 volumes, K.G.Saur, München 2004, 3-598-11630-6.
- Chroust, G., S. Schönhacker, K. Rainer, M. Roth , P. Ziehesberger *Training and Supporting First Responders by Mixed Reality Environments in: 53rd Annual Conference - The International Society for the Systems Sciences " Making Liveable, Sustainable Systems Unremarkable"*, pp. 18 *The International Society for the Systems Sciences 2009 (CDROM)*, July 2009, paper no. 2009-1248-Chroust, ISBN 978-1-906740-02-3.
- Chroust, G., S. Schönhacker, K. Rainer, M. Roth , P. Ziehesberger *Dependable Systems, Emergency Interventions, and Organizational Processes in: DOUCEK, P., G. CHROUST , V. OSKRDAL, (eds.): IDIMT 2009 -System and Humans - A Complex Relationship*, pp. 279–287 *Trauner Verlag Linz*, 2009, ISBN 978-3-85499-624-8.
- Humphrey, W.S. *Managing the Software Process* Addison-Wesley Reading Mass. 1989.
- Ing, D. et. al. *Team 2: The Science of Service Systems in: CHROUST, G. , G. METCALF, (eds.): Systems for Education, Engineering, Service, and Sustainability - Fifteenth IFSR Conversation*, pp. 16–22, , *Johannes Kepler University Linz, Austria, SEA-SR-28*, August 2010, 3-902457-28-8.
- ISO/IEC ISO/IEC 12207:2007 *Systems and Software engineering - Software Life Cycle Processes Techn. Report , Internat. Org. for Standarization, ISO (2007)*.
- ISO/IEC ISO/IEC 14764:2006 *Software Engineering – Software Life Cycle Processes – Maintenance Techn. Report , ISO/IEC, 2006*.
- ISO/IEC ISO/IEC 15504-1:2004 *Information Technology - Process Assessment - Part 1: Concepts and Vocabulary Techn. Report , ISO/IEC JTC 1/SC 7/WG 10, 2004*.
- ISO/IEC ISO/IEC TR 24774:2010: *Systems and software engineering – Life cycle management – Guidelines for process description Techn. Report , International Organization for Standardization (2007)*.
- Klir, G. J. *Facets of Systems Science* 2nd ed., IFSR Internat. Series on Systems Science and Engineering, vol 15, Kluwer Academic/Plenum Publ, New York, Boston, ... 2001, 0-306-46623-6.
- Maturana, H. *Autopoiesis in: ZELENY, M., (ed.): Autopoiesis, a theory of living organization* North Holland, 1981.
- Mrotzek, M. *Catastrophe Dynamics*. University of Klagenfurt. Dissertation Thesis, 2009
- Ould, M.A *Business Processes* Wiley, Chicester 1995.
- Rainer, K., N. Sturm, S. Schönhacker , G. Chroust *SimRad.NBC - Simulation and information system for Rescue units at CBRN-disasters in: G.A., PAPADOPOULOS , C. BADICA, (eds.): Intelligent Distributed Computing III*, pp. 297–303 *Springer Lecture Notes* vol. 237, Berlin, Heidelberg 2009, ISBN 978-3-642-03213-4.
- Scheer, A.W. *ARIS - Vom Geschäftsprozeß zum Anwendungssystem* Springer Berlin 1998, 3-540-63835-9.
- Spohrer, J., P. P. Maglio, H. Bailey , D. Gruhl *Steps Toward a Science of Service Systems* *Computer* 40, no. 1 (January 2007), pp. 71–77.
- Sturm, N., K. Rainer, G. Chroust , M. Roth *Simulation as a New Approach to First Responders Training in: Computational Intelligence, Modelling and Simulation, International Conference on*, vol. 0, pp. 159–163, Los Alamitos, CA, USA *IEEE Computer Society* 2009, ISBN 978-0-7695-3795-5.
- Thomas, O., K. Leyking , M. Scheid *Serviceorientierte Vorgehensmodelle: Überblick, Klassifikation und Vergleich* *Informatik-Spektrum* vol. 33 (2010), no. 4, pp. 363–379.

A Systemic View of Interventions in Regional Disasters

Tierney, K., Lindell, M., and Perry, R. Facing the Unexpected - Disaster Preparedness and Response in the United States. Josef Henry Press, Washington DC, SA 2001.

Wang, Y. , G. King Software Engineering Processes CRC Press 2000, Florida, 0-8493-2366- 5.

Wikipedia-English Wikipedia, the free encyclopedia <http://en.wikipedia.org/wiki/>.

RISK MANAGEMENT AS AN PROACTIVE TOOL FOR DISASTER (AND OTHER LOSS EVENTS) MANAGEMENT

Vlasta Svatá

Department of System Analysis
Faculty of Informatics and Statistics
University of Economics, Prague
svata@vse.cz

Abstract

There are many drivers forcing Public Bodies to either implement Business Continuity Plans (BCP) or to re-visit existing plans to ensure they are still relevant. However, it has to be accepted that Business Continuity Management (BCM) will have a cost, both in terms of time and money. To meet the joint requirements of focusing plans to ensure they are relevant to the most likely events and to maximize investment it is recommended that organizations adopt a structured risk analysis and management process. The adoption of such a process will provide an organization with the confidence that it's BCP has considered all the relevant risks.

This paper provides an analytic survey of the risk management tools with the special impact on business and IT continuity management.

Keywords

Business Risk Management, IT Risk Management, Business Impact Analysis, Business Continuity Management, IT Continuity Management, Business Continuity Plan, Disaster Recovery Plan

1. Introduction

The headlines related to both the financial crisis and environmental disasters highlighted that significant risk failures persist despite the investments in the risk assessment and the risk management disciplines. While isolated incidents of one-time governance failures are reduced, the long-term systemic failures are more than just an isolated anomaly. Various experts and professional organizations dealing with the risk management came to the conclusion that the failures may be caused by an upset in the risk information due to the different risk assessments from the different perspectives (McCaig, 2008, p.3).

Looking into the history, companies have been managing risk for years. The field of risk management emerged in the mid-1970s, evolving from the older field of insurance management. The term risk management was adopted because the new field has a much wider focus than simply insurance management. Risk management includes activities and responsibilities out-side of the general insurance domain. Insurance management focused on protecting companies from natural disasters and basic kinds of exposures, such as fire, theft, and employee injuries. More recently, companies have managed risk through the capital markets with „ derivative instruments“ that

help them manage the movements in currencies, interest rates, commodity prices and equities. From a practical point of view, all of these risks have been reasonably easy to measure, as they relate to financial transactions.

Later on risk management focused on these kinds of risks as well as other kinds of costly losses, including those stemming from product liability, employment practices, environmental degradation, accounting compliance, offshore outsourcing, and information technology. Therefore risk management grew into vital part of company planning and strategy in the 1980s and 1990s and risk management became integrated with more and more company functions. The field has become known as enterprise risk management (ERM). ERM includes crucial risks such as reputation, day-to-day operational procedure, supply chain, legal and human resources management, financial and other controls related to the Sarbanes-Oxley Act of 2002 (SOX), and overall governance.

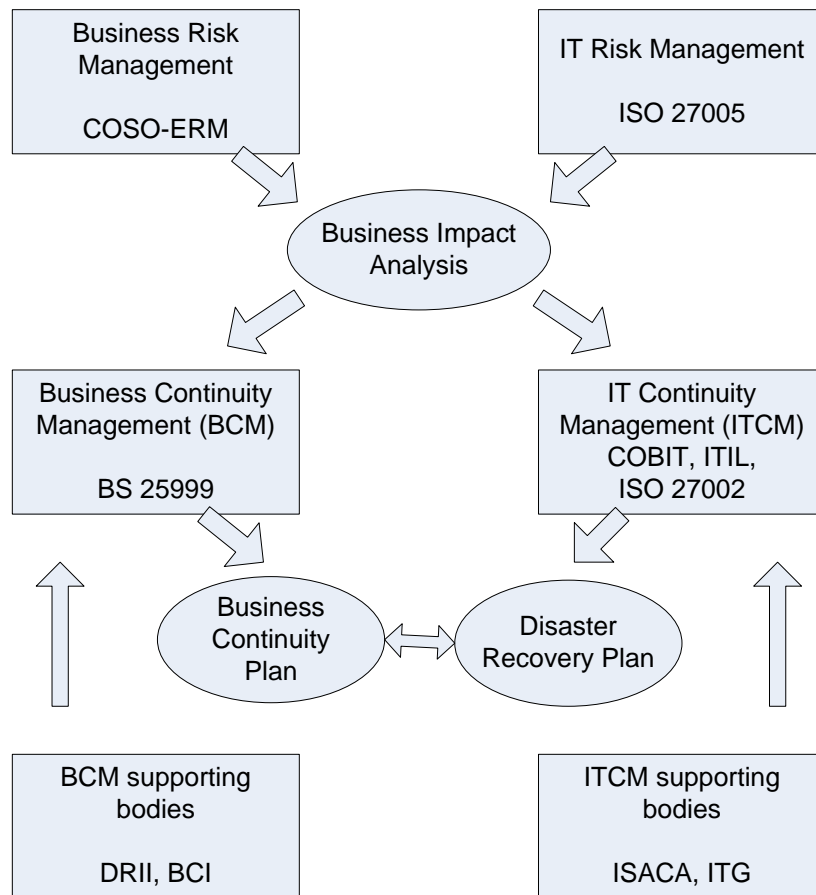


Figure 1: The core parts of Business Continuity Management and their mutual relationships

In the same time the growing importance of information systems and information technology (IT) resulted in the emergence of the new risk management discipline – IT risk management. Both the business risk management (ERM) and IT risk management can be provided for different purposes. But in each case there is a need to be able to assess the value of different risks on business processes. This is provided by the help of Business Impact Analysis (BIA).

Risk management together with BIA is an inherent part of the continuity management. Continuity management in general represents “the strategic and tactical capability of the organization to plan for and respond to incidents and business disruptions in order to continue business operations at an acceptable predefined level.” (Bird, 2011, p. 7). The important outputs of continuity management are Business Continuity Plans (BCP) and Disaster Recovery Plans (DRP).

BCM is thus an umbrella which covers the whole set of different activities and documents. Except the BCP and DRP they can be crisis management, supply chain, etc.

BS 25999-1 (2009, p.6) defines “BCP is documented collection of procedures and information that is developed, compiled and maintained in readiness for use in an incident to enable an organization to continue to deliver its critical activities at an acceptable predefined level”. The definition of DRP varies as the views over this document differ. There exist three basic opinions:

- The first maintains that DRP and BCP have more or less the same meaning and the labeling difference has its roots in evolution. The older name DRP was substituted by the more advanced one – BCP.
- The second views DRP as the part of the BCP that focuses upon recovery from, principally, physical disasters.
- The third one declares that BCP should look at how to recover the business and DRP is about recovering IT infrastructure. This is mentioned not only in some of the blogs but also some of the institutes preach the same.

Above mentioned procedures and tools should be formalized and standardized in order to communicate and share the best practices and standards within this area. Therefore there exist international bodies aiming this topic. See Figure 1 to understand all the items, related standards and their relationships. Next chapters provide the more detailed view over them.

2. Risk Management Issues

ISACA (2009, p.102) specifies ERM as the discipline “ by which an enterprise in any industry assesses, controls, exploits, finances and monitors risks from all sources for the purpose of increasing the enterprise’s short- and long-term value to its stakeholders”. Another relevant document COSO (2004, p. 2) defines “ERM is a process, effected by an entity’s board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives”.

There exist different components of the enterprise risk universe, as shown in Figure 2.

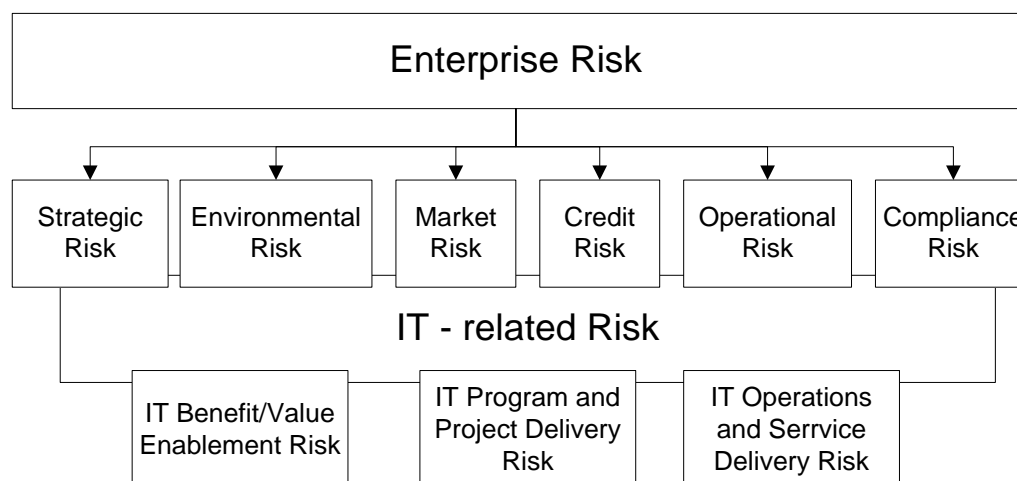


Figure 2: Types of enterprise risk (ISACA (2009, p. 11))

The different risk assurance frameworks deals with the next core components: strategic risk, environmental risk, market risk, credit risk, operational risk and compliance risk. Information systems and/or information technology (IT-related) risk has entirely exceptional role within each organization. IS/IT deals with the data/ information processing and as such managing IS/IT risk we are reducing the likelihood of “low quality” information. In the same time we are improving the quality of business processes, as information is the core part of each business process. Based on this assumption we can conclude that there is no need to make difference between the enterprise (business risk) and IS/IT risk. According to ITGI (2009, p.11), “IT risk is business risk – specifically, the business risk associated with the use, ownership, operation, involvement, influence and adoption of IT within an enterprise. The business value and IT risk are two sides of the same coin and risk is inherent to all enterprises”⁶. So there is the need to manage all the risks. But going through the frameworks, tools and documents dealing with risk and related continuity management, we came to the conclusion, that there is still gap between the “business” and “IT” area.

The Business Impact Analysis (BIA) is the fundamental building-block for both the risk management and continuity management. It is a whole-of-business analysis that identifies critical resources and functions and the timeframes in which these must be restored following a disruption. This then allows realistic consideration of Business Recovery Strategies. An impact analysis results in the differentiation between critical (urgent) and non-critical (non-urgent) organization functions/processes. A function/process may be considered critical if the implications for stakeholders of damage to the organization are regarded as unacceptable. It may also be considered critical if dictated by law. Setting the barrier between the „acceptable“ and „non acceptable“ risks it is recommended to provide two parameters:

- Risk appetite is the broad-based amount of risk a company or other entity is willing to accept in pursuit of its mission.
- Risk tolerance is the acceptable variation relative to the achievement of an objective (and often is best measured in the same units as those used to measure the related objective).

The main output of BIA is the recovery requirements for each critical function/process. Recovery requirements consist of the following information:

- The business requirements for recovery of the critical function (business portion of the recovery), and/or
- The technical requirements for recovery of the critical function (IT portion of the recovery).

After defining recovery requirements it is recommended to integrate them with the potential risks (threats) by the help of the risk scenarios. Risk scenario is a technique by which the different relevant and important risks are identified and their impact on business activities is assessed. This technique can be provided via two different mechanisms:

- A top-down approach, where one starts from the overall business objectives and related critical business activities (see output of the BIA),
- A bottom up approach, where a list of generic scenarios is used to define a set of more concrete and customized scenarios, applied to the individual enterprise situation.

⁶ Sometimes IT risk is considered to be component of the operational risk mainly in the financial industry in the Basel II Framework.

3. Risk management frameworks

The risk management is conducted by many groups within an organization to fulfill a variety of business and regulatory requirements. The various groups within the same organization often rely on the guidance from different professional organizations to provide a framework for conducting the risk assessment. As these professional organizations offer disparate approaches to the risk assessment they contribute to the jungle of risk information.

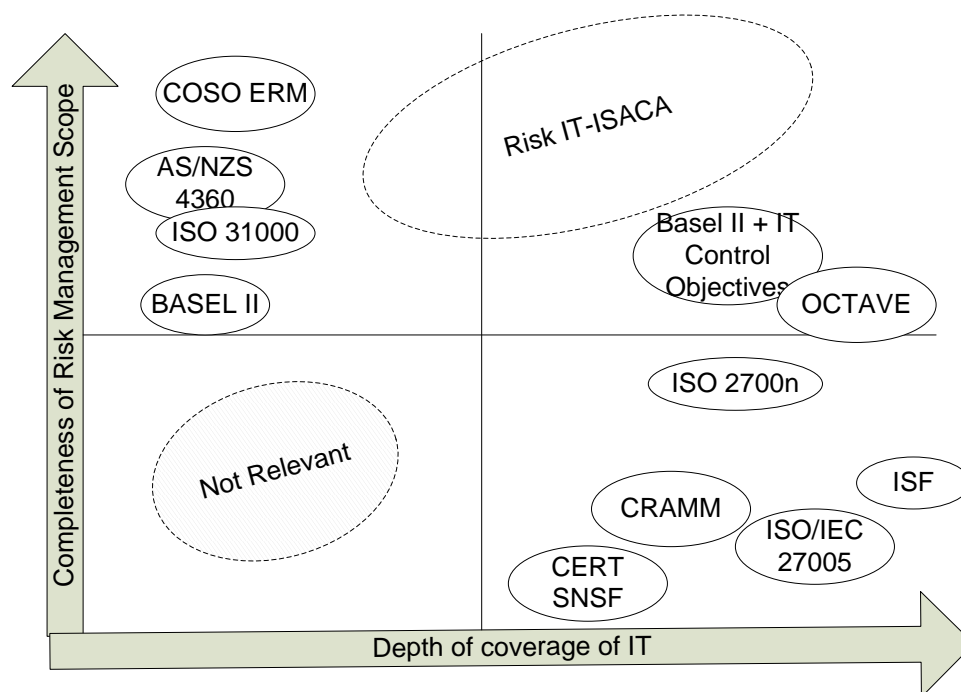


Figure 3: Risk management frameworks (ISACA, RISK IT, 2009, p. 12)

Different types of risk assessment frameworks are shown in the Figure 3. Their positioning within the axis X – Depth of coverage of IT and axis Y – Completeness of risk management scope can help us to understand both their relevance to IT/IS area and the level of commonness in the understanding the phenomenon of risk. We can summarize, that there exist the whole range of different frameworks dealing with the risk assessment, but these regulations either are too generic to be applicable for the IT risk management or although they deal with the IS/IT risk management, they are narrowing this area to the IT security risk management. The area named “Risk IT- ISACA” refers the only methodology Risk IT which complements ISACA’s COBIT. It provides a comprehensive framework for the control and governance of business-driven, IT based solutions and services and thus attempts to bridge the gap between the business risks oriented frameworks and IT security risk management frameworks⁷.

⁷ For the more detailed description of the different risk management frameworks see (Svatá, 2011).

4. Business Continuity Management Frameworks

Some research on the web and a visit to some of the popular business continuity sites can help us in building a little database (which is obviously not exhaustive). Displaying the number of documents on a time axis (based on date of first publication) led to the following diagram (Figure 4).

In the period 2000-2003, industry specific bodies (such as Business Continuity Institute - BCI and Disaster Recovery Institute International - DRII) published their initial good practices and guides, which acted as a catalyst for other organizations. Amongst these we can find documents DRII PP⁸ - professional practices, or BCI GPG⁹).

In the period 2004-2008, the growth in the number of documents can find its origin in the publication of sector-specific guidelines/requirements (with the finance sector clearly leading the way) and the publication of some initial national standards, some of which are standards against which third party certification is possible

In the period 2007-2009, we can notice a great boom which was accelerated by the introduction of the international ISO standard on business continuity management (e.g. ISO/PAS 22399:2007). To the end of this period, the first standards regulating the BCM audit has been introduced (e.g. NFPA¹⁰ 1600 Business Continuity Management Audit Process).

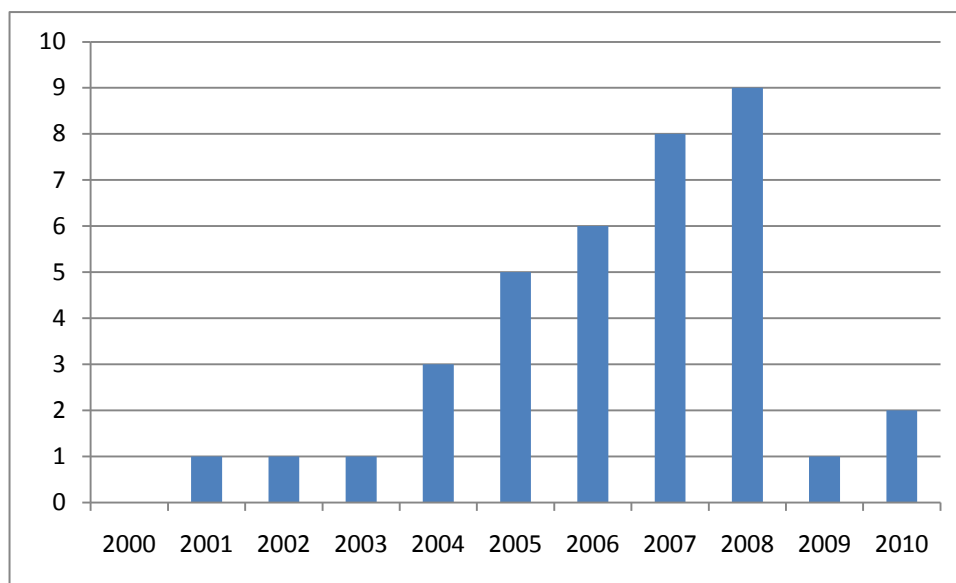


Figure 1: The evolution of the number of BCM documents (Verlinden, 2010)

Currently the world's first standard for business continuity management is BS 25999. It was produced by the British Standards Institution (BSI).

BS 25999 has two parts:

- The first, "BS 25999-1:2006 Business Continuity Management. Code of Practice", takes the form of general guidance and seeks to establish processes, principles and terminology for Business Continuity Management.

⁸ Profesional Practices

⁹ guides, principles, circulars, regulatory requirements and others

¹⁰ NFPA – National Fire Protection Association

- The second, "BS 25999-2:2007 Specification for Business Continuity Management", specifies requirements for implementing, operating and improving a documented Business Continuity Management System (BCMS), describing only requirements that can be objectively and independently audited¹¹.

5. IT Continuity Management Frameworks

Comparing the situation in the number and types of frameworks on BCM the similar situation is in IT Continuity Management (ITCM) area. There exist the whole set of different standards, best practices and methodologies.

The relevant representative of the ISO norm is ISO/IEC 24762:2008 'Information technology - Security techniques - Guidelines for information and communications technology disaster recovery services. It provides guidelines on the provision of information and communications technology disaster recovery (ICT DR) services as part of business continuity management, applicable to both "in-house" and "outsourced" ICT DR service providers of physical facilities and services.

Next example is ISO/IEC 27002: 2005, which is not primarily focused on ITCM, but on Information security Systems Management (ISMS). It includes eleven sections and within the each section information security controls and their objectives are specified. One of the sections (A14) is devoted to Business Continuity Management.

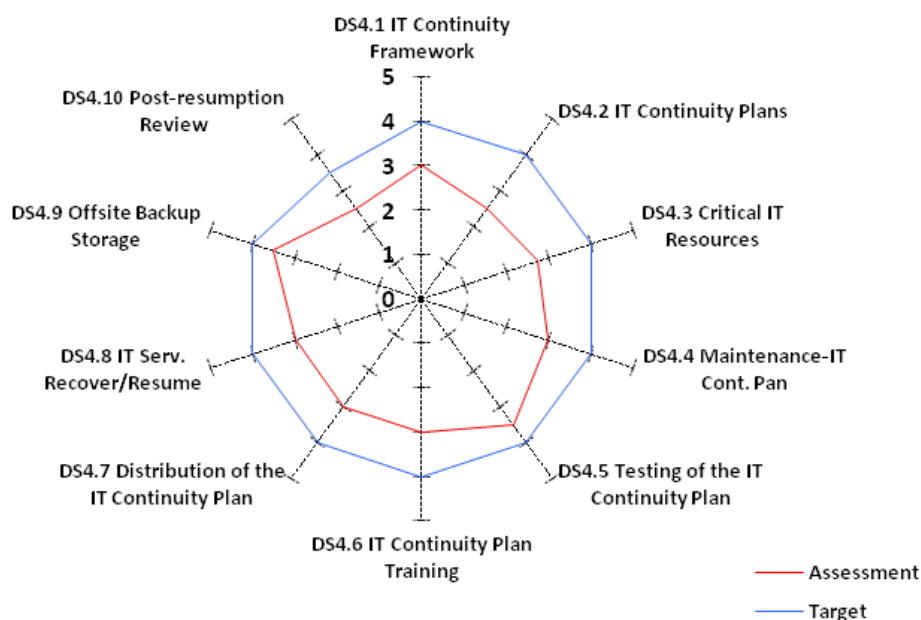


Figure 2: Assessment Maturity vs. Target Maturity (ISACA, 2009, p. 36)¹²

Two representatives of internationally accepted IT management frameworks are COBIT and ITIL. Both of them are process oriented and one of the identified processes deals with the IT Service Continuity Management. In COBIT there we can find this process in the Delivery and Support

¹¹ According to various sources, the BS 25999-2 will be replaced by an international standard ISO 22301 by the end of 2011.

¹² The peaks of the graph represent the control objectives of the COBIT DS4 process ((DS4.1 – DS4.10))

domain. It is named DS4 – Ensure Continuous Service. In ITIL the process DS 4.5 IT Service Continuity Management is part of the Service Design book.

To be exhaustive we should add information about the documents supporting the audit / assurance processes within the IT service continuity management. The best representative is ISACA's document IT Continuity Audit/Assurance Program. This document is part of the IT Assurance Framework (ITAF). In general ITAF provides standards that are designed to be mandatory, and are the guiding principles under which the IT audit and assurance profession operates.

IT Continuity Audit/Assurance Program describes in detail the separate Audit/Assurance Steps and together with COBIT process DS4 helps auditors and assurance professionals to assess the maturity of the defined control objectives of the process. Figure 5 represents the likely output of such an assessment.

6. Conclusions

Enterprises today must meet many different events, incidents and disasters. They must be prepared for them and implement the whole set of different both the preventive and reactive controls. But owing to the politic and financial situation those controls must be effective and efficient as much as possible. To attain this goal is not an easy job. Therefore there exist the whole set of different standards, document, procedures, etc. helping organizations to establish processes, principles and tools of risk management, business continuity management and IT continuity management. This article attempts to provide a short survey of them.

7. References

- Andrew Hiles Business Continuity: Best Practices (2nd Edition), ISBN: 1931332223
- Baas Stephan, (2008), Selvaraju Ramasamy , Jenny Dey DePryck , Federica Battista, Disaster Risk Management systems Analysis, A guide book, Rome
- Bird Lyndon , (2011) BCI, Dictionary of Business Continuity Management Terms, <http://www.thebci.org/Glossary.pdf>
- BS 25999-1 (2009), Business continuity management – Part : Code of practice
- COSO, (2004), Enterprise Risk Management - Integrated Framework, Executive Summary
- ERNST&YOUNG (2009), Risk convergence: The Future State of Governance, Risk, and Control,
- ISACA (2009), IT Continuity Planning Audit/Assurance Program, ISBN 978-1-60420-079-9
- ISACA, Risk IT Framework, (2009), ISBN 978-1-60420-111-6
- ISO 27005:2008 – Information Security – Security Techniques – Information security risk management
- Jon William Toigo, Disaster Recovery Planning (3rd Edition), ISBN: 0130462829
- M. Stimson, (2005) Principal Consultant, VEGA Group PLC, Risk Management as Part of the Business, white paper,
- McCaig Bruce, (2008) Fundamentals of GRC: Mastering Risk Assessment, White Paper, Thomson Reuters,
- Schulman R. (2004), Disaster Recovery Issues and Solutions A White Paper, http://www.hds.com/assets/pdf/wp_117_02_disaster_recovery.pdf
- Svatá V., Fleischmann, M., (2011), IS/IT Risk Management in Banking Industry, Acta Oeconomica Pragensia, 3/11
- Verlinden W. (2010), A short tour of business continuity management standards, <http://www.continuitycentral.com/feature0742.html>

PROCESS SIMULATIONS IN EMERGENCY SITUATIONS IN THE CZECH HOSPITALS

Klára Antlová, Michal Tvrzník

Department of Informatics

Faculty of Economics

Technical University of Liberec

klara.antlova@tul.cz, michal.tvrznik@tul.cz

Abstract

This article presents a discussion of the methodological approaches used in various contexts of the emergency and common situations based on the process management in hospitals. The article also presents the results of the research about using the process management in forty hospitals in the Czech Republic. The data of the survey has been collected by structured interviews with hospital managers. At the end of the article, the case study is demonstrating the investigation of process management approach with the real data obtained during the faculty research: Student's Grant Project. The case study approach was employed to examine the exchange of performance related information in a key time information critical service.

Keywords

Process Management, Process Simulation, BPMN, Data Mining, Crises Management, Business Intelligence, Emergence

1. Introduction

Hospitals are under pressure to be prepared for emergencies and disasters and to quickly react to changing situations, especially when the conditions in hospitals are substantially different from a classic corporate environment (Zákon o krizovém řízení, 2000, The Health Care Criteria, 2004) for the reasons of political influences. In hospitals the managers are searching for responses to the following key questions:

- How to improve the processes?
- How to assess the processes?
- How the processes could be more flexible?
- How to simulate the processes?
- How to be prepared for a crisis situation?

One of the ways how to increase the flexibility of the processes is to use modern tools which allow the simulation of the processes. Nowadays there is a trend to look at organizations from their processes and to improve the flexibility of organizations through them. A review of the literature (Šmída, 2007, Ministr, 2010, Karagiannis, 2002) suggests that although the term “process management” is increasingly being used in everyday business language, the practical experience

especially in hospitals is very limited. The emergency response requires information sharing, including the time-critical nature of emergency services and the need for timely information in a form that can be trusted and used by emergency responders (Arens & Rosenbloom, 2002; Dawes, Cressell, & Cahan, 2004; Sawyer, Tapia, Pesheck, & Davenport, 2004; Turoff, Chumer, Van de Walle, & Yao, 2004). Effective and timely service depends upon all participating organizations working cooperatively and utilizing information technology effectively (Mayer-Schonberger, 2003).

During the last decades the process management has been applied in many business or production enterprises but still Gartner expects that business process management (BPM) will grow. Also Gartner research identifies business process analysis as an important aspect and not just in manufacturing industry but also in services. Structural changes and the ability to be able to react to the emergency and different disasters in the health care sector intensify the need of simulation and process optimization. The hospitals and health care facilities are the new emerging areas, they are very important elements in the crisis situations and therefore we have focused our research on the health care services.

Business Product Management (the BPM) tools are appropriate solution in this kind of situations, because they allow high-quality analysis elaboration and - as a side effect - give valuable information to management of the organization. Additionally these tools can help to simulate the different changes during emergency and disasters.

Information about processes is in information systems. These records log types of events that occur during the process execution, including the start and completion time of each activity, its input and output data, the resource that executed it, etc. Also any failure that occurred during activity or process execution is recorded. Data in warehouses are cleaned, aggregated and analyzed by Business Intelligence technologies. It is very important that with these methods it is possible to explain why for instance low-quality executions occurred in the past and to predict potential problems in running processes or to predict some exceptional situations.

2. Data collection

Next step of the research was focused on a narrow group of ICT tools, which are designed for the modeling process and used in hospital facilities. These tools can be used by the management and medical staff as a sophisticated auxiliary tool. The research aims to identify the satisfaction with the currently used ICT tools in various medical facilities throughout the Czech Republic. Results indicate that 85% of healthcare facilities use some form of information system. Data were collected through a structured questionnaire in 40 hospitals. The questionnaire was distributed in the spring of 2011 to determine the use of information systems in hospitals and the use of process management.

One of the most important questions in the questionnaire, which caused further research in this area, was about using process modeling. This question emerged from previous research conducted last year and the issue is mainly associated with the individual management methods of hospitals. Especially in the health care there is a problem with the need of implementing the specific modeling supported by ICT.

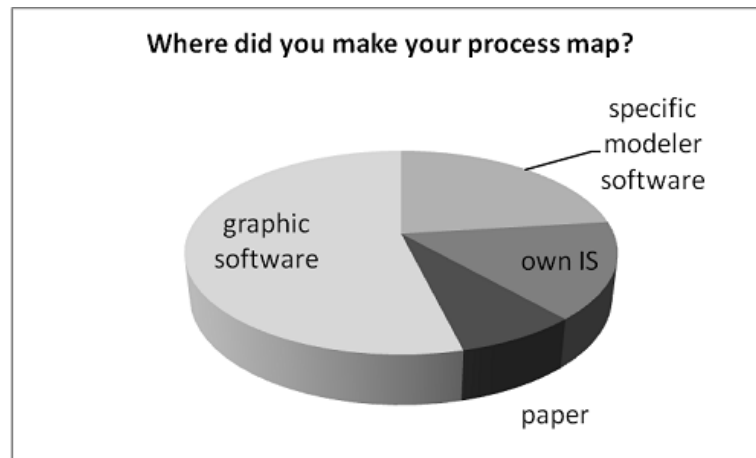


Figure 1: Process mapping tool

As shown in the Figures 1 and 2, the ratio between hospitals managed by process modeling and without differs.

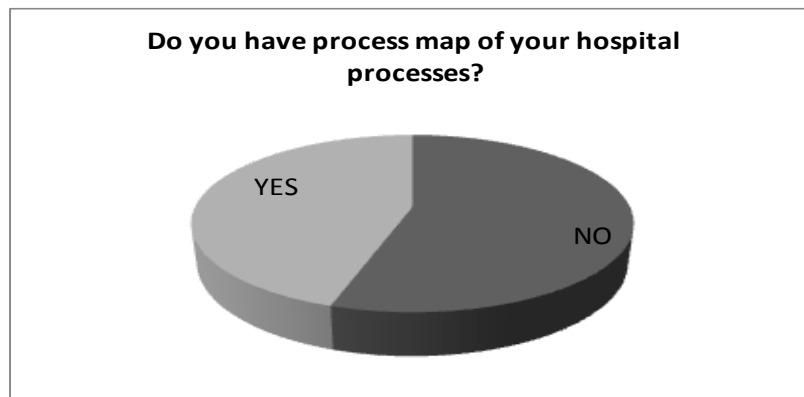


Figure 2: Using of process mapping

3. Business Process Management

Business process management (BPM) is a part of management focused on business processes in organizations. It is set of methods, tools and technologies used to design, analyze, and control operational business processes. (Garimella, Lees, Williams, 2008). BPM is collaboration between business people and information technologists to foster effective, agile, and transparent business processes. BPM directly promotes increased process effectiveness through the adaptive automation and coordination of people, information and systems. BPM can be used to understand organizations through expanded views that would not otherwise be available to organize and present.

BPM is closely related to the concept of workflow. (Russell, Hofstede, 2006). The workflow is a pattern of activity enabled by a systematic organization of resources, defined roles and mass, energy and information flows, into a work process that can be documented and learned.

3.1. BPM modeling software

There is a lot of software designed for Business Process Management (BPM). In the case study the BizAgiProcess Modeler was used. This software is very intuitive and quite simple. In process

management it is necessary to define, implement and automate business processes. Therefore the software has these components:

- **Process:** Main notation and views the information, activities and instructions required to automate a business process as a procedure. In Designer, the main component of a procedure is one or more maps, but it may also contain other components such as forms or roles.
- **Mapping:** There can be illustrations of the various steps required to complete a specific business process (the lifecycle of a folder). Each instance of the business process is called a folder, and the steps are called stages and actions.
- **Box of folder:** A new instance of the business process is initiated and added to a new folder. A folder contains one or more tabs/forms of information relating to that instance of the process. This information may come from users (through forms), databases or other applications
- **Stage:** a specific state of the business process. When a folder reaches user's desktop, BPM views the folder as having reached a stage in the procedure. A map may also contain various system stages that do not require human interaction to move the folder to the next stage.
- **Action:** This action shows how the process moves from one stage to another. Actions may include activities such as: filling out a form, logging a telephone call, reviewing an attached file, or approving or denying a request.
- **Form:** forms are used to gather and display information necessary to perform a business process.
- **Role:** Participants in a procedure have specific roles assigned to them based on either their individual or group responsibilities. Assignments within a procedure are made based on these role designations.

3.2. Hospital process management

The main part of hospital process management has to be focused on process maps. These maps are very important for easy viewing of the processes which are conducted in hospitals. We are asking

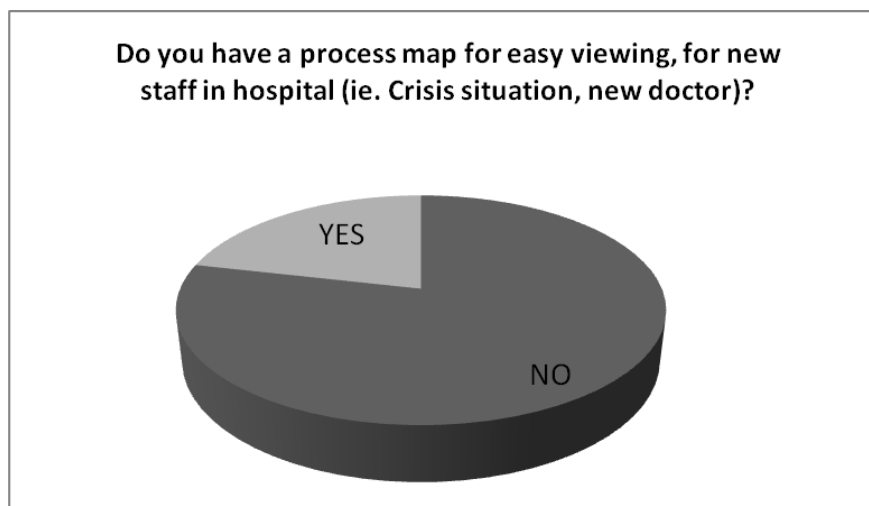


Figure 3: Process map using

for this in our questionnaire (Figure 3). The picture provides a quick view of the operating principle of the process, enabling to check suitability for example in dealing with crisis situations. When a foreign doctor joins the processes which he has not yet done, it is necessary to have a clear and valid map of the process that he shall perform. So in order to recognize what is the procedure of the operation in the hospital, for this illustrative view, it is advantageous to use a graphical notation BPM that uses icons and images graphically depicting the process, which is followed by another route (Figure 4). The research results show that only very few devices use process maps that can be easily read and used in crisis situation or for new employees without having to provide complex training.

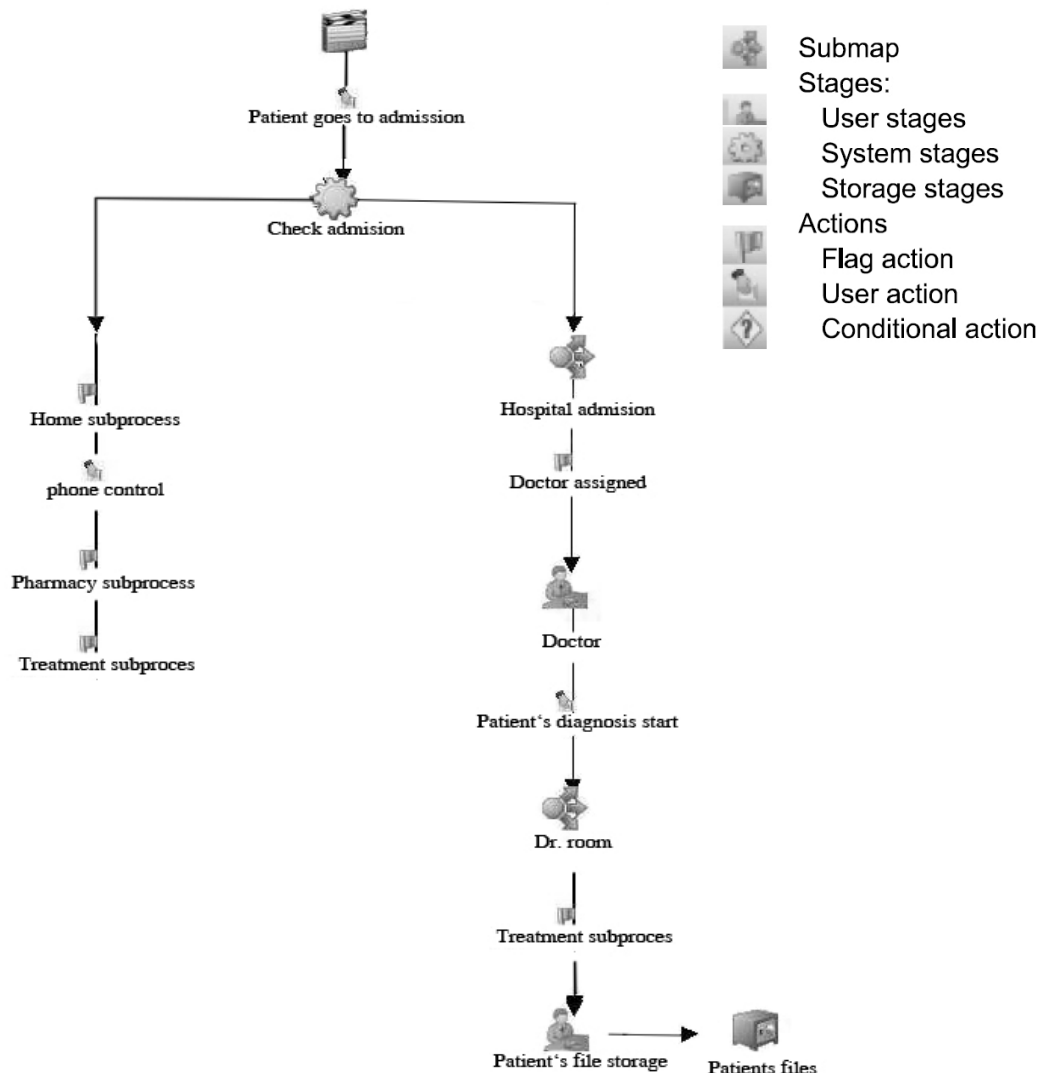


Figure 4: Process of Patient Admission

Each process definition includes in fact several maps. The basic main map allows the information to be transferred along the whole process and includes some submaps. These submaps correspond to sub-processes that are specified by means of the so-called “sub-procedure stage” relational components. In this manner, in the chronic disease management process (Figure 4), the following submaps have been used: Admission in Figure 4 (and further specified in Figure 5 for illustration purposes), Dr Room, Nursery (which in turn is a subprocess of Dr Room), Pharmacy, Treatment, and Home. Initially, patients enter the hospital and ask for an appointment in the admission office.

If everything goes right, it will be assigned and the patient will move to the doctor's room. From this subprocess, the flow returns to the main map and, if required, the patient will move to the pharmacy to buy some medicines or to the treatment sub-process (which ends when the nurse finishes treating the patient). In any case the flow will return to the main flow. All subprocesses end with an action that corresponds to the storage of the patient's file.

4. BPMN notation

Business Process Modeling Notation (BPMN) is a graphical notation (a set of graphical objects and rules under which they may be associated with another one), which is used to process modeling. Behind its creation there is an initiative BPMI (Business Process Management Initiative), whose primary objective in this case is a notation that will be read by all participants in the life cycle process (business analysts, technical developers, analysts, monitoring processes, etc.). BPMN has successfully managed to reduce the communication gap between the design and implementation process and with dozens of tools that use it, and it has become the de facto standard for process modeling.

BPMI has another objective which is a notation that will be on one hand, simple to understand and use, and on the other hand, offers the possibility to model complex business processes. It was important also to define the conversion between the design process in BPMN and its implementation in BPEL (Business Process Execution Language), BPML (Business Process Modeling Language), or any other language for running processes. BPMN defines how to transform individual elements and sequences of these elements in the BPEL language. It is therefore possible (manually) to transfer the process model into an executable form. With relative freedom in the BPMN model it is not possible to automatically generate BPEL and BPMS (Business Process Management System).

Level 1:	Enterprise Activities (Eas). On this level the process model is quite simple. Model describes basic principle of business activities and illustrates process maps including also the organizations diagrams.
Level 2:	Essential Core Activities (ECAs). This level brings basic core processes which are the most important in companies.
Level 3:	Primary Core Activities (PCAs). This level explains in detail how the primary core activities are composed.
Level 4:	Elemental Process Activities (EPAs). This is the most detailed model of processes. All processes are in detail described on the level of working steps.

Table 1: Levels of process diagrams

BPMN defines a single chart called the Business Process Diagram (BPD). This flow diagram (see Table 1) has four levels and consists of graphical objects, in particular activities and views on the information flow between them. Individual graphics are very well differentiated from each other, which contributes to the clarity of the diagram. It gives clearly the shapes of these objects which are observed and it is possible for them to choose their own colors. In certain cases, you can use in your own chart and graphics, but it has not duplicated any existing object and would not affect the flow of the process itself, it merely clarifies or provides any additional information.

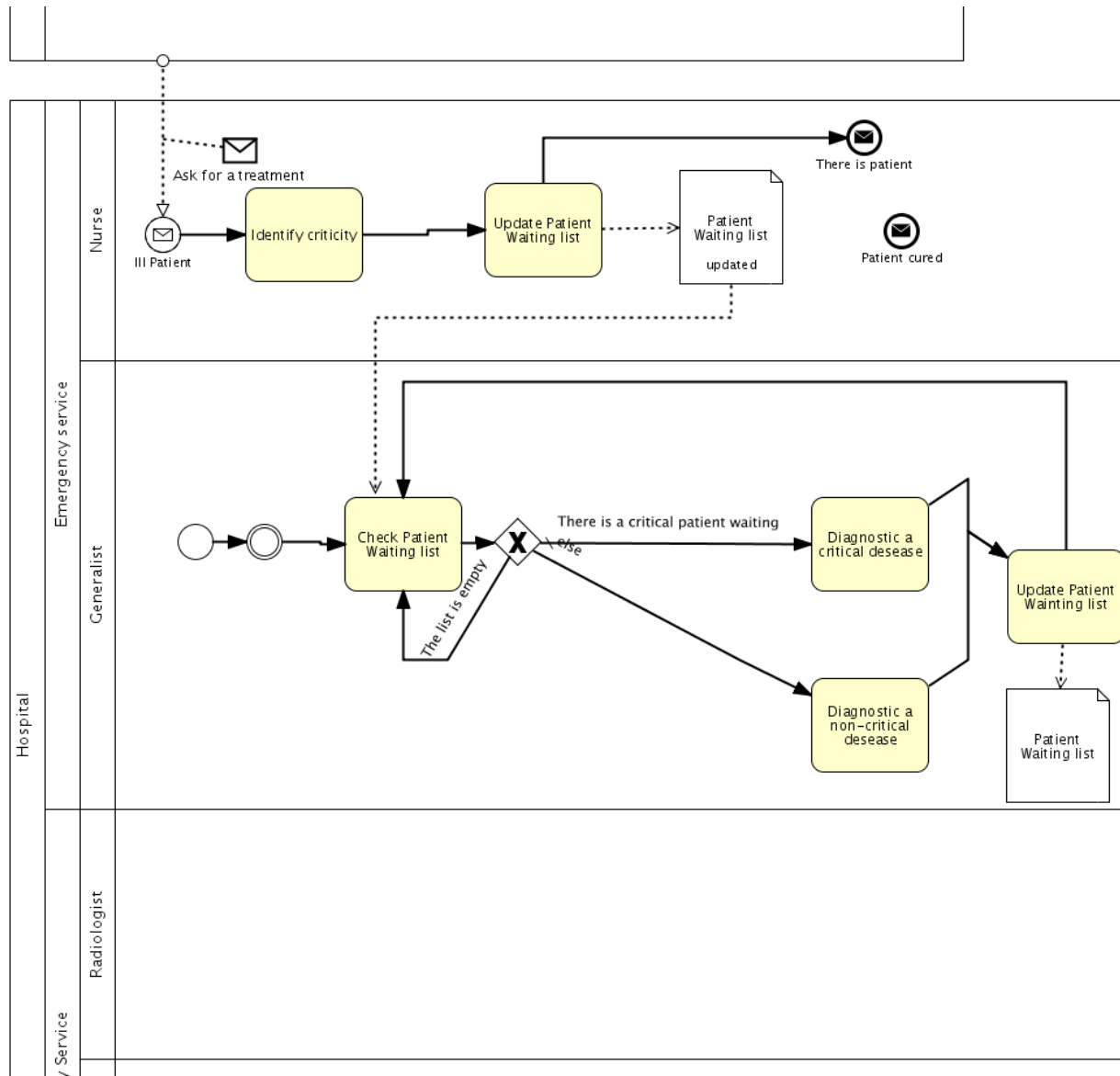


Figure 5: Subprocess of Admission

5. Conclusion

The case study illustrates promising factors that can enhance information sharing across hospitals, improve the need for timely information in a form that can be trusted and used by emergency responders. Effective and timely service depends upon all participants in hospitals working cooperatively and utilizing technology effectively. When the processes are transparent, they can be in the next step improved, optimized (matured according to the Capability Maturity Model) and later also simulated in different emergency situations.

Future research will aim to design the conceptual framework for time critical information services. It will enable information sharing, including operational, organizational and governance factors as timeliness and quality as key performance metrics. Other objectives include the draft of a separate graphical notation that would be appropriately applied in health care and could be easily used for process planning, crisis situation and preview maps.

6. References

- Arens, Y., & Rosenbloom, P. (2002). Responding to the unexpected. Report of the Workshop. New York, NY.
- Casati, F., Intelligent Process Data Warehouse for HPPM 5.0, HP Labs Technical Report HPL-2002-120, 2002. <<http://www.hpl.hp.com>>.
- Dawes, S., Cressell, A., & Cahan, B. (2004). Learning from crisis: Lessons in human and information infrastructure from the World Trade Center response. *Social Science Computer Review*, 22(1), 52–66.
- Fiala, J., Ministr, J., (2003). Průvodce analýzou a modelováním procesů. 1. vyd. Ostrava VŠB-Technická univerzita, 2003. 110 s. ISBN 80-248-0500-6.
- Gartner Research Process analysis (2009). <<http://www.gartner.com/2009/>>
- Garimella, K.K., Lees, M.J., Williams, D. (2008). BPM Basic. 1st ed. Hoboken: Wiley Publishing, 2008. 64 p. ISBN 978-0-470-28571-8
- The Health Care Criteria (2004). <http://www.nist.gov/baldrige/publications/archive/upload/2004/HealthCare_Criteria_pdf>.
- Karagiannis D., Kühn H.: Metamodelling Platforms. (2002). Bauknecht, Min Tjoa, A; Quichmayer G., (Eds.): Proceedings of the Third International Conference EC-Web 2002 – Dexa 2002, Aix-en-Provence, France, Springer, Berlin, Heidelberg, p182.
- Mayer-Schonberger (2003). Emergency communications: The quest for interoperability in the United States and Europe. In A. Howitt, & R. Pangi (Eds.), Countering terrorism: Dimensions of preparedness. Cambridge, MA:MIT Press.
- Leymann, F., Roller, D., (200). Production Workflow, Prentice-Hall, Englewood Cliffs, 2000.
- Russell.N, Hofstede, A. and Edmond, D. (2005). Work-flow Resource Patterns: Identification, Representation and Tool Support , Proceedings of the 17th Conference on Advanced Information Systems Engineering (CAiSE05).
- Sawyer, S., Tapia, A., Pesheck, L., & Davenport, J. (2004). Mobility and the first responder. *Communications of the ACM*, 47(3), 61–64.
- Skrbek, J., Kvíz, J. (2010). Critical Areas of Early Warning System, 2010, Information Technology – Human Values, Innovation and Economy, 18th Interdisciplinary Information and Management Talks, Jindřichův Hradec.
- Šmída F. (2007). Zavádění a rozvoj procesního řízení ve firmě. Praha, Grada Publishing, a.s., 2007, 300 s. ISBN 978-80-247-1679-4.
- Štefko, M., Ministr, J. (2010). Human Resources Requirments for Professional Management of ITSCM Process, IDIMT 2010, Information Technology – Human Values, Innovation and Economy, 18th Interdisciplinary Information and Management Talks, Jindřichův Hradec
- Turoff, M., Chumer, M., Van de Walle, B., & Yao, X. (2004). The Design of a Dynamic Emergency Response Management Information System (DERMIS). *Journal of Information Technology Theory and Application*
- Vašíček, P. (2008). Úvod do BPMN. BPM prakticky [online]. <<http://bpm-sme.blogspot.com/2008/03/3-uvod-do-bpmn.html>>. ISSN 1802-5676.
- Voříšek, J. (2002). Strategické řízení informačního systému a systémová integrace. Praha Management Press, 2002. 322 s. ISBN 80-85943-40-9
- Řepa, V. (2006). Podnikové procesy: Procesní řízení a modelování. Grada Publishing, a.s., Praha, 2006. 268 s. ISBN 80-247-1281-4.
- Zákon o zdravotních službách (2000). Krizové řízení 240/2000 Sb.

EFFECTIVE NOTIFICATION OF CIVILIANS OF REGIONAL EMERGENCIES – ILLUSION OR REALITY?

Jan Skrbek

Department of Informatics
Faculty of Economics
Technical University of Liberec
jan.skrbek@tul.cz

Abstract

Modern communications technologies provide continually updated news about worldwide crises, disasters and tragedies. The common aspect of the most disasters is the incapability of standard communication channels to inform people in time and in right place. The contribution that continue on papers (Skrbek, 2009) and (Skrbek & Kvíz, 2010) of previous IGIP conferences, will describe current trends of notification of civilians in situations like crisis, nature disasters, chain crashes on motorways etc. It critically evaluates the KATWARN system (introduced in Germany), based on new generation of mobile phones. The KATWARN capabilities are compared with the original Radio-Help system of warning and notification.

Keywords

Communication, Emergency, Crisis, Information, Distribution, Radio-Help, KATWARN

1. Introduction

On March 11 a massive earthquake occurred near Japan, created extremely destructive tsunami waves which hit Japan just minutes after the earthquake. Millions of people were affected by lack of electricity, water, transportation and - information. A month after the earthquake the number of crash victims raised above 27 thousand people. On the TV and Internet we watched practically on-line the big tragedy. For many people on movies (especially driving their cars or watching tsunami from bridges) that were last seconds of their lives. They really got – in Japan - no warning information?

Japan has the most advanced earthquake early-warning system in the world. A nationwide online system launched in 2007, it detects tremors, calculates an earthquake's epicenter and sends out brief warnings from its 1,000-plus seismographs scattered throughout the country, one of the most earthquake-prone nations on the planet. (Birmingham, 2011)

Similar situation in smaller dimension took place in Liberec region in August 2010. A massive flash floods killed people, destroyed homes and livelihoods. Some 2,000 people were evacuated during the disaster, which destroyed two water treatment plants and dozens of homes. Many roads and bridges were damaged or made impassable by the floodwaters, and several rail lines were forced to close. The center of the town of Frýdlant was covered in 1.5 meters of water. The cost of the damage caused were in excess of 7 billion Kč (280 million EUR).

Almost 5,000 homes were without either electricity or gas supply for more than three days. More than 200 people have to be evacuated by helicopters... Why did people not leave their homes in time? Why did they not get the urgent information that the level of the water will dramatically rise in minutes?

Czech TV on the channel CT24 permanently informed about situation by live broadcast from floods areas, by running commentary of experts, politicians and representatives of regional government and rescue services. The TV organized a floods-facebook, which was full of videos and comments. Despite of these activities many people had to be evacuated by helicopters... The problem was that one of the first affects of a spate is a total electric black-out. Radios, TVs, Internet as well as mobile phones were shut down. The radio and TV broadcasting and Internet were available to listen, watch and use far away from floods. In Liberec region as well as later in Japan were not available systems or REAL notification of emergency. Current early warning systems were evidently used, but they did not affect all potential victims. Is there a way to improve it? (Skrbek, 2010)

All these emergency situations have character of very high complex problems. It does mean that they are influenced by many factors and their impact on environment includes many different factors to. In order to solve problems with high complexity is necessary to apply system approach principles. Different aspects of these principals are presented for example in (Doucek, 2010).

2. Communication as a tool of Emergency management

“A disaster is an event concentrated in time and space, in which a society or one of its subdivisions undergoes physical harm, and social disruption, such that all or some essential functions of the society or subdivisions are impaired.” (Rodríguez at all., 2007)

Society has a basic interest of ensuring its environment to behave like a dependable system (exhibiting safety, reliability, or survivability, etc.). This implies the necessity of preventing, eliminating or at least mitigating the negative impacts of disasters in order to safeguard or re-establish dependability as fast as possible. (Chroust, Finlayson, 2011).

Communications has become an increasingly critical function in emergency management. The dissemination of timely and accurate information to the general public, elected and community officials, and the media plays a major role in the effective management of disaster response and recovery activities. Communicating preparedness, prevention, and mitigation information promotes actions that reduce the risk of future disasters. (Haddow, Bullock & Coppola 2010)

Today's information and communication technologies provide the means for improving prevention and recovery in many different ways (Chroust, Finlayson, 2011):

- applying disaster prediction methods,
- providing adequate information on the status-quo and on best-practices fast and reliably by fault-tolerant communication means,
- establishing support logistics,
- simulating and optimizing interventions by tactical guidance, prediction and forethought planning,
- realistic training environments.

Effective disaster communications strategy has to provide timely and accurate information to the public in all four phases of emergency management (Haddow, Bullock & Coppola, 2010.):

1. Mitigation - to promote implementation of strategies, technologies, and actions that will reduce the loss of lives and property in future disasters.
2. Preparedness - to communicate preparedness messages that encourages and educates the public in anticipation of disaster events.
3. Response - to provide to the public notification, warning, evacuation, and situation reports on an ongoing disaster.
4. Recovery - to provide individuals and communities affected by a disaster with information on how to register for and receive disaster relief.

As planning proceeds for a disaster information network, these important goals should be pursued:

- improve decision making before, during and after emergencies through better access to a quality of data and information,
- identify users and their needs,
- promote efficiency and cost effectiveness,
- stimulate and facilitate mitigation.

To contribute to the well-being of the community following a disaster by ensuring the dissemination of information that (1) is timely, accurate, consistent, and easy to understand and (2) explains what people can expect from their government.

The provision of timely and accurate information directly to the public and the media is critical to the success of any response and recovery effort. An effective communications strategy allows emergency managers and community officials at all levels of government to provide information and comfort to disaster victims and, at the same time, manage expectations. Regular communications with the public and the media helps ensure that accurate information is being disseminated and reduces the chances for misinformation and rumors. Monitoring direct communications with victims and media reports helps identify potential problems with misinformation and rumors and allows emergency officials to address these issues before they become too widespread and damaging. (Haddow, Bullock & Coppola, 2010)

3. KATWARN as a possible solution?

Risk communication theory (Coppola & Maloney, 2009) is based on the assumption that people leave themselves vulnerable because they are uninformed or unconvinced about the consequences of their actions. Providing accurate, helpful information would change people's beliefs about a hazard and lead to an adoption of appropriate mitigation strategies. This is a bit of an oversimplification, because many other factors and obstacles are involved, but it illustrates the general principle.

At the beginning of March the Czech TV informed about KATWARN (Catastrophe Warning) - new German early warning system, designed in the Fraunhofer Institute for Software and Systems Engineering. The core idea of KATWARN is that people can only be protected from dangerous situations, extreme weather and forest fires if they are alerted at the right time at the right place. The role of it is to amend and broaden possibilities and efficiency of warning systems.

KATWARN employs various warning channels in order to reach people potentially or real affected by disasters: They base on classical warning channels like e-mail, text messages and fax. Additionally to the conventional interaction channels for instance the phone or radio, different

warning technologies are in addition being checked. These alarms operate freely of the power grid and like fire alarms, they might emit sound and light signals, however they might in addition send out language and text signals to issue warnings in ultimate situations — even where different systems have already not succeeded. In particular for warning older people (slower reaction, taking naps by the TV), special flashes for the TV set will be compiled, which univocally draw an attention to dangers and give instructions that supply a clear notice of potential dangers and tell what's to be done. (KATWARN, 2011)

Warning devices are being distributed and installed in public as well as private buildings. “Those devices are independent from the power supply and like fire detectors they are able to emit audio-, light-, speech- or text-signals. Therefore, they are able to issue warnings even in cases in which other systems had already failed.” The KATWARN would also create a large collection of parallel items of information that might interfere with each other. It could be also possible to integrate into the system nets of automatic sensors – e.g. of rain, wind, floods, earthquake, tsunami etc.

The system employs color-marked warning thresholds: The threshold values can be adapted to the occurrences – it is crucial that the concerned persons can evaluate the potential for danger immediately on the basis of a simple color scale and are able to act accordingly. The warnings are being issued and disseminated by a warning editorial department in the control center. The system will initially issue warnings by postal code; later on it will be able to adjust it on street or geo-coordinates level.

This system converts information needs of users into requests. Afterwards, the requests are being structured and processed by special components: The so called »Content Broker« provides the required contents, the »Locator« makes available the location of concerned persons or the object observed and the »Timer« determines the time of delivery. Via the component »Presentation Producer« all pieces of information for each end device are being processed and sent to the users. (KATWARN, 2011)

The KATWARN officially started at September, 21st 2010 in Aurich, Germany and is tested – in a limited mode (SMS and e-mail) - in East Friesland (Germany). The KATWARN represents very complex solution of distribution of warning information in right time to right place. As was mentioned above, currently the main communication channel of the KATWARN system is the mobile phone and e-mails. Its positioning system is currently based on postal codes. The complexity of the KATWARN system brings also some disadvantages. To the main of them e.g. belongs that people will learn to use the system in different ways as will be real situations of disasters and emergencies. The presented applications are based on the functionalities of mobile networks and Internet in affected areas.

As was described in (Skrbek, 2009), irrespective of the applied technical solution, the system of information services for crisis, disasters and unexpected emergencies must fulfill following requirements:

- system has to be available to every citizen,
- system has to be accessible everywhere,
- system has to be independent of the functionality of mobile networks and internet,
- system has to be independent of functionality of the electric power network
- system has to be very simple to use.

KATWARN does not fully fulfill these aspects. Mobile phones can be switched off in cases like terrorist attacks etc. A well known example of an inoperability of mobile networks was e.g. the

situation during terrorist attack in London transport at July 7th, 2005. The mobile networks were not switched off but they collapsed due overloading of communication traffic (LONDON REGIONAL RESILIENCE FORUM, 2006).

One of the first “affects” of floods is not only a black-out of electricity, but mostly a drop-out of communication cells. This situation happened in the Czech Republic not only in 2010 but also by previous floods, especially in 2002 and 2009. The current early warning systems in the Czech Republic (as well as in most European states) are designed to work independent of electricity in defined limited mode for 72 hours. What would be after this time?

4. Radio-Help as a potential way

In 2008 was firstly published information about an original Czech system of Radio-Help (Skrbek 2008). The crucial idea of a Radio-Help was to design and create a system that fully respects five main requirements for crisis and disasters communication mentioned above. During following years the system was precisely defined and designed also for additional applications. Finally it was presented to responsible institutions and persons in the Czech Republic (e.g. the Fire Rescue Services of the Czech Republic and the Czech Radio). By the principle the system is less complex than KATWARN, but simply and fully covers all potential situations for address crisis communication even in cases when KATWARN will be not workable (longer black-out of electricity, destruction or collapse of mobile network, switching-off the Internet, forced radio silence etc.).

As was described in (Skrbek, 2009), the core task of the Radio-Help project was to find an appropriate technology for targeted one-way communication. In other words – it was necessary to define two main components of a radio-broadcasting system, sender and receiver, based on current transmitting protocols and technologies.

The main requirements defined for a sender are as follows:

- single sender has to cover a large region (optimally the state),
- sender must be able to use secure and safe dedicated frequency (under the state/military control),
- sender has to be able to broadcast not only sound, but also identification codes for receivers,
- broadcasting content must be under responsible control.

For these communications it is possible to apply the existing, well proven, technology of HD Radio or DRM Radio. HD Radio is a digital radio standard developed by iBiquity Digital and recognized by the U.S. Federal Communications Commission. HD Radio technology is a system used by to digitally transmit audio and data in conjunction with their analog signals (a hybridized digital-analog signal). On the broadcast end, audio is digitally compressed and broadcast by a transmitter designed specifically for HD Radio broadcasting. Audio is also transmitted in its analog form, as usual. The radio station sends out the analog and digital signals on the same broadcast frequency, along with the signals for the digital data. On the listener end, the signals are received and decoded. An HD Radio tuner picks up the digital radio transmission with its accompanying digital signal (mostly text information). Today, there are more than 2,100 stations only in the USA using this standard of broadcasting (iBiquity, 2011).

DRM (Digital Radio Mondiale) is a set of digital audio broadcasting technologies designed to work over the bands currently used for AM broadcasting. The encoding and decoding can be performed

with digital signal processing, so that a cheap embedded computer with a conventional transmitter and receiver can perform the rather complex encoding and decoding. As a digital medium, DRM can transmit other data besides the audio channels (data casting) — like RDS-type metadata. Both of these systems are based on the analog broadcasting with a superposition of digital signal (Skrbek, 2009). With HD Radio technology, broadcasters can use the current radio spectrum to transmit free analog simultaneously with digital sound signals. It is surely possible to superimpose any kind of digital data – e.g. the position code-word of aimed area of forced receiving. For the initial purposes the Radio-Help could be possible to test at current RDS broadcasting systems.

The crucial point of the Radio-Help system is the receiver - „Personal Communication Terminal“. In principle it could be a HD Radio receiver that is integrated into wide-spread personal equipment, e.g. a mobile phone, but is independent and fully separated from its hardware and software. The recipient of any crisis communication would only hear sound from his/her own mobile-phone. The PCT could also be recharged by internal or external mechanical boost of the battery.

The PCT is equipped with a position system (GPS and/or Galileo) that generates position codes. The sender of Radio-Help digitally broadcasts during initiation of a warning transmission an identification code for the targeted area (i.e. the position code). The PCT continually checks the position code of the Radio-Help sender and activates itself for receiving the broadcast transmission only with matching of the received position code and Galileo/GPS position code of receiver (mobile phone). If position codes of PCT and broadcasting sequence do not match, no forced receiving (no sound) is activated. If internal and receiving codes match, the system automatically switches the receiver on for receiving of crisis information. The only thing required to upgrade a current mobile phone (with GPS) into a PCT is an addition of one chip (Radio-Help receiver and comparator) to a mobile phone system.

5. Technology of the Radio-Help in traffic applications

Radio-Help offers to design and realize a wide number of position based useful services. Smart traffic applications of Radio-Help (Radio Traffic Terminals) could dramatically improve the security of participants of road traffic. The crucial role especially in minimizing of chain crashes plays the early warning system of traffic accidents.

Information about serious traffic accidents are currently provided by a number of independent channels. The radio traffic broadcasting, RDS-TMC, information on the motorway gates etc. have one common feature – too long delay. The most danger situations on the roads by car crashes are immediately after such accidents. There is currently no information channel to inform drivers about accidents in distances of hundred meters of it.

A Radio Traffic Terminal is a Radio-Help based device receiving information through one unique communication channel. It provides a forced voice session, activated only in a particular geographical area thus delivering warning messages only to the relevant recipients. In practice, we may be able to provide a road user, depending on his/her current position and travel direction, with automated information on a danger ahead (traffic accident) almost immediately. In the case of emergency the appropriate information (e.g. from the smart road systems) could be automatically (real-time) broadcasted to the area near the place of an accident.

The real-time information about the position of a car accident will would be automatically broadcasted for Radio Traffic Terminals to the area of the road close to the car accident. Such system practically allows eliminating chain crashes.

Distribution of warning messages is described on the Figure 1. National Traffic Information Centre obtains the information about critical point on the road that significantly cut or eliminates traffic. Real danger could be a car accident, glazed frost, falling of the tree, petrol on the road etc. NTIC define the space in which car drivers have to be informed about a problem. Through the GIS system is generated position code that foregoes the warning report. The position code activates the forced receiving of the Radio-Help system, if the car is inside the space of warning. If the Radio-Help receiver is integrated with the navigation system, is additionally possible to define, if the vehicle approaches or departs the point of the accident or obstruction.

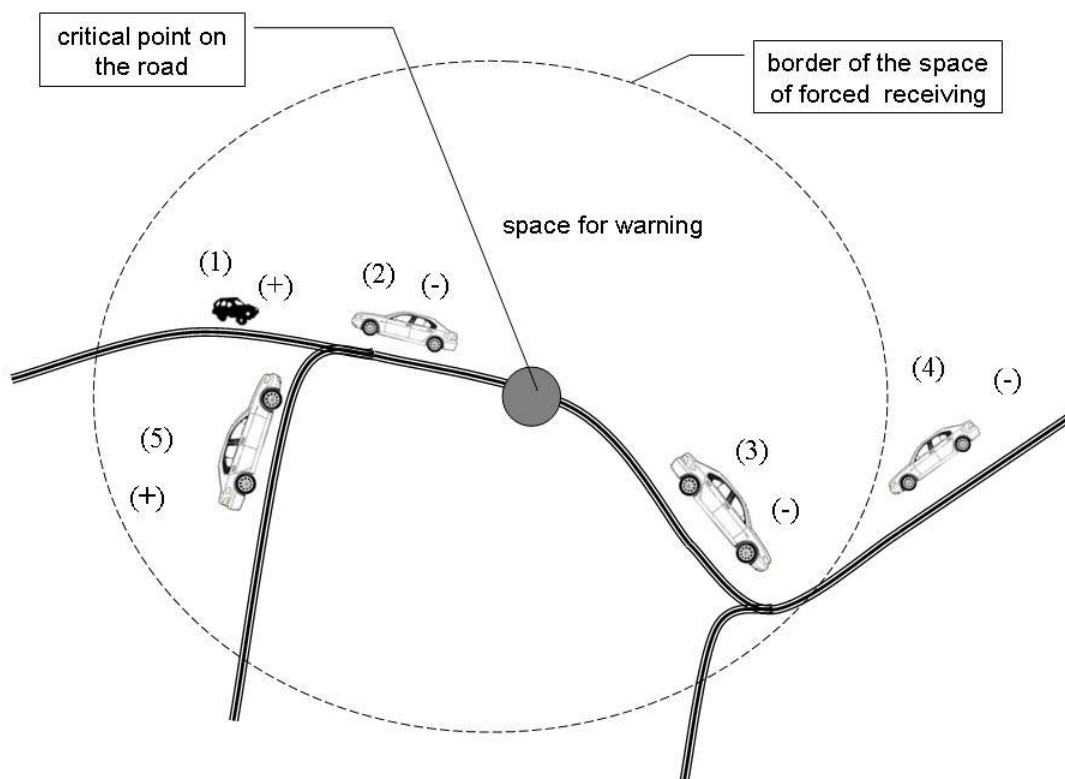


Figure 1: Principles of Radio-Help in traffic

All new European cars after 2013 will be equipped with an e-call system. In the case of a crash or serious accident that activates the e-call system, the information of the position of a car is transmitted to the emergency center (the phone number 112). The main reason of an e-call system is to inform the rescue and health services about position of serious car accident.

The center could generate information for emergency broadcasting about the position of an accident and the type of it. This codeword could be real-time broadcasted to activate the receiving system in cars approaching the point of an accident. A driver will get warning information with an acoustic signal – e.g. “200 m ahead is a crash of three cars”. In such case the driver will be able to react immediately also in cases of fog, heavy rain or sand storm. Such process could dramatically eliminate the number of serious accidents, especially chain crashes.

6. Summary

The article stress attention to lacks and disadvantages of current early warning systems. Describes the potential of adequate information in right time and right place as an aspect that can in cases of disasters and emergencies radically reduce the loss of lives, health and properties. A KATWARN system represents an example of appropriate way in distribution of information in emergencies and disasters. It is draw readers attention to some “bottle necks” of KATWARN. The strengths of original Radio-Help system is the acceptance of all demands of position based crisis broadcasting. Finally the article presents the Radio Traffic Terminal as a receiving tool for Radio-Help broadcasting. This system extends the possibilities of an e-call system and could dramatically eliminate chain crashes.

7. References

- Birmingham, L. (2011). Japan's Earthquake Warning System Explained, Time [online],, Tokio, [cit. 2011-3-15], Available from WWW: <http://www.time.com/time/world/article/0,8599,2059780,00.html>
- Brunclík, M., Skrbek, J. (2008-1). Krizový rozhlasový a televizní vysílač, patent application [online], [cit. 2011-04-24], Available from http://spisy.upv.cz/Applications/2008/PPVCZ2008_0160A3.pdf
- Brunclík, M., Skrbek, J. (2008-2). Personální krizový terminál, patent application [online], [cit. 2011-04-24 Available from http://spisy.upv.cz/Applications/2008/PPVCZ2008_0131A3.pdf
- Brunclík, M., Skrbek, J. (2008-3). Personální servisní terminál, patent application [online], [cit. 2011-04-24 Available from http://spisy.upv.cz/Applications/2008/PPVCZ2008_0253A3.pdf
- Brunclík, M., Skrbek, J. (2008-4). Terminál nuceného poslechu, patent application [online], [cit. 2011-04-24 Available from http://spisy.upv.cz/Applications/2008/PPVCZ2008_0254A3.pdf
- Chroust, G, Finlayson, D. (2011). Reacting Systematically to Regional Disasters, invitation for Workshop at the ISSS 2011 Congress in Hull, UK, 2011
- Coppola, D.P., Maloney, E.K. (2009). Communicating Emergency Preparedness: Strategies for Creating a Disaster Resilient Public, Auerbach, 2009, ISBN 978-1-42006-510-7
- Doucek, P., Informační management. 1st. edd. Praha: Professional Publishing, 2010, 251 p. ISBN 987-80-7431-010-2
- Haddow, G.D., Bullock, J.A. ,Coppola, D.P. (2010). Introduction to emergency management, 4th edd., Butterworth-Heinemann, Oxford, 2010, ISBN 978-1-85617-959-1
- Haddow, G.D., Haddow, K. (2008). Disaster Communication in a Changing Media World, Butterworth-Heinemann, Oxford, 2009, ISBN 978-1-8561-7554-8
- iBiquity, What is HD RADIO Broadcasting?, [online], [cit. 2011-04-20], Available from WWW: http://www.ibiquity.com/hd_radio
- Jordan-Meier, J. (2011). The Four Stages of Highly Effective Crisis Management: How to Manage Media in the Digital Age, CRC Press, 2011, ISBN 978-1-439-8537-33
- KATWARN – Catastrophe Warning for Every Eventuality, Fraunhofer ISST, [cit. 2011-03-15], Available from WWW: http://www.isst.fraunhofer.de/en/business_units/gfaal/topic_projects/KATWARN/
- LONDON REGIONAL RESILIENCE FORUM (2006). Looking back, moving forward: The Multi-Agency Debrief, Lessons identified and progress since the terrorist events of 7 July 2005 [online], September 2006, [cit. 2009-07-10], Available from WWW: <http://www.londonprepared.gov.uk/downloads/lookingbackmovingforward.pdf>
- Rodríguez, H, Quarantelli, E.L., Dynes, R.R . (2007) (ed.). Handbook of disaster research, Springer, New York, 2007, ISBN 978-0-387-73952-6
- Skrbek, J. (2008). Jsme schopni sdílet správné informace na správném místě, in proceedings „Liberecké informatické fórum“, TUL, Liberec, 2008, str. 77 - 80, ISBN 978-80-7372-408-5

- Skrbek, J. (2009). New Possibilities of Information Services for Special Situations, in 17 – th Interdisciplinary Information Management Talks, Proceedings (IDIMT-2009), str. 123 - 130, Trauler Verlag, Linz 2009, ISBN 978-3-85499-624-8
- Skrbek , J. (2010). Informační služby ve specifických situacích. In DOUCEK, P. (ed.) Informační management. 1st. edd. Praha: Professional Publishing, 2010. S. 129 – 146. ISBN 987-80-7431-010-2
- Skrbek , J., Kvíz, J. (2010). Critical Areas of Early Warning System. In IDIMT 2010: Information technology – Human Values, Innovation and Economy, 18th Interdisciplinary Information Management Talks. 1st edd. Linz: Trauner Verlag, 2010. S. 193 – 202. ISBN 978-38-5499-760-3.
- Tierney, K.J., Lindell , R. Perry, R.W. (2011). Facing the Unexpected - Disaster Preparedness and Response in the United States., Josef Henry Press, Washington DC, SA 2001, ISBN 0-309-06999-8
- Timothy, C.W. (2007). Ongoing Crisis Communication: Planning, Managing, and Responding , 2nd edd., Los Angeles: SAGE Publications, 2007, ISBN 978-1-4129-4991-0
- White.C. (2011). Social Media, Crisis Communication, and Emergency Management: Leveraging Web 2.0 Technologies, Jacksonville State University, Alabama, 2011, ISBN 9781439853498

ICT Impact on Economy and Innovation

ECONOMIC ASPECTS OF CLOUD COMPUTING

Martin Pochyla, Petr Rozehnal

Department of Applied Informatics

Faculty of Economics

VŠB-TUO

martin.pochyla@vsb.cz, petr.rozehnal@vsb.cz

Abstract

Economic growth in Czech Republic will depend on exports and smart investment. Cloud computing can help improve productivity, as well as spur new types of ICT investments. Currently, however the field of clouds implementation is not sufficiently developed from economic point of view. This aspect is critical for deployment. In this paper we focused on three main aspects of economy evaluation: costs, benefits and risks. We focused on the identification and definition of economic factors affecting businesses before selecting and implementing Cloud Computing solutions.

Keywords

X as a Service, XaaS, Cloud Computing, Costs, Benefits, Economy, ICT, E-government.

1. Cloud Computing

At a basic level, cloud computing (CC) is simply a means of delivering IT resources as services. Almost all IT resources can be delivered as a cloud service: applications, compute power, storage capacity, networking, programming tools, even communications services and collaboration tools. (Sun Microsystems, 2009)

The paradigm of providing ICT completely changes the view not only on technical aspects of developing ICT, but on its purchase and administration as well. Strategies of business informatics may gain entirely new dimension. The economic aspect is the unifying context for the final answer to the question of deployment.

Philosophically the concept of services was to bring ICT market the situation, where the use of selected technologies is a matter of buying from vendors (similar to other commodities). Reality shows that the main problems occur for reasons of consistency of ICT in other areas of organizations (asset management, human resources, financial management, accounting, customer relation management, etc.).

These comprehensive assessments of the impact and management of ICT services that affect the success of the organization as a whole are important (Ministr, 2009).

From different sources we can find these five main characteristics of Cloud Computing (Spinola, 2009) or (Pochyla, 2010).

- **On-demand self-service:** individuals can set themselves up without needing anyone's help;

- **Ubiquitous network access:** available through standard Internet-enabled devices;
- **Location independent resource pooling:** processing and storage demands are balanced across a common infrastructure with no particular resource assigned to any individual user;
- **Rapid elasticity:** consumers can increase or decrease capacity at will;
- **Pay per use:** consumers are charged fees based on their usage of a combination of computing power, bandwidth use and/or storage

Cloud computing solutions have three possible delivery models. Delivery models are generally labelled as XaaS (Everything as a Service).

- Cloud Software as a Service (**SaaS**) - Customers rent software hosted by the vendor.
- Cloud Platform as a Service (**PaaS**) - Customers rent infrastructure and programming tools hosted by the vendor to create their own applications.
- Cloud Infrastructure as a Service (**IaaS**) - Customers rent processing, storage, networking and other fundamental computing resources for all purposes.

Respectively four possible deployment models: (Hurwitz, 2010)

- **Private cloud** - The cloud infrastructure is owned or leased by a single organization and is operated solely for that organization.
- **Community cloud** - The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations).
- **Public cloud** - The cloud infrastructure is owned by an organization selling cloud services to the general public or to a large industry group.
- **Hybrid cloud** - The cloud infrastructure is a composition of two or more clouds (internal, community, or public) that remain unique entities but are bound together by standardized or proprietary technology).

In case we put next to each other above basic characteristics of cloud computing - delivery models and deployment models – we can get an idea of the number of possible options for usage of cloud computing. It also shows the economic dimension of understanding of this form of operation ICT. We emphasize the difficulty of optimizing the deployment of existing or planned enterprise ICT architecture.

There are number of sources discussing the benefits and risks of cloud computing. However, the crucial distinction is among those that relate to the customer and the cloud-related providers, yet they are often transmitted to their clients. General characteristics achieved in specific cases may have different impacts, especially in the long term.

As stated in (Louda, 2009), Google has realized a survey to map the role of the Internet and online activities for small and medium-sized enterprises in the Czech Republic. Only a few companies have heard of cloud computing. Cloud computing is almost unknown, because 65% of organizations had never heard of or do not know it. Furthermore, the survey showed that only 6% of respondents use cloud computing and 8% said they are considering its use in business. This approach is currently used more frequently in medium-sized firms (12%) and most of its implementations are considered in trading sector (13%) in the Czech Republic.

The findings are particularly significant in two aspects. Firstly, the usage of cloud computing by customers. The research has shown that the most frequently are XaaS used by midsize companies. It is logical in terms of usability focus of this technological approach. Economically, the most interesting results can be achieved from this market segment (the benefits of deploying see below). These factors will affect mainly the SMEs segment, which do not have great potential (finance, human resources, etc.). Practical SaaS implementation you can find in (Tvrdíková, 2010).

Secondly, an interesting fact is indication of ignorance of technology. Elimination of this is particularly problematic because it is not just knowledge of technology itself, but also more particular knowledge of its use. So, not only “I know what it is”, but “I know how to use it!” This fact is particularly interesting in the context of the above the reflection of the complexity of the impact of this variant on the company operations. The demand for ICT professionals will increase in future. According to the new research, most new employment opportunities stand to be created as a result of cloud computing in the government, education and health sector, where more than 800,000 new jobs are projected to become available. The study shows that the total of new jobs across the five economies will potentially rise as high as 2.4 million by 2015 (CEBR, 2011). We can discuss their professional specialization. Details see in (Maryska, 2010) or (Doucek, 2009).

2. Economic aspects of cloud deployment

Economic evaluation we can split onto three main aspects that are relevant to the deployment of cloud computing. These are as follows:

1. Benefits. How will your company benefit from cloud computing?
2. Costs. How will your company pay, both in hard costs and resources, for cloud computing?
3. Risks. How do uncertainties change the total impact of cloud computing on your business?

These three key areas are critical for the final calculation and assessment of the impact of deployment. Benefits and costs are to some extent coherent, mutually complementary.

2.1. Costs

At present it is best developed the issue of costs. Cloud computing is fundamentally cheaper due to economies of scale. Apart from general cliché type of savings in this area, is relatively easy to calculate the cost of particular type of service according to specific requirements. There are online calculators for an initial idea, respectively, precise characteristics that emerge from the contact of your service provider (including the SLA and other documents).

We summarized costs aspects (from the perspective of user):

- Smaller recurring costs
- Lower costs on administration
- Lower costs on hardware
- Lower energy costs
- Lower costs on implementation
- Lower costs on software update.

2.2. Benefits

A more complex situation is the calculation of benefits. Again, there are general characteristics that bring XaaS solutions. More complicated is the calculation of specific benefits for specific organization. The main benefit is the reduction in cost fields, so it is necessary to compare it with variations that are associated with the cloud computing platform (or are otherwise competitive). Other benefits associated with the cloud computing solution are difficult to measure. Let's say, for example, a better adaptability for users with unlimited geographic access to services, the potential environmental effects of global efficiency, better and faster access to software and hardware infrastructure.

We summarized general benefit aspects (from the perspective of user):

- Scalability
- Removal of barriers to the acquisition of funds
- Faster launching, development
- Reduced support needs

2.3. Risks

The third aspect is the risk associated with the transition to cloud computing. In addition to risk based on the subjective attitudes of the participants, there is a group of risks which have deep economic fundamentals. The problem of quantifying risk is not yet sufficiently documented. Generally, given concerns are related to implementation of cloud solutions. (Microsoft, 2010), (Feuerlicht, 2010)

- Security and data protection
- Performance
- Technology immaturity
- Compliance with rules
- Technology addiction (the cost of migration)
- Costs
- Availability

This overview is general and for the end user can be misleading. Take, for example, data security. On the one hand, there is concern about security of data stored off-site organization. On the other hand, how many bodies that have the data under their control can ensure their safety at the professional level? Can we worry about the power where there are generally available thousands of processors to provide the computing power in comparison with the operation using their resources which have lower computing power?

3. Cloud computing economy issues

Depending on company situation, cloud computing might not actually save money - and even if company is convinced that cloud is saving money, proving it can be very difficult, says Geva Perry, an independent cloud strategist and author of the "Thinking Out Cloud" blog. (Schultz, 2011)

Very interesting information we can find about companies which decided to return back to on-premises applications. According to a Gartner survey of 270 respondents in nine countries around 16% of SaaS customers have gone back to on-premises application. They stated four main reasons – integration issues, very high TCO, performance metrics not met and security problems. (Gartner, 2010)

Total Cost of Ownership (TCO) is used to calculate the total cost of purchasing and operating a technology solution over its useful life. TCO provides a construct to evaluate technology costs that may not be reflected in the initial pricing. For example, if you're buying a new server, server costs usually account for just 8 to 17 percent of the long-term costs to install, maintain, upgrade and support the server over time. A 2010 survey by Goldman Sachs highlighted an unstoppable shift to SaaS by SMBs and noting that lower total cost of ownership is a key factor. (Aggarwal, 2010)

Another issue is green energy and cost of power nowadays. Electricity cost is rapidly rising to become the largest element of total cost of ownership currently representing 15%-20%. (Microsoft, 2010). Power Usage Effectiveness tends to be significantly lower in large facilities than in smaller ones. While the operators of small data centers must pay the prevailing local rate for electricity, large providers can pay less than one-fourth of the national average rate by locating its data centers in locations with inexpensive electricity supply. Operators of multiple data centers are able to take advantage of geographical variability in electricity rates, which can further reduce energy cost.

Another problem is time and price change from cloud computing providers. When we will look at Amazon, we will see that it's had something like twenty pricing announcements in the last two years - so the calculations companies have made two weeks ago may no longer be relevant because their cloud provider has just slashed prices on one of its services their use. This is real problem for accurate determination of ROI of cloud computing solution.

Also companies must be aware that the pricing for pilot projects and experimentations won't necessarily mirror the cost of a production deployment.

There is a study which evaluates CC contribution to GDP growth in European countries. (Etro, 2009) Author calculated with slower and faster adoption of CC paradigm. He focused on the impact on GDP, business creation and employment in the short term. Short term means economics impact after one year, and in the medium term, that is after five years. The range is between 0.05% in short run under slow adoption and 0.3% in the medium run under optimistic adoption of CC.

4. E-government and Cloud Computing

As we mentioned above, Cloud Computing is a possible way for building E-government in near future. The main reasons are in basic properties of CC. Petr Řiha presents three key aspect of CC in e-government: (Řiha, 2011)

- The better using of sources, for example servers utilization up to 70 % or less of servers
- More flexibility of using sources, the goal is creating shared environment with dynamically allocated sources
- Different economic point of view on ICT managing, from managing of property to managing of services.

We must add that e-government has some typical preconditions for taking advantage of CC solutions. We can think about next ones:

1. High centralization of sources (e.g. power capacity, data stores). We suppose there will be only a few places maintaining data and applications.
2. High initial cost. At this time particular offices solve single parts of e-government system and stay before a problem of money. They review plans for realization just calculating with new ways of running this systems. But there are more problems with finance, see below.
3. Changing requirements for capacity (or unknown requirements in longer period). The system of e-government services continues to grow. Final requirements are unknown. We can be sure for great fluctuation of power capacity during operation (daily peaks, peak in some periods).

Nowadays is the most important to establish and follow legal framework. At this time it is quite impossible to realize CC services (operating with selected data) abroad. Current legal system is not prepared for technological possibilities (in the area of data processing) offered by ICT.

Moreover there is dilemma in CapEx versus OpEx in the area of financial. There is a great chance to find a support for investment from EU financial programs in Europe. So we can build systems, which need to be maintained later. There is a gap between CapEx money and a necessary of operational expenditures in future. (Řiha, 2011)

Potential for CC proclaims also Neelie Kroes (Vice-President of the European Commission, responsible for Digital Agenda). He said "Cloud computing can become a vehicle for governments to deliver services to citizens more efficiently and at lower cost." (Kroes, 2011)

5. Conclusion

There is a chance to turn ICT provision into a real utility by using CC. We believe there are three main aspects to discuss according to implementation of CC. First, establish a legal framework which will define privacy, data protection and users rights. Second, reduce dependence on technology to achieve better interoperability between systems. Third, determine key economic factors and effects. This is the main goal of our paper.

It is crucial to understand the economic impact of the introduction of this general purpose technology. The first and most relevant benefit is associated with a generalized reduction of the fixed costs of entry production. (Etro, 2009) This contributes to reduce the barriers to entry for SMBs. This benefit is also mentioned by (Kepes, 2011) who believe that ICT has its own Pareto principle and CC change allocation of money to run and maintain companies ICT environment. CC can help us better divide costs between application (where all business value is concentrated) and other infrastructure (like operating system, servers, data center, networks). In other words we can focus our attention to core business application. Another impact is reduction of CapEx and grows of OpEx. We can also better calculate economic results of particular parts of business, because we have overview of costs (typically per unit).

In our future work we would like to design a methodological framework for companies and institutions how to decide, compare and estimate proper economic values for planned cloud computing solutions. We will focus on the side demanding services and not the company's services offering. How you can read above we have found and described a lot of issues and questions with very difficult answers. A key economic advantage of the cloud computing is its ability to address variability in resource utilization brought on by different factors. Companies must be ready to estimate and quantify these factors together with economic benefit from cloud computing solutions.

6. References

- Aggarwal, S. (2010) The TCO Advantages of SaaS-Based Budgeting, Forecasting & Reporting. (online). c2010 (cit. 2011-04-09). Available from: http://www.adaptiveplanning.com/docs/Hurwitz_TCO_of_SaaS_CPM_Solutions.pdf
- CEBR (2011) Centre for Economics and Business Research Ltd. The economic benefits of cloud to business and the economy (online). c2010 (cit. 2011-04-08). Available from: <http://www.computerweekly.com/Articles/2011/03/14/245896/CW+-Study-The-economic-benefits-of-cloud-to-business-and-the-economy-part.htm>
- Doucek, P. (2009) ICT Human Capital – Research and Development Work in ICT. Jindřichův Hradec 9.9.2009-11.9.2009. In IDIMT-2009 System and Humans – A Complex Relationship. Linz: Universitat Linz, 2009, p. 83-94. ISBN 978-3-85499-624-8
- Etro, F. (2009) The economic Impact of Cloud Computing on Business creation, Employment and Output in Europe. Review of Business and Economics. (online) 2009, vol. 54., p.179-208, (cit. 2011-6-10) Available from: <http://www.econ.kuleuven.be/tem/jaargangen/2001-2010/2009.htm>
- Feuerlicht, G. (2010) Impact of Cloud Computing: Beyond Technology. In System Integration. Praha, 2010. p. 262-269. ISBN 978-80-245-1660-8
- Gartner, Inc. (2010) Gartner Survey Indicates More Than 95 Percent of Organizations Expect to Maintain or Grow Their Use of SaaS Through 2010. (online). c2010 (cit. 2011-03-28). Available from: <http://www.gartner.com/it/page.jsp?id=1361216>
- Hurwitz, J., Bloor, R., Kaufman, M., Halper, F. (2010) Cloud Computing for Dummies. 1st ed. Hoboken: Wiley Publishing, 2010. 310 p. ISBN: 978-0-470-48470-8.
- Kepes, B. (2011) CLOUDONOMICS – the economics of cloud computing, (Online) c2011 (cit. 2011-5-5). Available from: http://broadcast.rackspace.com/hosting_knowledge/whitepapers/Cloudonomics-The_Economics_of_Cloud_Computing.pdf
- Kroes, N. (2011) Cloud Computing Strategy needs to aim high. (Online) c2011 (cit. 2011-5-29). Available from WWW: <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/11/199>
- Maryška, M., Novotný, O., Doucek, (2010) P. ICT Knowledge Analysis of University Graduates. Jindřichův Hradec 8.9.2010-10.9.2010. In IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz: Universitat Linz, 2010, p. 125-136. ISBN 978-3-85499-760-3
- Microsoft. (2010) The Economics of the Cloud (online). c2010 (cit. 2011-02-25). Available from: http://download.microsoft.com/download/7/B/6/7B6E6840-C493-48A5-A5D7-7BBA27A966C9/The_Economic_Aspect_of_Cloud_Computing_An_In-depth_Analysis.pdf
- Ministr, J., Števko, M., Fiala, J. (2009) The IT Service continuity management principles implementation by method A2. Jindřichův Hradec 9.9.2009-11.9.2009. In IDIMT-2009 System and Humans – A Complex Relationship. Linz: Universitat Linz, 2009, p. 131-140. ISBN 978-3-85499-624-8
- Louda, P. (2009) Google: Dvě třetiny českých firem nemá tušení, co je to cloud computing. (Online) c2009 (cit. 2011-03-08). Available from: <http://computerworld.cz/aktuality/google-dve-tretiny-ceskych-firem-nema-tusen-co-je-to-cloud-computing-5307>
- Pochyla, M. (2010) Cloud computing pro malé a střední firmy, In IT pro praxi 2010, Ostrava, p. 114-123, ISBN:978-80-248-2300-3
- Říha, P. (2011) eGON si bere Klaudii aneb příběh o budoucnosti českého e-governmentu. Egovernment, (online) 2011, vol. 1, (cit. 2011-06-10) p. 38-39. Available from WWW: <http://www.egovernment.cz/archiv/2011%201.htm>
- Schultz, B. (2011) Cloud-onomics 101. (Online) c2011 (cit. 2011-04-11) Available from: <http://www.networkworld.com/supp/2011/enterprise1/020711-ecs-cloud-economics.html>
- Spinola, M. (2009) An Essential Guide to Possibilities and Risks of Cloud Computing. (Online) c2009 (cit. 2011-04-01) Available from: <http://www.mariaspinola.com/white-paper/white-paper-an-essential-guide-to-possibilities-and-risks-of-cloud-computing/>
- Sun Microsystems. (2009) Take Your Business To A Higher Level: Sun Cloud-Computing Technology Scales Your Infrastructure To Take Advantage Of New Business Opportunities. (online). c2009 (cit. 2011-03-25). Available

from WWW: <http://www.techrepublic.com/whitepapers/take-your-business-to-a-higher-level-sun-cloud-computing-technology-scales-your-infrastructure-to-take-advantage-of-new-business-opportunities/2384255>

Tvrđíková, M. (2010) Implementation of Business Intelligence as the SaaS – the opportunity for small and medium sized companies. Jindřichův Hradec 8.9.2010-10.9.2010. In IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz: Universitat Linz, 2010, p. 377-386. ISBN 978-3-85499-760-3

IMPACT OF LEGAL REGULATION OF TECHNOLOGICAL DEVELOPMENTS ON COMPETITIVENESS

Michael Sonntag

Institute for Information Processing and Microprocessor Technology (FIM)
Johannes Kepler University Linz
sonntag@fim.uni-linz.ac.at

Abstract

New technological developments are rarely solely advantageous. Almost all have potential dangers and perhaps an undesirable impact on economy or society. This calls for their regulation through law to ensure safety and security. However, side-effects from this exist, as each country decides on these issues autonomously. One very important is competitiveness. Additionally this doesn't only influence the development of the new technology itself, but also its "home market" and through this the national infrastructure and labour market. This paper identifies the various levels and areas where legal regulation can take place as well as their drawbacks and advantages regarding competitiveness, both between companies and between countries. Typically at the start of a new technology little or no information on the dangers exists, rendering decisions on prohibitions or restrictions very difficult. Which types of regulation can still be useful and reduce competitiveness to the least possible extent or even improve it is investigated.

Keywords

Law, Legal Regulations, Competitiveness, Technological Development

1. Introduction

Whenever a new technology is developed, it may impact the existing society in various ways. One of these dimensions is the legal view. For example, when the automobile was invented, rules existed for horses/carriages, medicines (gas/oil products) etc. But regulations for cars, as well as production/storage/distributions of gasoline on a larger scale, were non-existing. Similarly ample precedents existed when someone was responsible for damage caused by an animal owned/guided by them. But for cars and trains a new mode was introduced: liability independent of guilt, because such things are "inherently dangerous". Similar developments occurred later quite often, e.g. regarding atomic power, food additives etc. These regulations, as well as the technology itself, also impact the competitiveness of companies and countries. If the rules are too strict, development is hindered and production/sale perhaps almost impossible. This means, that corresponding products will not be introduced and available, at least not to a larger degree, within this country. Consider e.g. very strict regulations on who might own/drive a car: without a modern transportation system a country will be cut off from other developments as well.

However, legal changes must be unsynchronized with these developments. Before a technology exists it is typically impossible to imagine rules specifically tailored to it, and after its invention the

specific risks, problems, and implications are not necessarily immediately apparent. For instance, mobile telephones did exist for quite a long time (sometimes in the form of radio with a base station somehow connected to the landline telephone system), but only when they became ubiquitous some of their problems became obvious. Nowadays there are rules and signs where the use of mobile phones is discouraged or forbidden and even technical devices have been developed and are being sold to enforce compliance (with their own regulatory problems!). Also note the extremely long and ongoing discussion about their health implications. Similarly, the till-then common (and presumably also commercially successful) public phone booths became more or less obsolete and their continued existence must be enforced by laws (=loss of competitiveness).

Another example of the influence of legal regulation on competitiveness is the modem: a device for computer communication using analogue telephone lines. Previously only officially tested and approved modems were allowed to be connected to telephone lines in Germany (to avoid interference), which had to be rented from the (monopoly) company too, resulting in very few types of modems available and only for a very high price. As a result, modems were almost exclusively manufactured in other countries and widespread computer communication delayed.

This paper explores the role of legal rules (typically, but not necessarily, legislation) of new technological developments and their influence on competitiveness. As examples nanotechnology and ICT will be used. It should be noted that lesser “regulations” exist too, where an industry (or individual companies) commits themselves to rules; normally this is done to prevent “official” regulation. Another example is standardization, which typically has no legally binding force, but may be important when considering whether a process or product conforms to the state of technology or not. These latter aspects are not covered here.

2. General problems of competitiveness when regulating technology

Regulating technology should affect all companies identically – at least in theory. But this is obviously not the case if different rules apply, e.g. within different countries. But similar differences occur also between companies in the same country, if they differ e.g. only in size. Compare for instance a rule requiring expensive pre-testing before a product may be sold requiring insurance or instituting liability. The former favours large companies who can pay this “gateway cost”, while new start-ups might have large problems. Even if their quality/production method/... is far superior, and therefore their insurance fee would be significantly lower (or no liability would materialize), they might be kept out of competition. A similar problem may occur between different branches of technology, even if they are not complementing or substituting each other. If one branch of industry is regulated too intensely, it will develop new technology only to a lesser degree compared to another, where regulations are few or easy to fulfil. This is especially apparent in medicine, where countries prohibiting specific research (e.g. on human cells) obviously fall back in this technology and also lose related companies and employment opportunities.

Most important for competitiveness is however not always the specific content of (proposed) regulation, but rather its uncertainty or delay. While science might sometimes progress very fast, legal regulation typically moves at a far more sedately speed. And when a new technology is really “new” and not just an improvement, existing laws are sometimes very unsuitable for this new situation. Examples are limits regarding the weight of “contaminants”, which are often useless regarding nano-materials; e.g. gold is medically harmless in normal form, but can be poisonous as nano-particles (see Gros, 2008). In the IT area similar problems occurred: “fraud” requires deceiving a human being, so is inserting an illegally copied credit card into an ATM allowed? In Austria a new paragraph was introduced to prohibit such “computer fraud”. This delay in regulation

might be regrettably, but apart from the problem of bureaucracy also factual reasons exist: although only little or nothing much about associated dangers is known (scientists care mostly about getting it to work!), decisions must be made (and not acting is a decision as well). Irrespectively of the complexity, a result should be reached (public pressure), and typically also within a timeframe too short to start new or detailed investigations. So little about potential dangers is known, but they should (or must) still be regulated.

Competitiveness is also influenced by the decision, which general approach for regulation to pursue: taking care of the specific problems of a certain technology, with all the associated difficulties (see below), or regulating general dangers independently of technology. In a typical legal environment both co-exist. Regulating dangers ensures a basic level for all products and services, like a prohibition on selling “unsafe” products. This ensures an even playing field for competitors with the same product or replacement technologies (if the new technology has one danger less, it is less regulated and enjoys an advantage). Technology specific rules are intended for problems associated with a certain product, its use/disposal/..., which are “more” dangerous and require a higher level of protection than in general (“unsafe” products might not be sold to consumers but still be used e.g. in industry, then requiring additional precautions). But most important, these often cover areas where the danger is not exactly known (yet) or probabilistic. So a product is not unsafe (and therefore prohibited), but “suspicious” and “just in case” there are limits on amounts, recycling prescriptions, or information requirements.

A typical scenario looks like this: A new technological development is made. Scientists investigate why and how it works and what it can be used for. Associated dangers (of all kinds) are of less importance, as these are only laboratory experiments (controlled environment) and less interesting/scientifically rewarding (they want to get it to work and see it in action, not investigate why you should not do it!). Because of this lack of knowledge about problems the security standard required is low (producers/distributors have to care about known dangers only) and regulation is scarce. Based on this low standard little incentive to research this area or look for improvements exists. Therefore the security level will remain low unless the potential danger materializes in a big, and “preferably” public, manner, starting an instant and pressing demand for regulation. Investigating a technology for dangers is therefore often undesirable from a competition point of view. When potential problems are discovered, costs increase because they have to be prevented – and first for the discoverer (other companies/countries might delay acting, e.g. to verify the claim). Therefore regarding competitiveness it is even a disincentive to identify dangers.

Regulation can also improve competition. If rules apply to all in the same way and e.g. prescribe interoperability or permissions to access monopoly goods, the market size increases. For instance the Internet has achieved its large size only because it is built on the same protocol and open for all. In this way every participant benefits from its increased size. However, regarding the Internet very little legal regulation occurred, but rather technical and practical one only. Note that this is a rather exceptional example, as in the Internet “compartmentalization” occurs very often too. Proprietary protocols are invented and many companies try to get their own to be used exclusively while preventing others from implementing them. Especially notable here is Microsoft, which kept its protocol for file access across the network (called CIFS/ SMB) secret and legal action by the EU commission was needed to open it up; see Microsoft WGSP (2004). Although Microsoft here lost some measure of competitiveness, overall the gain was probably larger.

When talking about regulation, here only the legal basis (but including procedural law) is discussed. Apart from the legal “facts” the “implementation” by the administration is a different aspect, which might considerable increase the burden of any requirement. Reductions on the other hand are scarce

and typically illegal (e.g. bribes to avoid doing the complete process and take a shortcut to the decision, even if the result is perfectly correct!).

3. Types of legal rules and their impact on competitiveness

Legal influence is possible on new technological developments in many stages as well as through various approaches. These latter may be very direct (prohibiting or requiring something) or indirect (increasing taxes on it, granting special rights). Additionally the competitiveness of companies as well as countries where these rules apply as opposed to those without them (or with different ones) is influenced. The most important approaches are the following:

- **Liability:** This is an extremely indirect measure and may be used to further or hinder the new development. The basic idea is, that the technology's use increases (or decreases, e.g. through additional requirements or state guarantees) the liability in case of "problems", like accidents, intentional acts of third person etc. Such requirements may also be introduced silently through common practice. E.g. in Austria no law states that software must be scanned for viruses before it is sold. However, when damages occur because of a virus introduced by newly installed software, the provider must pay compensation (today common practice, but not in the past). The more commonly problems occur, the more must be done against them. This means, when only few products exist (few computers → few viruses), selling them introduces no specific liability. But when they become widespread, users become more "common" too (more computers → the less "specialists" the users are) and more careless or uninformed behaviour must be taken into account. Competitiveness is touched here only to a small degree. Insurance is usually available and a necessity for doing business anyway. Compared to other countries the difference is mostly small too, as some liability for damages will typically always exist. Only the more extreme forms (like strict liability independent of guilt) can be a real competitiveness problem. Examples include product safety laws (see also Eisenberger 2011a), which typically institute liability for the vendor of a product (who normally is neither the developer nor producer!).
- A mix between taxes (see next paragraph) and liability is mandatory insurance, which might cover e.g. production, erroneous products, or general problems of all kind with some relation to the product. Examples for this include atomic power plants, airplanes, working as a court expert etc. This seems to be very useful if the problems are not yet known. But very often the burden is just shifted to the insurance companies, which then must assess the risk. An example in the IT area are certification authorities for issuing digital certificates, which must (in Austria) obtain a liability insurance for a minimum of € 700.000 and a minimum of three cases per year (SigV). Competitiveness is affected only little, as typically all providers of products/services must bear this burden at least within a country (Signatures: The basic requirement stems from an EU directive, so it exists in all member states in some way equally). If a company is led responsibly, insurance costs will be present anyway, as they would be replaced by reserve funds. In this way insurance levels the playing field, as even companies who would have just risked it (and not reserved any funds and so could produce cheaper) will have to do this.
- **Taxes:** Through taxes the behaviour of companies or the population can be guided to a certain degree. Additionally, specific costs borne by all persons (as opposed to the individual producing/using the new product/service) can be covered. However, in most cases this may be the intention, but not necessarily the reality. An example for such taxes was the Austrian "certificate tax", which was not an official tax, but for every certificate

issued by a certification authority suitable as an equivalent to a manual signature two Euros had to be paid to cover the costs of the responsible supervisory board (§ 1 Abs 2 SigV idF BGBl II Nr. 30/2000; valid until end of 2004). This doesn't influence competitiveness within the whole sector where this tax applies. But if the new technology replaces a quite different one, other or no taxes might apply there. These would significantly influence competitiveness, similar as differences in taxation between countries. It is also important that in the stage of developing a new technology moving development or production to a different location is typically still quite easy.

- **Product approval procedures:** A much more intrusive regulation, especially regarding competitiveness, is the necessity for an approval process to be completed before a product (or a service) may be sold or used. This is common in the area of health, e.g. for drugs (Eisenberger 2011a). Typically (compare procedures for building e.g. a new power plant or a mobile phone tower as counter examples) the procedure itself is not the problem, but the requirements that need to be fulfilled (e.g. the clinical tests) for a positive outcome. Examples for these are medical devices, which today often include computers, therefore subjecting software (operating systems as well as the custom software!) to such tests as well. For nano-materials used in cosmetics (Art 16 of CosPro; one of the very few specific regulations!) the EU proscribes e.g. a registration procedure with the possibility of the commission to request additional information and publish comments (the commission may even change the regulation by adding requirements, Art 16 par 7, a legally doubtful procedure where legislation is passed off to the administration!). Another example are food additives, where no specific rules regarding nano-materials exist, but it is at least stated (Art 12 FoodAdd), that changes of material in particles size (nano-particles) are to be seen as different from their existing chemical compound and require a new permission procedure. New technologies typically suffer from approval procedures to a much larger degree than existing and well-known ones: no old material can be referenced or reused and the procedure as well as the topic might be new for all involved parties. Also, such official procedures may take a long time, resulting in a competitive drawback in comparison to countries without such procedures or where they are completed more speedily.
- **Direct restrictions of various kinds on processes and materials** may be introduced for all stages of the lifecycle of the product as well as the development of the underlying technology. Restrictions regarding the product lifecycle cover i.a. precautions during production (location, "filtering" of all kinds of emissions, security requirements, worker protection, allowed processes/base materials like REACH 2006, Eisenberger 2011c etc.), distribution (transport restrictions according to type of transport, routes, amount per shipment etc.), and requirements for recycling (see WasteStream for an example of regulations on specific products or industries) (separate collection, quotas, obligation of accepting returns ...) or disposal (special treatment). Examples from the IT area are RoHS 2003 (restrictions of hazardous materials like lead or quicksilver) and WEEE (2003) (separately collecting waste electronic devices as well as their reuse/recycling). Such restrictions can influence competitiveness to a very large degree, as the development itself might suffer or at least render the exploitation of the technology more difficult. If too many restrictions are in place, production/distribution might not be economically feasible any more or even outright impossible. This is especially dangerous regarding restrictions existing from "old" technology, which might not be necessary for the new one anymore, but are still in place and no exception exists yet.
- **Person restrictions:** These may restrict the persons allowed to produce the product or perform the service, in the extreme case to a state monopoly. More common are restrictions

requiring minimum quantities of capital (see also insurance above), specific legal form (no “limited companies”), employee count (e.g. mandatory 24/7 hotline), qualifications (minimum level of education of all/some personnel, like at least one qualified doctor at each site), available equipment (redundant sites, minimum technological level etc.), or proof of unsatisfied demand (economical necessity). An example of more indirect regulation (private contracts; regulating only their enforceability) is non-competition clauses, which may prevent people from joining new technology companies (see Fannon 2007). An example from the IT area is the prohibition of certification authorities employing persons with certain convictions and simultaneously the requirement to employ personnel with specific knowledge (§ 7 SigV 2008). From the point of competitiveness such rules are of lesser influence, as typically the difference to what is actually required is not that large. Still, problematic areas can exist, as e.g. new start-ups developing new technology are commonly limited in funds, meaning that technical qualifications are usually not a problem, but other personnel (e.g. hotlines) or limitations on legal form (typically funded by venture capital) are more difficult. Very problematic can be a requirement for unsatisfied demand. For new technology demand might be created solely through the new offering, so without publicity and actual products the (current!) demand might be non-existing.

- Burden of proof: A practical issue is, which party of a conflict must prove their position: is it the producer/user of a new technology who must prove that there are no dangers associated with it (making the non-existence plausible is very difficult), or must the person claiming to be damaged/endangered prove that some damage/danger exists (very difficult if the damage takes a long time to materialize or is only statistical in nature, e.g. smoking: lung cancer occurs only after some years and not everyone smoking develops it). Competitiveness is influenced by this only very rarely, as to be of any importance legal proceedings must exist. And because of the newness of technology discussed here, providing any kind of proof is typically difficult. However, it might significantly influence insurance premiums.
- Procedural law: Apart from the content of the law, the process of enforcing it may be adapted too. Examples for this are collective proceedings for problem, where numerous persons are involved. These may use exemplary selected persons (US class actions), a representative organization (e.g. Austrian consumer protection organizations; § 29 KSchG 1998), or model decisions in individual cases. Typically these are cases of liability, but there are equally important ones for obtaining permissions to operate factories or other necessary installations. There commonly numerous people are potentially touched, requiring their involvement, while simultaneously many different laws (environmental protection like water or air, worker safety, protection of neighbours/wildlife, traffic issues etc.) must be followed, requiring numerous expertises. The influence of procedural law on competitiveness is very diverse. It might be very low (class actions etc.; see above) or very high (numerous parties involved, resulting often in a high number of objections and a very long and complicated procedure or a high number of separate procedures). Also in international comparison such procedures are often more important than the subject matter regulations themselves.
- Punishment: If the technology is not dangerous in itself but can be used for undesirable behaviour or render previously insignificant problems large, crimes may be extended or newly “invented” by law. Examples for the previous in the ICT area are privacy (Privacy-Directive 1995, ePrivacy 2002; because the EU lacks competency in punishment these elements are national: Art. 24 – Sanctions: “suitable measures”), which had little importance before (a bit about publishing private data in newspapers), or interception of communications

(previously only telephone and mail were regulated; there the danger was comparatively small and originated from the state, now almost everything is computerized and many private third parties – Internet! – are involved). Competitiveness is not touched here, except to a very small degree of perhaps receiving a bad reputation – but this would apply to all identically.

- Monopoly rights: If the developer of a new technology receives a monopoly on it in some way, e.g. by intellectual property rights like (design) patents, this ensures a competitive advantage. Through this also less profitable investments in research (further improvements to reduce drawbacks, potential dangers) become possible. Advantageous is, that the state is very little involved and most problems are tackled by the involved companies themselves. This is simultaneously the drawback as well, as there is no guarantee what the competitive advantage will be used for.

4. Conclusions

Numerous possibilities exist for regulating new technology according to its (real, perceived, or possible) dangers. Some of them invariable impact competitiveness (like taxes), some only rarely (e.g. burden of proof only in case of actual court proceedings). It seems therefore advisable to first try those approaches not or only minimally impacting competition, to avoid “killing” the new technology before it is fully developed or can be commercialized. This is especially important in the IT area, where software development can be easily moved to other countries and online sale over the Internet is difficult to regulate. Therefore it is advisable to improve the regulation of software “production” and these companies, rather than the actual sale or use of it. This can be seen e.g. by the example of Facebook and privacy: the company is located in the USA (and possesses probably illegally no imprint, although clearly targeted at EU customers!) and any privacy regulation within the EU is very difficult to enforce. If the company would be located within the EU this would be comparatively trivial. Similarly the “certificate tax” was also suboptimal: uses cases for digital signatures were scarce and so any price increase was even more problematic (note that because of low usage also only a very low amount of money was acquired!).

The problem of not exactly knowing what to regulate, because little is known about the problems of new technologies, might be improved by considering aspects of competitiveness. Companies investigating associated problems should derive some advantage from it, not a drawback. This could be possible through a bonus of some kind for discovering and proving a drawback or a problem with a new technology, e.g. in the form of refunding a part of the research costs. Exemptions from regulations addressing the problem are probably unsuitable, as then the problem would be prolonged. Another approach increasing competitiveness would be some kind of “punishment taxes” on all other providers for not identifying the problem. This would however have to be done in a larger area and covering all competitors, including completely different technologies which could act as a substitute. Especially regarding the latter this would be problematic: their product doesn’t have a problem and why should they investigate the dangers associated with a “foreign” technology or product? It seems therefore that the “bonus” is better suited. Offsetting the costs would have to be done from the general budget, or similar problems as with “danger taxes” would appear.

In Austria the economical impact of laws must already be investigated. However, often this is relatively superficial and described in a few sentences (or to an unrealistic degree: calculating five minutes for approximately six proceedings per year, multiplying this with an average salary and finding out that the law will cost additional € 25,20 per year in administrative costs; GGBG-

Novelle 2001). This is a useful approach, but more details and a larger focus on competitiveness would be helpful.

It should also be noted that the content of regulation is only one factor of competitiveness: continuity and predictability of changes (both in regulation as well as in application of regulation; see CHI/BCG 2011) allow much better planning than “random” changes at various times.

5. References

- California Healthcare Institute, The Boston Consulting Group, Competitiveness and Regulation: The FDA and the Future of America's Biomedical Industry, 2011 <http://www.bcg.com/documents/file72060.pdf> (15.6.2011)
- CosPro, Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 on cosmetic products, OJ L 342/59, 22.12.2009
- Eisenberger, Iris, Nentwich, Michael, Fiedeler, Ulrich, Gazsó, André, Simkó, Myrtil: Nano-Regulation in the European Union. NanoTrust Dossier Nr. 17, April 2010 <http://epub.oeaw.ac.at/ita/nanotrust-dossiers/dossier017en.pdf> (15.6.2011)
- Eisenberger, Iris, Nentwich, Michael, Fiedeler, Ulrich, Gazsó, André, Simkó, Myrtil: Nano Regulation in Austria (I): Chemical and Product Safety. NanoTrust Dossier Nr. 18, January 2011 <http://epub.oeaw.ac.at/ita/nanotrust-dossiers/dossier018en.pdf> (15.6.2011)
- Eisenberger, Iris, Nentwich, Michael, Fiedeler, Ulrich, Gazsó, André, Simkó, Myrtil: Nano Regulation in Austria (II): Workplace Safety, Industrial Law and Environmental Law. NanoTrust Dossier Nr. 19, January 2011 <http://epub.oeaw.ac.at/ita/nanotrust-dossiers/dossier019en.pdf> (15.6.2011)
- El-Privacy, Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications), OJ L 201/37, 31.7.2002 as amended by directive 2009/135/EC, OJ L 337/11, 18.12.2009
- Fannon, Irene Lynch, Regulation and Competitiveness: A mysterious and difficult relationship in the European Union, EUSA Conference, 2007 http://papers.ssrn.com/sol3/papers.cfm?abstract_id=988945 (15.6.2011)
- FoodAdd, Art 12 Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives, OJ L 354/16, 31.12.2008
- KSchG, Bundesgesetz vom 8. März 1979, mit dem Bestimmungen zum Schutz der Verbraucher getroffen werden (Konsumentenschutzgesetz - KSchG), BGBl. Nr. 140/1979; see also Directive 98/27/EC of the European Parliament and of the Council of 19 May 1998 on injunctions for the protection of consumers' interests, OJ L 166/51, 11.6.1998
- GGBG, Ministry draft for modifications to the law regulating the transport of dangerous goods (GGBG-Novelle 2011), 1116 d.B. http://www.parlament.gv.at/PAKT/VHG/XXIV/I/I_01116/fname_210143.pdf (15.6.2011)
- Gros, Anna, Nanotechnologie als Herausforderung für die Rechtsordnung, NuR (2008) 30, 779f
- Microsoft: Microsoft Implementation of European Commission Decision - Microsoft Work Group Server Protocol Program, 22.12.2004, <http://www.microsoft.com/About/Legal/EN/US/Antitrust/EUDecision/Default.aspx> (15.6.2011)
- Privacy-Dir, Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data, OJ L 281/31, 23.11.1995
- REACH, Regulation (EC) No 1907/2006 of the European parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), OJ L 396/1, 30.12.2006
- ROHS, Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, OJ L 37/19, 13.2.2003

SigV, Verordnung des Bundeskanzlers über elektronische Signaturen (Signaturverordnung 2008 – SigV 2008), BGBl. II Nr. 3/2008 idF BGBl. II Nr. 401/2010

WasteStream, European Commission, European Union legislation on specific waste streams <http://ec.europa.eu/environment/waste/legislation/c.htm> (15.6.2011)

WEEE, Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and elec-tronic equipment (WEEE) - Joint declaration of the European Parliament, the Council and the Commission relating to Article 9, OJ L 037/24, 13.2.2003

Anventure: Linux Certification Questions & Answers, <http://gocertify.com/faq/linuxfaq.shtml>

Browne, C.: The X Window System, <http://linuxfinances.info/info/x.html>

Creative Commons: Namensnennung - Keine kommerzielle Nutzung 3.0 Österreich, <http://creativecommons.org/licenses/by-nc/3.0/at/legalcode>

NATIONAL ACCOUNTS AS A USEFUL DATA SOURCE FOR COMPETITIVENESS ANALYSIS INCLUDING THE ICT IMPACT

Jakub Fischer, Kristýna Vltavská

Department of Economic Statistics
Faculty of Informatics and Statistics
University of Economics, Prague
fischerj@vse.cz, kristyna.vltavska@vse.cz

Abstract

In this paper we present the system of national accounts as a useful data source for many macro-economic and industrial analyses. A lot of analyses are focused on the ICT impact on productivity, GDP, employment and other economic indicators which are closely related to competitiveness of an economy. In recent years, quite strong development has been accomplished in the area of availability of statistical data useful for economic analyses. Moreover, such development has been achieved in the area of national accounts, from which the data is well-comparable both between countries and in time. For instance, the annual data from national accounts system for the Czech Republic is available as a database which has been recently extended. The aim of the paper is to show this data source and to present examples of the analyses which could be based on national accounts data.

Keywords

National Accounts, ICT Goods and Services, Indicators, Production Accounts and Generation of Income Accounts

1. Introduction

Many economic analyses recently published or planned for publishing relate to quantification of the impact of ICT on competitiveness of an economy. Competitiveness is a relatively wide term which includes phenomena such as output, economic growth, employment, productivity and so on. These economic phenomena are represented by statistical indicators: gross output, gross value added, gross domestic product, number of employees, rate of unemployment, labour productivity, total factor productivity index etc. The relation between economic phenomena and statistical indicators is a key issue of economic statistics; see also Jilek, Moravova (2007) or Fischer, Fischer (2005).

More than one statistical indicator is available for each of the phenomena. However, the question is how to choose the most appropriate one. Other issues concern indicators which are most suitable for analyses of ICT impact on competitiveness of economy; reasons why to use national accounts data for analyses; and which types of analyses may be based on national data.

2. National accounts data and advantage of its usage

The system of national accounts is a complex macro-economic, statistical and descriptive model of the economy consisting of data on different parts of economy. We can consider production as a key indicator and view it from two different angles. Firstly, production is a source of the value of goods and services. All goods and services are either produced in home economy or imported. We can see the uses of a produced item: it can be consumed, invested, stocked or exported. Secondly, production can be analysed as a source of income (e. g. from sales) which is furthermore distributed (we pay compensations of employees and costs of capital), redistributed (e. g. as taxes and social payments) and used for final consumption and investments. While with the first point of view we analyse *products* defined by statistical classifications of products such as CPA¹³, the second point of view needs to analyse *producers* divided into institutional sectors using classification of residential institutional sectors or into industries using NACE¹⁴. In relation to ICT we can consider both *ICT products* (goods and services) as a part of products and *ICT activities* (ICT-related industries) as a part of producers. It is necessary to note that NACE has been recently changed from version 1.1 to version 2 which also has an impact on ICT-related analysis.

Besides production, consumption, capital formation, external trade and distribution of incomes there are some additional indicators included to the system of national accounts such as the number of employees (both in physical meaning and full time equivalents), number of hours worked and so on.

We consider complexity of the system the main advantage of this data source. It has two important consequences.

Firstly, *production indicators* (sales, output, value added) - contrary to other data sources - are balanced with the side of uses. It means that in industrial statistics the sources are not necessarily balanced to the uses side. On the other hand, national accounts are balanced and each transaction is recorded twice (for the sources side and for the uses side). It implies that both sampling and non-sampling errors occurred at structural statistics system (based on statistical statements) are balanced to data from the uses side (based on sample surveys of consumption, external trade statistics etc.).

Secondly, *productivity indicators* such as labour productivity and multi-factor productivity (incl. total factor productivity index) are based on indicators which have the same methodological basis. The definition of *productive activity* is quite complicated and has been significantly changed since the second half of 20th century. While in developed countries the production was considered a *market production* (which did not include non-market goods and services such as public education), in socialist countries the production was considered a *material production* (which included goods and only several types of services). Productivity indicators are constructed as ratios of production and employment (number of employees, number of hours worked, full time equivalent). In typically used data sources (labour force sample survey, evidence from statements of enterprises) the indicators of employment methodologically differ from a basis of production which could lead to a bias in productivity estimates. Contrary to this situation, the number of employees and the number of hours worked available in national accounts database are methodologically very close to production. An employee is every person whose activity is considerable as productive activity.

¹³ Classification of Products by Activities.

¹⁴ Nomenclature statistique des activités économiques dans la Communauté européenne.

Estimation of productivity as a ratio of production and the number of employees/hours worked¹⁵ if both data are taken from national accounts database is much clearer than alternative ways.

The other advantage of national accounts data usage consists in unification and harmonisation across regions and time. Since the indicators included to national accounts are strongly harmonised by EUROSTAT¹⁶, it allows very good comparison of data between countries, industries and in time. It unfortunately implies one disadvantage: indicators are unified for all industries so it is impossible to include industry-specific indicators.

National accounts data also allows us not only to analyse production, producers and their incomes, but also technical-economic relations in production using input-output analysis. Data are at disposal in a user-friendly way as a database.

3. Examples of analyses based on national accounts data

By using data from national accounts we can do numerous analyses. Recently the analyses may be done using two classifications of industries – OKEČ and CZ-NACE¹⁷. In this paper we use both classifications. It depends on the dataset we have from the national accounts. During September 2011 the revision of the dataset will be performed and after that researchers will only use the classification CZ-NACE for their analyses.

All the analyses are carried out for the two industries of ICT goods and one industry of ICT services. It is just an example of two-digit OKEČ. Because it is a one-year analysis we use data in current prices. Analyses are done only for the year 2007 because for the period between the years 2008 and 2010 the definitive dataset was unavailable.

ICT goods: **30** – office machinery and computers, **32** – radio, television and communication equipment

ICT services: **72** – computer and related activities

Examples of the analyses:

3.1. Estimation of the share of ICT goods and services on the total output/value added

Data source for this analysis can be found in the production accounts and generation of income accounts. This dataset contains total output, intermediate consumption, gross value added, consumption of fixed capital, compensation of employees (all in current prices, constant prices of 2000, constant prices of previous years and volume indices), other taxes/subsidies on production, net operating surplus and net mixed income. Furthermore, this dataset contains information about self-employment, employees and total employment in hours worked, persons or full time equivalents. All the information is published in two-digit code of NACE classification.

It contains not only the dataset in the classification already mentioned but also sorted by the type of institution – total economy, non-financial corporations, public non-financial corporations, national private non-financial corporations, foreign controlled non-financial corporations, general

¹⁵ To the differences between them see also Fischer, Sixta (2009).

¹⁶ See also Eurostat (1998).

¹⁷ OKEČ is based on NACE rev. 1.1, CZ-NACE is based on NACE rev. 2.

government, central government, local government, social security funds, households and non-profit institutions serving households.

For this analysis we used the data of output and value added in 2007 and computed an indicator which shows the share of ICT goods and services on total output and gross value added in 2007.

Industry	Share on total output	Share on gross value added
30	2.05	0.12
32	2.56	0.68
72	1.26	1.76

Table 1: Share of ICT goods and services on total output and gross value added, current prices, 2007, %;

Source: Czech Statistical Office, computation of authors

From the table 1 we can see that the highest share of goods and services on total output was achieved in the industry 32 (2.56 %). On the other hand the highest share of ICT goods and services on gross value added was achieved within the industry 72 (1.76 %).

3.2. Analysis of the differences in labour productivity between ICT and non-ICT industries or total economy

For the analysis of labour productivity and total factor productivity the production accounts and generation of income accounts can be used. As mentioned in chapter 2, labour productivity can be estimated in three ways which differ by the input variables (number of employees, number of hours worked, full time equivalent¹⁸). As the input, gross value added is used because of the industry analysis.

	LP in thousands CZK per hours worked	LP in million CZK per person	LP in million CZK per full time equivalent
Total economy	0.31	0.61	0.61
30	0.20	0.37	0.38
32	0.27	0.51	0.51
72	0.42	0.82	0.83

Table 2: Labour productivity (LP) in ICT sector and total economy, using different inputs, 2007; Source: Czech Statistical Office, computation of authors

3.3. Analysis of which industries mainly use the ICT goods/services and if usage of ICT goods/services influences the economy of industries

For this analysis the data from the Supply and use tables needs to be used. The table describes the transaction of goods and services which take place during the specific year. The supply and use table shows the flows of goods made and service offer with non-residents and used by all residents. The table is based on equality of production by industries and source by goods. The supply and use table are based on two classifications: classification of product and industry classification.

¹⁸ For more information see Fischer, Sixta (2009).

30	84.97
32	83.59
72	31.41

Table 3: Structure of intermediate consumption in ICT goods and services, 2007, %; Source: Czech Statistical Office, computation of authors

As the table 3 shows, each ICT industry consumes the most goods and services which they produce themselves.

Supply and use tables contain more useful information which will be part of further studies.

3.4. Comparison of the share of gross value added on total output between ICT and the total economy

This analysis is based on the information from the production accounts and generation of income accounts.

Total economy	34.42
30	2.08
32	9.11
72	47.96

Table 4: Share of gross value added on total output, industries, 2007, %; Source: Czech Statistical Office, computation of authors

As the table 4 shows, the share of gross value added on total output differs among the ICT sector. ICT manufacturing has minor share of value added on the output. It means that the intermediate consumption has major share on the total output. The share of gross value added on total output in the ICT services is almost 50 %. It means that the gross value added has almost the same share on total output as the intermediate consumption among ICT services.

3.5. Comparison of the share of compensation of employees on value added between ICT and the total economy

For this analysis we used production accounts and generation of income accounts. This analysis could be done not just for industries but also for industrial sectors and subsectors.

Total economy	47.71
30	81.80
32	61.62
72	60.15

Table 5: Share of compensation of employees on gross value added, industries, 2007, %; Source: Czech Statistical Office, computation of authors

The table 5 indicates that the highest share of compensation of employees on gross value added in ICT sector is achieved by the industry 30 – office machinery and computers.

	National private corporations	Foreign controlled corporations
Total economy	60.69	45.81
30	81.62	86.55
32	61.3	68.47
72	65.66	71.44

Table 6: Share of compensation of employees on gross value added, national private non-financial corporations and foreign controlled non-financial corporations, 2007, %; Source: Czech Statistical Office, computation of authors

From the point of view of national private non-financial corporations and foreign controlled non-financial corporations the share of compensation of employees on value added of the ICT sector is higher in foreign controlled non-financial corporations. The main difference is achieved in the ICT services.

4. Conclusion

High-quality economic analyses strongly need high-quality data sources. For analyses related to the ICT impact on competitiveness of the economy we recommend to use the extended database of national accounts. This database contains the production accounts and generation of income accounts which can be used for the analysis of the share of ICT goods and services on the total value added or for the analysis of labour productivity/total factor productivity. The national accounts also contain the Supply and use tables which are very useful for the analysis of which ICT goods and services are mainly used in the economy or if the usage of the ICT goods and services influence the economy of the industries. This paper showed some examples which help the researcher understand the main target of using national accounts in the ICT analyses.

Acknowledgement

This paper has been prepared under the support of the project of the University of Economics, Prague - Internal Grant Agency, project No. 19/2011 "Single-factor and multifactor productivity in context of input-output tables and composite indicators".

5. References

- EUROSTAT (1998). European System of Accounts 1995. Luxembourg.
- Fischer, J., Fischer, J. (2005). Měříme správně hrubý domácí produkt? (Do We Measure Gross Domestic Product Correctly?). Statistika, 3/2005.
- Fischer, J., Sixta, J. (2009). K odhadu souhrnné produktivity faktorů (To the Estimates of Total Factor Productivity). In: Politická ekonomie, 2009, vol. 5, pp. 544--554. ISSN 0032-3233.
- Hronová, S., Fischer, J., Hindls, R., Sixta, J. (2009). Národní účetnictví (National Accounts). C.H. Beck, Praha.
- Jilek, J., Moravova, J. (2007). Ekonomické a sociální indikátory (Economic and Social Indicators). Futurum, Praha.

THE POSITION OF ICT SECTOR IN THE NATIONAL ECONOMY OF CZECH REPUBLIC

Antonín Pavlíček, Radovan Kačín, Tomáš Sigmund, Josef Hubáček

Department of System Analysis
Faculty of Informatics and Statistics
University of Economics, Prague

antonin.pavlicek@vse.cz, kacin@vse.cz, sigmund@vse.cz, josef.hubacek@vse.cz

Abstract

As economies around the world are transforming towards the new information economy, the pace and status of these transformations become something to be measured in order to be able to accurately compare national economies and their level of development. While there are many indicators as to digital readiness, a purely economic overview in a comparable manner is rarely available. This paper presents the results from a study of the position of ICT sector in the Czech and comparable neighboring economies from three main points of view - GDP value added, employment rate covered by ICT and effectiveness of the ICT sector. The methodology described is used to calculate these measures for Czech Republic. At the end a comparable neighboring countries statistics are provided to offer a simple and clear comparison.

Keywords

ICT Sector, Information Economy, Effectiveness, GDP

1. Introduction

The ICT transformation of economies and societies is a world-wide phenomenon indicating a shift towards a new kind of society – usually called “information society”. Information and the ability to quickly transfer, cheaply store, widely share (Pavlicek 2009), extensively search, find the most relevant, and readily use it is becoming one of the key production factors in a successful economy (Rosicky, 2006). While it would be possible to track it back perhaps a couple of years or decades (probably the first who mentioned such a shift was Bell (1974) in his term “post-industrial society”), the benefits of information economy, such as increase of effectiveness, speed of production and overall customer satisfaction, are indisputable.

Government agencies in the majority of countries are finally becoming aware of this transformation and initiate various levels of support for ICT driven economy, they do their best to foster the trend, usually with the focus on the education (Maryska, 2010).

The importance of ICT can be demonstrated simply by a comparison of average sectors’ wages of developed economies. Along with financial/insurance sector, the ICT specialists had one of the highest average wage in the Czech economy over the past 10 years (see Figure 1), and the gap of

average wages seems to still rise – sign that the demand for ICT services and products is still not saturated.

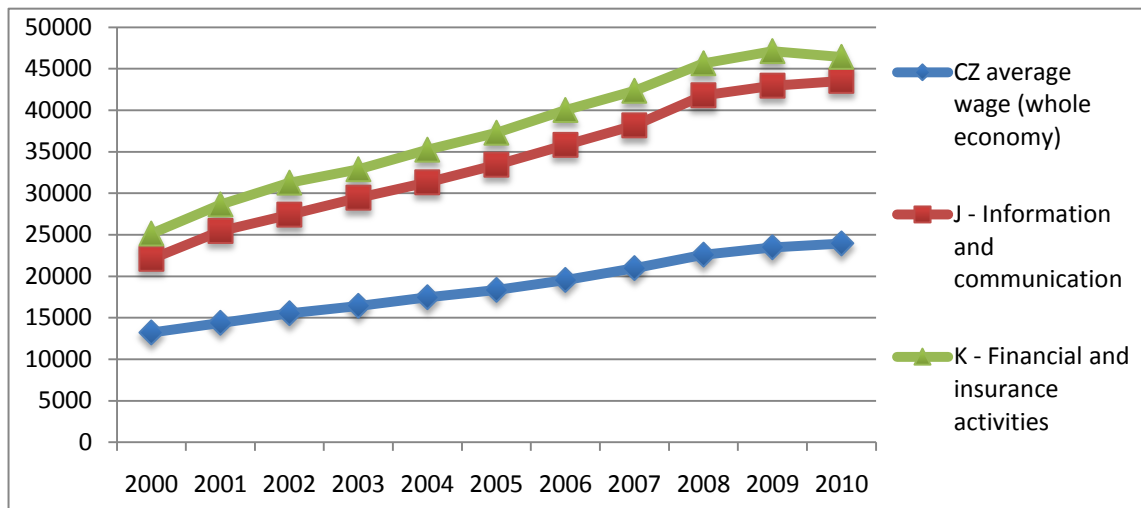


Figure 1: Average wages in Czech Republic (in CZK) (CZSO, 2010)

Some countries seem to have taken a better path to the digital transformation than others, but the lack of objective indicators for an easy comparison makes it difficult to pinpoint, what exactly should be done to increase the value of ICT in a national economy.

While researching the economic impact of ICT on Czech economy, a study was prepared to define the position and importance of ICT sector and precisely capture its place among other economic sectors. The results were used to support a report for the Czech government to set new goals for future national ICT strategies within Czech Republic.

By presenting and discussing the results from Czech Republic and then calculating the same indicators for other (similar sized) economies, we shall present a way to quickly compare the importance that ICT has in various countries. This, in effect, will allow us to more precisely conclude, whether the steps taken to support ICT on a national scale are comparable and reusable in the countries compared, as it should clear out some of the partly hidden variables.

2. Methodology

For the basic comparison, three main approaches were taken. Firstly there is the economic value that ICT presents to the national economy. This is measured by the value added to GDP in a given year, a statistical variable which is usually measured by local (national) statistical offices in most countries and similar structure. We use the total amount of value added to GDP in economic sectors categorized as ICT production / ICT services, and divide it by the total value added to GDP by all sectors in the economy.

$$\text{ICT economic position} = X_{\text{ICT}} / X_{\text{total}}; \text{ where } X \text{ is the value added to GDP}$$

Secondary factor of importance could be the number of working positions on the labor market covered directly by ICT sector. This can be usually found as raw data from national statistical offices as well, however in our research there proved to be difference between Czech and abroad methodology. A similar calculation as in previous indicator is used; the number of people employed by ICT production and ICT services is divided by the total number of people employed within the economy.

ICT employment rate = $Y_{\text{ICT}} / Y_{\text{total}}$; where Y is the number of people employed, either in a given sector (in our case ICT) or in economy as a whole.

It is important to realize that many people in ICT, especially in ICT services might not be working on a fulltime contract, but instead, they work with part-time contracts or just as freelancers. To control for this difference in our calculation it is best to use employee counts recalculated to FTE (full-time equivalent) that represents the employee numbers and the labor ratio more precisely. This of course was a problem, since such data were available just for the Czech Republic.

The last variable calculates the effectiveness of ICT sector in Czech Republic by combining the two previous indicators (dividing the GDP value added indicator by the labor rate indicator). This provides us with a new indicator that represents how much value to GDP is added by the same amount of labor in ICT sector of the economy.

To be able to position the ICT sector within the national economy, the same calculations must be made for all the other economic sectors as well. Afterwards a simple sorting by the descending values of each indicator allows us to define the place that ICT sector takes up in the economy. Some additional comparative statistics can be calculated as well.

3. Data sources

3.1. Czech Republic

Main data sources used for research and calculations are statistics available at national statistical offices (CZSO 2010, CZSO 2011, Austria 2011, Finland 2011, Ireland 2011, Slovak 2011, and Eurostat 2011). In the case of Czech Republic all the necessary data are available online in a very detailed form. This allowed us to calculate the indicators on a quite detailed level of economic sector distinction.

Since there was no specific sector for information technology industry/services defined as a whole, it was necessary to use a definition also provided by the Czech Statistics Office (CZSO).

The exact definition of sectors involved covers:

- **ICT manufacturing (ICT producing industries)** - covering all industry with their main focus on manufacturing machines and devices necessary for information collection and processing on a digital level.
- **ICT trade (ICT wholesale)** - covering all sectors where the main economic activity consists of procurement and re-selling of ICT products
- **ICT services** - covering any economic areas of supplying services directly linked to information and communication technology

These three distinct parts needed to be identified for better analysis, because they can all produce very different results. Because of unavailability of data on the ICT trade, the study only focused on ICT manufacturing and ICT services.

As mentioned earlier, there were two basic data types used. For economic value added to GDP the simple "gross GDP value added" from national macroeconomic variables was used. Employment ratio is calculated from the reported data on FTE equivalent workers in each sector of the economy. Then by dividing the two indicators, we derived the result of the economic sector effectiveness.

3.2. Slovakia, Austria, Ireland and Finland

Data sources have been identified on Slovak (2011), Austrian (2011), Finish (2011) and Irish (2011) national statistical offices, as well as some data from OECD (2011) were useful. While the data were in different structure (and some gaps in them), it was suitable just for a basic comparison. So far we can make the comparison on a more generalized level (differentiating ICT from other main economic sectors according to highest level of NACE classification). It is our hope to be able to obtain data also on a more detailed level to provide a comparison on a similar level as we were able to calculate for Czech Republic in some future papers.

4. Results for Czech Republic

4.1. Economic value of ICT sector

As described earlier, the results for economic value present the part which ICT related sectors take in the added value to national GDP. Data is available in both more generalized and more specialized view on economic sectors, and also differentiates ICT for ICT manufacturing and ICT services.

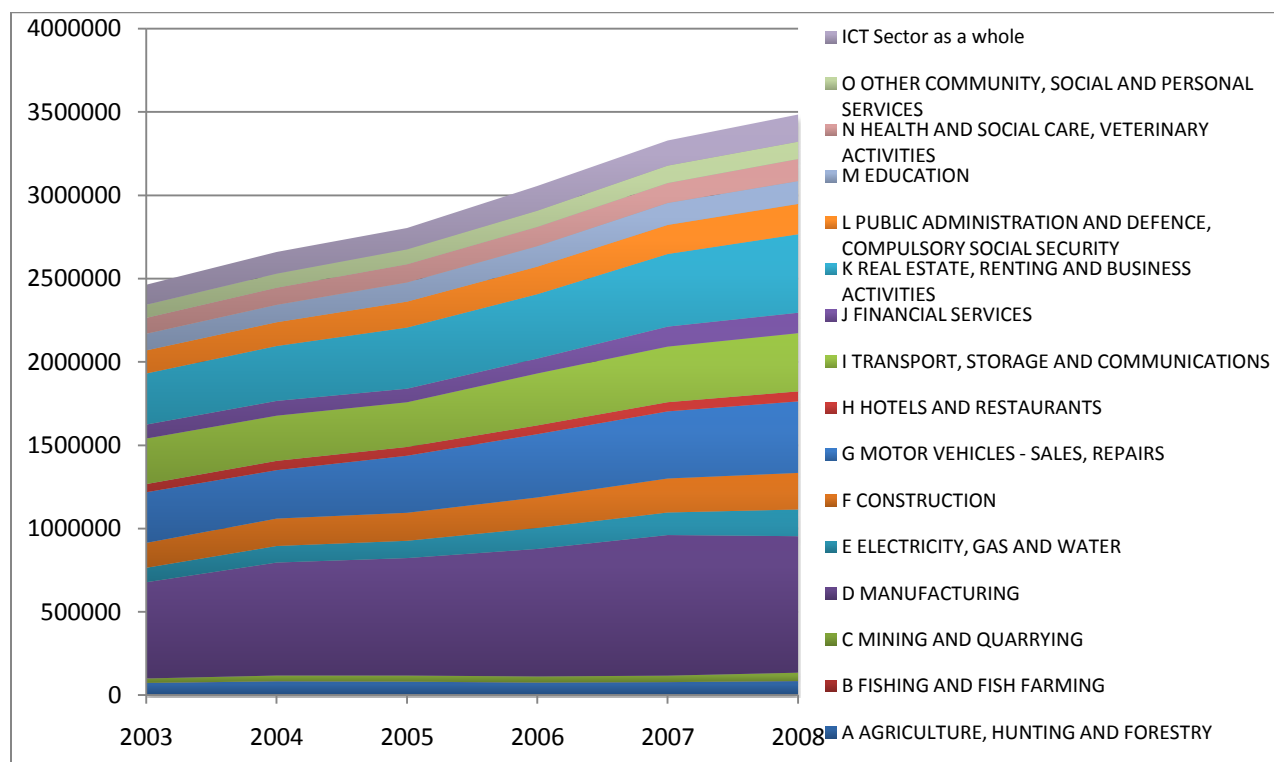


Figure 2: Value added to national GDP in Czech Republic (in millions CZK)

ICT sector's value added to GDP has grown by about 35,5 % over five years. Czech Republic's GDP in total has grown by nearly 41,8 % in the same period, so ICT is somewhat under the average. The latest calculated state in the year 2008 shows that ICT sector as a whole generates a 5,128% of all the GDP value added. This positions it on the 7th place of all 16 referenced economic sectors (15 basic sectors plus ICT).

To visualize the portion of GDP value added in comparison to others see Figure 2, which depicts well that ICT adds an undisputable portion of value to the Czech economy.

4.2. Employment ratio of ICT sector

There are two possible way to analyze ICT workforce. The approach from the standpoint of HR management has been discussed by the authors last year (Oskrdal, 2010, Pavlicek 2010); now let's have a look on the level of whole economy. Similarly to the economic value added to GDP, we can measure the portion of all employed people working directly in the ICT sector. As in the section before, data is available both in general and more detailed form; once again we only present the general ones to save space.

Table 2 shows the economic sectors and their respective counts of workers (recalculated from the full-time equivalent).

	2003	2004	2005	2006	2007	2008	Portion of 2008 CZ employed personnel	Change 08/03	Posi- tion
A AGRICULTURE, HUNTING AND FORESTRY	132584	122666	117297	112490	105338	97962	3,021%	-26,11%	11.
B FISHING AND FISH FARMING	1504	1449	1334	1319	1174	1143	0,035%	-24,02%	16.
C MINING AND QUARRYING	48635	46117	44198	42653	40440	39533	1,219%	-18,71%	15.
D MANUFACTURING	1026863	1021545	1036078	1052630	1072143	1083900	33,425%	5,55%	1.
E ELECTRICITY, GAS AND WATER	61883	60251	56949	53541	52266	47124	1,453%	-23,85%	14.
F CONSTRUCTION	159822	157366	161015	162244	158427	156795	4,835%	-1,89%	8.
G MOTOR VEHICLES - SALES, REPAIRS	259908	261721	276716	288390	308969	318634	9,826%	22,60%	2.
H HOTELS AND RESTAURANTS	44118	45665	48491	49489	49037	51095	1,576%	15,81%	13.
I TRANSPORT, STORAGE, COMMUNICATIONS	260413	255855	250305	248553	248265	249128	7,683%	-4,33%	6.
J FINANCIAL SERVICES	64440	63017	62676	62785	64595	67237	2,073%	4,34%	12.
K REAL ESTATE, RENTING, BUSINESS ACT.	184600	191684	199807	219214	240085	250779	7,733%	35,85%	5.
L PUBLIC ADMINISTRATION AND DEFENCE, COMPULSORY SOCIAL SECURITY	294690	290166	289169	290539	287546	289796	8,937%	-1,66%	3.
M EDUCATION	272277	268258	259644	260483	262536	258868	7,983%	-4,92%	4.
N HEALTH AND SOC. CARE, VETERINARY ACT.	214978	215642	217417	220414	223371	223368	6,888%	3,90%	7.

OTHER COMMUNITY, SOCIAL AND PERSONAL SERVICES	100294	103328	105988	109516	107311	107405	3,312%	7,09%	10.
ICT Sector as a whole	107036	110385	113407	121349	132917	144986	4,471%	35,46%	9.
Czech Republic totals	3127010	3104730	3127084	3174260	3221503	3242767		3,70%	

Table 1: Number of people employed in economic sectors of Czech Republic (FTE recalculated); Source: CZSO (2010, 2011)

The percentage of working positions covered by ICT in the last year of the time series, 2008, shows that ICT jobs represent almost 4,5 % of the Czech workforce. This positions it on the 9th place of all the 16 sectors compared. Once again, the ICT jobs are not only covered by our "ICT as a whole" sector, but also in other ones as well (mainly in sector *I - Transport, storage and communications*). This is the cause to the cumulative total of all the percentages would be over 100%.

Most interesting point of the ICT workforce however, is the growth over time. A quick look through Table 1 indicates that together with the real estate and renting sector, ICT has one of the fastest growing bases for employment - the rest is usually growing much slower, in some cases even shrinking.

4.3. Effectiveness of ICT sector

Comparing the GDP value added and FTE recalculated employment allows us now to construct a new indicator to measure the effectiveness. Simply put, we will divide the percentage found as a part of GDP value added by the percentage of active workforce in a given economic sector. The result shows the real effectiveness - how much value does each working person in any sector generate compared to a person in other economic sectors. While the indicator itself is rather simple, we believe it to be sufficient for a quick comparison among all sectors within a national economy.

In order to have a time-series of results for this new indicator, we calculated the percentage portions for each year in both previous two indicators (GDP value added and employment coverage). To save space the recalculated tables are not presented here. The percentages for each year were however used to calculate the effectiveness indicator for every sector in each year separately. The results are available in Table 2.

	2003	2004	2005	2006	2007	2008	Change 08 / 03	Position (2008)
A AGRICULTURE, HUNTING AND FORESTRY	0,67	0,74	0,72	0,66	0,67	0,75	13,40%	11.
B FISHING AND FISH FARMING	0,49	0,46	0,45	0,43	0,35	0,28	-42,41%	16.
C MINING AND QUARRYING	0,66	0,82	0,86	0,84	0,87	1,12	68,60%	7.
D MANUFACTURING	0,68	0,73	0,71	0,72	0,72	0,66	-2,70%	12.
E ELECTRICITY, GAS AND WATER	1,70	1,82	1,91	2,32	2,36	2,99	75,83%	1.
F CONSTRUCTION	1,13	1,15	1,09	1,11	1,17	1,23	8,54%	5.

G MOTOR VEHICLES - SALES, REPAIRS	1,42	1,22	1,30	1,30	1,19	1,18	-16,58%	6.
H HOTELS AND RESTAURANTS	1,35	1,35	1,14	1,05	1,02	1,04	-23,07%	8.
I TRANSPORT, STORAGE AND COMMUNICATIONS	1,27	1,17	1,12	1,24	1,22	1,23	-3,20%	4.
J FINANCIAL SERVICES	1,58	1,55	1,36	1,40	1,69	1,60	1,57%	3.
K REAL ESTATE, RENTING AND BUSINESS ACTIVITIES	2,01	1,89	1,92	1,74	1,65	1,65	-18,08%	2.
L PUBLIC ADMINISTRATION AND DEFENCE, COMPULSORY SOCIAL SECURITY	0,57	0,54	0,56	0,56	0,55	0,55	-3,43%	13.
M EDUCATION	0,44	0,43	0,46	0,47	0,46	0,47	4,86%	15.
N HEALTH AND SOCIAL CARE, VETERINARY ACTIVITIES	0,54	0,53	0,53	0,52	0,49	0,52	-3,37%	14.
O OTHER COMMUNITY, SOCIAL AND PERSONAL SERVICES	0,95	0,90	0,88	0,88	0,89	0,85	-10,52%	10.
ICT Sector as a Whole	1,36	1,30	1,19	1,20	1,03	0,99	-27,54%	9.

Table 2: Effectiveness in economic sectors of Czech Republic (GDP value added per workers employed)

Results of the last indicator show that the effectiveness of ICT sector as a whole is basically average among the rest of the sectors. There are two reasons to this. Firstly, the number of ICT employees is growing faster than the GDP value produced. Secondly, our definition of ICT sector as a whole covers both ICT services and ICT production. If we were to differentiate between the two, there will be a large gap, with ICT services resulting with much higher effectiveness than ICT production. This however is only visible at the more detailed level not presented within this paper - but can be found in our referenced studies. In our generalized case, ICT as a whole is placed once again around the middle of Czech economy at the 9th place.

Noteworthy is also the change of effectiveness over time, as it's falling quite swiftly, over 27,5 % in just five years. This of course is not the problem of ICT sector alone; many others seem to be on a similar path as well. Aside from a few exceptional increases – mainly mining and energy distribution - most sectors are not getting much better at their effectiveness.

5. Other countries: Slovakia, Austria, Ireland and Finland

When comparing situation in the Czech Republic to our neighbouring (comparable) countries, we can say that position of Czech ICT sector is relatively good. With fluctuations around 5 % mark the

Czech Republic has the ICT sector of economy well established. Other countries score about one percentage point below that, with exception of Finland, reaching 5,5 % in 2004, but steadily declining since (possibly connected with Nokia's decline). For details see Table 3, which summarizes the data from countries' statistical offices, Eurostat (2011) and OECD (2011).

	2003	2004	2005	2006	2007	2008	Change 08 / 03	Position (2008)
CZECH REPUBLIC	5,13%	5,14%	4,79%	5,10%	4,74%	4,91%	-4,42%	7
FINLAND	5,53%	5,50%	4,81%	4,45%	3,20%	3,23%	-41,53%	10
IRELAND	1,52%	1,72%	1,99%	3,28%	3,01%	N/A	98,23%	10
SLOVAKIA	4,00%	3,92%	N/A	4,74%	4,81%	4,51%	20,25%	8
AUSTRIA	N/A	N/A	N/A	N/A	N/A	4,00%	N/A	11

Table 3: Value added to national GDP in ICT sector; Source: relevant statistical offices

Table 4 describes the development of ICT employment in selected countries, using the employment in 2003 as a benchmark. While the Czech Republic and Ireland (data incomplete) have been rising the amount of its ICT workforce, Slovakia seems to be stagnant, while other countries even slightly decline numbers of ICT professionals (clearly reached the peak earlier). This may be surprising finding, which need further research for an explanation (OECD, 2011).

	2003	2004	2005	2006	2007	2008	Change 08 / 03	Position (2008)
CZECH REPUBLIC	100%	103,13%	105,95%	113,37%	124,18%	135,46%	35,46%	9
FINLAND	100%	99,17%	99,79%	96,04%	94,38%	85,83%	-14,2%	15
IRELAND	100%	N/A	119,68%	150,98%	N/A	N/A	N/A	16
SLOVAKIA	100%	105,31%	N/A	111,84%	119,18%	101,63%	1,63%	12
AUSTRIA	100%	97,95%	96,58%	96,23%	86,99%	N/A	N/A	16

Table 4: Development of ICT sector employment (percentage of 2003); Source: relevant statistical offices

6. Conclusion

Position of Czech ICT sector is solid. Its value added to GDP has grown by about 35,5 % over five years (2003-2008), while overall Czech Republic's GDP has grown by nearly 41,8 % (ICT sector almost matched the growth). The percentage of working positions covered by ICT represents almost 5 % of the Czech workforce, being above the EU average. It is safe to conclude, that the Czech Republic has transformed its economy and society towards modern trend of "information society".

Acknowledgement

This article was created thanks to the finances provided by VŠE IGA grant „IG409061“

7. References

- Austria Statistical Office (2011) GDP statistics, (on-line, accessed 15. 4. 2011, <http://www.statistik.at/dynamic/wcmsprod/groups/mi/documents/webobj/029252.pdf>)
- Bell, Daniel (1974). The Coming of Post-Industrial Society. New York: Harper Colophon Books, ISBN-13: 978-0465097135
- CZSO - Czech Statistical Office (2010) Mzdy IT odborníků v ČR, (on-line, accessed 3. 4. 2011, available at www.czso.cz/csu/redakce.nsf/i/mzdy_it_odborniku_v_ceske_republice)
- CZSO - Czech Statistical Office (2011) Average wages in Czech Republic, (on-line, accessed 3. 4. 2011, available at www.czso.cz)
- Eurostat (2011) GDP statistics on-line http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_bde15ag&lang=en
- Finland Statistical Office (2011) GDP statistics, (on-line, accessed 17. 5. 2011, <http://pxweb2.stat.fi/Dialog/Saveshow.asp>)
- Ireland Statistical Office (2011) GDP statistics, (on-line, accessed 12. 4. 2011, <http://www.cso.ie/px/pxeirestat/Statire/SelectVarVal/saveselections.asp>)
- Maryska, M., Novotny, O., Doucek, P. (2010) ICT Knowledge Analysis Of University Graduates IDIMT-2010: Information Technology - Human Values, Innovation And Economy Book Series: Schriftenreihe Informatik Volume: 32 Pages: 125-135 Published: 2010, ISBN: 978-3-85499-760-3
- Mildeova, S. (2006) The Network of National and EU Projects To Support Systems Thinking And System Dynamics, IDIMT-2006 Book Series: Schriftenreihe Informatik Volume: 19 Pages: 309-318 Published: 2006, ISBN: 978-3-85499-049-9
- OECD (2011) GDP and Employment Statistics (on-line, accessed 15. 4. 2011, available at www.oecd.com)
- Oskrdal, V., Jelinkova P. (2010) Human Resources Management in ICT Context - The Drivers Of Personnel Performance. IDIMT-2010: Information Technology - Human Values, Innovation And Economy Book Series: Schriftenreihe Informatik Volume: 32 Pages: 145-152 Published: 2010, ISBN: 978-3-85499-760-3
- Pavliceck, A. (2009) The Challenges of Tacit Knowledge Sharing in a Wiki System, IDIMT-2009: System and humans - a complex relationship Book Series:Schriftenreihe Informatik, 2009, Vol.: 29 Pages: 391-397, ISBN: 978-3-85499-624-8
- Pavliceck, A. (2010) Human Resources in ICT-Information And Technological Literacy as the Qualification Prerequisites IDIMT-2010: Information Technology - Human Values, Innovation And Economy Book Series: Schriftenreihe Informatik Volume: 32 Pages: 153-159 Published: 2010 ISBN: 978-3-85499-760-3, ISBN: 978-980-6560-80-2
- Rosicky, A., Pavliceck, A. (2006) Information and Internet change society: emerging constitution of the social system Internet Society II: Advances in Education, Commerce & Governance Book Series: Wit Transactions On Information And Communication Technologies Volume: 36 Pages: 201-213 Published: 2006
- Slovak Statistical Office (2011) GDP statistics, (on-line, accessed 15. 4. 2011, <http://portal.statistics.sk/showdoc.do?docid=29032>)

THE LIMITS OF ICT FOR INNOVATIONS AND ECONOMIC GROWTH

Stanislava Mildeová, Radim Brixí

Department of Systems Analysis
Faculty of Informatics and Statistics
University of Economics, Prague
mildeova@vse.cz, radim@bixi.net

Abstract

ICT is now key an asset for the competitiveness of enterprises. It became the main stream of doing business well. These days we come to era where enterprises are fully dependant on ICT. This paper should describe more deeply the impacts of such a dependence and underlying problems. In context of the necessary new innovations of enterprises, we will focus more on the negative aspects of being dependent on ICT with the technological architecture of hard systems. We will also provide a suggestion as to how to model these limits in an objective manner.

Keywords

Innovation, ICT, Enterprise, Diffusion Model, Information Management, Causal Loop Model, System Dynamics Model

1. Introduction

Based on eminent phenomena, today's world is automatically drawn together in the pursuit of *complexity* and of building *knowledge society*, which is well-known within Richardson's work last year (for example Richardson and Goldstein, 2007 or Tait and Richardson, 2010), of *e-society* according to Doucek (2004), of *ambient intelligence* as a vision of *information society* of the future (see Bures and Cech, 2007), and of building *innovative society*, so-named in Mulej's innovation theory work (Mulej, 2006), among others. In connected, competitive, globalized world innovation is understood as *competitive advantage*. It turns out it is *innovation* more than *optimization of processes* that leads to success of enterprises. Enterprises are always looking for new and evolutionary solutions and opportunities (see Mildeova, 2010).

Basl and Gala stated, "ICT is a part of innovation or it is the innovation itself," and "ICT is one of the information system sources, it effectively supports development and/or innovation adaption and usage" (Basl, Gala, 2009, p. 70).

There is some evidence that various approaches to innovation exist, foremost *hard models* focused on technical programs and soft models focused on organizational programs. Empirical studies show that *soft model* approaches to innovation have greater success (Salge, 2008).

The reasoning of the *research methodology*, which is used in the paper, is to look at the innovation problems from a different point of view than do traditional approaches. For this purpose we are trying to understand both, the *systemic nature of technology* and the *human factor* of using ICT in

enterprises. Systems and systemic points of view come to light as useful paths for solving problems connected with complex systems and their economic growth (Potuzakova, Mildeova, 2011). No matter how much of this text is concerning *technological innovation*, technologies are not the only form of innovation. Though humans and technology understand the world differently, their two perspectives can be meshed to show two sides of a coin. These two perspectives can be united in *narrativity*. Sigmund (2008) pointed out this problem.

2. Dynamism of Innovations in ICT Business

According to *National Innovation Initiative*, published by *U. S. Council on Competitiveness*, innovation is the most important factor dictating enterprise success. Thanks to innovation, the work productivity in enterprises has grown, mainly in the ICT sector.

Thanks to the growth of ICT productivity, functionality is increasing while prices go down, as described by *Moore's Law*. According to this law, the prices of the integrated circuits decrease by fifty percent every 18 months. If the prices stay the same their efficiency doubles. There has never been such a huge market for mass production with such speed of technological improvement, with the exception of the computer industry (Jandos, Vorisek, 2009).

2.1. Models for Innovation Diffusion

In ICT, the typical way to compete with competitors is by decreasing productivity time. The enterprise needs to quickly invent new products and implement them to the market. Most of the ICT products prefer the strategy of hitting the mass market rather than “exceptional market” and maximizing the profit with great volumes of production. It is believed that the price of a product is the key to winning the market. The enterprises try to be at top of lowest price competition rather than being on top of innovation (Prokesch, 1993).

A different but also very effective way to create and maintain company growth is called *disruptive innovation diffusion*. According to Georgantzis and Katsamakas (2009), disruptive innovation diffusion is an innovation which is quite evolutionary and discontinuous, and customers accept new paradigms. Two examples are the first personal computer from Apple and accounting software QuickBooks by Intuit. These products emerged in a market that did not at first target the masses, but rather supposed that their customers, mainly businesses, needed all the power and functionality offered by traditional companies. Ultimately, while other companies went out of business, these products managed to dominate because they chose to innovate and adapt themselves to accommodate use by the average person.

Invention of PC can also be understood as disruptive innovation diffusion because minicomputers from the end of nineteen eighties offered more power, functionality and capability than customers could use. The PC was a new choice for people who accepted less functionality for lower price. PDA and i-Pod will probably follow this example.

Discussing innovations, we have to mention, that distribution of many new products roughly mimics logarithmic curves. The *logarithmic model* contains two *feed-back positive loops*, generating accelerating growth in the short term and a *negative feedback*, which slows the growth down as the number of units is getting near capacity. Diffusion of innovation usually contains many different *positive feed-backs*. For example, availability of software for company support is a very attractive feature for a PC product. Software engineers for company support will always write software for platforms with the biggest market potential. This means that the more installed

computers and the more software written for them generates a larger variety for potential customers and the larger amount of installed computers.

The *Bass diffusion model* and wide spread extension of *Logarithmic model* with concept of external source of information has become very useful in advertising is widely used in technology management (Stermann, 2000).

3. Technical Limits of ICT for Innovations

ICT is widely used for precise and fast algorithmization and computers offer very good service in terms of fulfilling given tasks (of hard system type) with *exact input* and *exact output*. This can be easily used in places where changes in the calculation process does not change or rarely changes. Otherwise a skilled developer must change the *code* and update the *algorithms*. This *correction mechanism* is a small step in the innovation process of software. Innovations where hardware change is incorporated are more difficult because of necessary software migration and technological upgrade issues. This is based on architecture of computers and these principles will last unless paradigm change in architecture like Brixí and Brixí (2009) is used for different handling with information and understanding information.

3.1. Enterprise IS

Now let's consider some issues when evolving to larger scales of the same principles. First of all we can consider large enterprise with several divisions that need to be harmonized from the *technological end process point of view*.

Now we continue useful discussion about human resources management according to Oskrdal and Jelinkova (2010) and face the question: How much energy and what resources are needed to manage ICT to evolve in the same speed as the *enterprise evolution process* changes the enterprise's needs for ICT services? We should also ask whether or not the effectiveness, flexibility and amount in the larger scale is still effective when we focus on innovations. The problems can be documented when large enterprise IS are installed in large scale international enterprises. Human beings evolve naturally continuously, but ICT mainly evolves in steps even though they can be small like hot-fixes or smaller updates. Larger steps are upgrades or entirely new *architectures of information systems*.

Basically humans learn continuously, but IS is updated in steps based on innovation needs (see Figure 1).

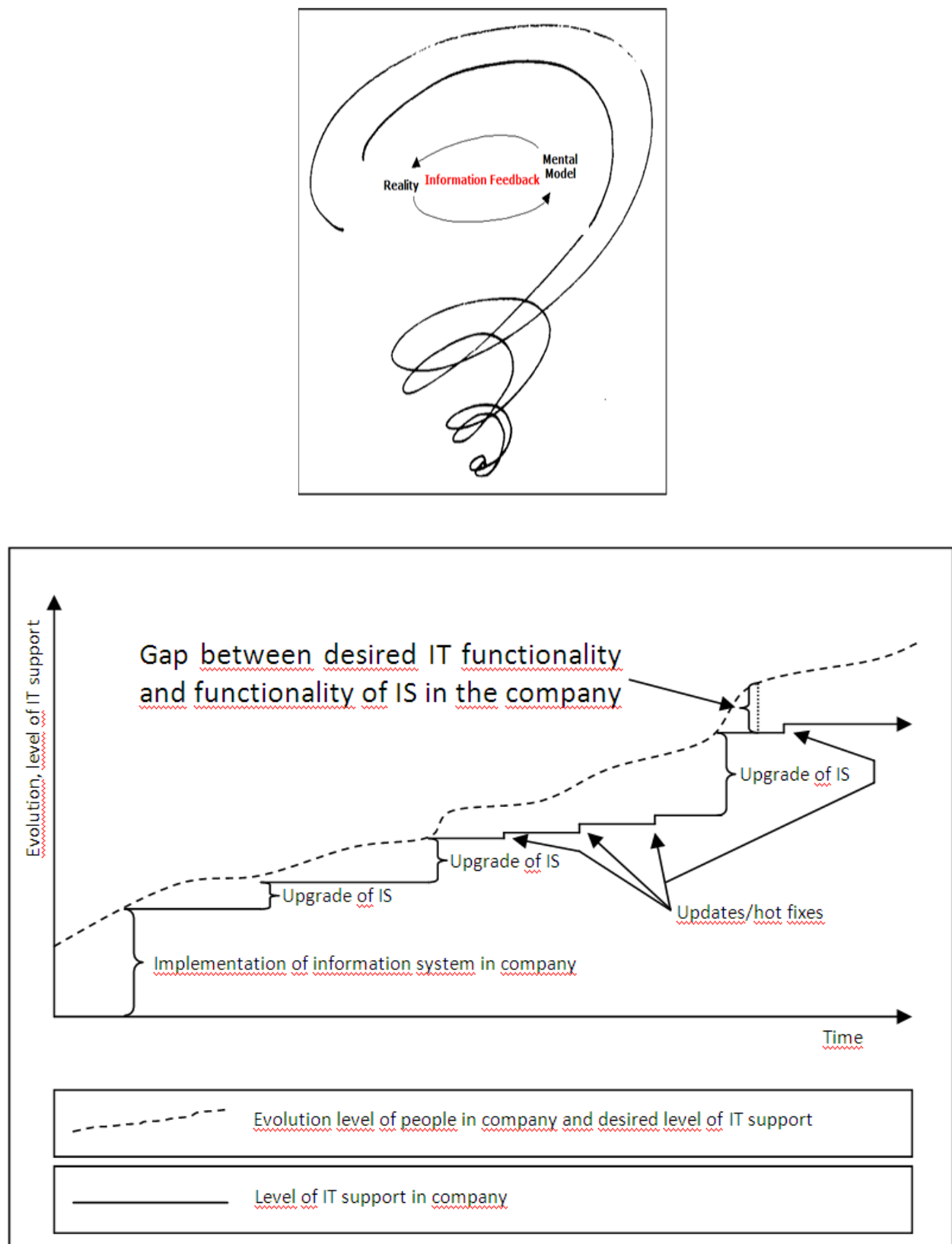


Figure 1: Differences between kinds of development; (Source: authors)

This distinctness is the causal reason for many issues with low flexibility of ICT for current needs that change quickly in turbulent environment. Even though resistance to changes is a typical attribute of most people, humans rather adapt to ICT than managing ICT to adapt to humans needs. This is why the architecture of ICT should be revised and these issues should be taken into account. The *dependence on ICT* is therefore a very dangerous factor for innovations and economical growth. In larger scales ICT brings many limitations and can be the cause of enterprise's stagnation.

As we showed in part 2 "Dynamism of Innovations in ICT Business", the usual reason to accelerate *innovation cycle* is to get from research to market as quickly as possible. The question is, if it should be otherwise in ICT area. The cycle should take a short time to allow research to start as late as possible. Then the producer of ICT will have time to find out all requirements of its users and provide the technology that people really need.

This could be a chance for disruptive innovators. Never-ending innovations of recently lead companies, overloading customers with technological functionality and services could turn against them.

3.2. Information Management

In the end it is very important to accent the role of *information management*, which plays an important part in the problems mentioned above. ICT is a technological base of information management for activities focused on managing of all information assets used by an *enterprise* (an organization) (Doucek, 2010). Management plays a leading role in the guiding and enforcement of innovation; on the other side, thanks to innovation within ICT, some activities in information management are performed by machine, creating additional spaces for management's own creativity (and further innovations).

3.3. Other limits of ICT for Innovation

Another consideration is the limit on ICT set by the government. ICT innovation is a dominant factor in global *economic growth*. According to Hanclova and Doucek (2011), who have provided a 2005-2008 time-analysis of determinants influencing a share of the ICT sector of GDP for the EU countries, the ICT sector part of GDP oscillates at about 5% and at the same time causally influences productivity of all other economic sectors. This is one of the main reasons why governments try to manage the rate of innovation activities within ICT and to set limits and other restrictions for innovation. Concerning governmental support, Stricik and Hajduova (2011) found that companies depend too much on ICT innovation for money from structural funds, i.e. support from the EU. Concerning governmental limits, we see significant problems in tight-money policy, tax policy, depreciation policy, and inadequate tax allowance.

4. Modeling of technical limits of ICT

The positive effects of ICT on enterprises are obvious. As known as soon as the enterprise slows down in terms of innovation it has very negative consequences. Being on top of the innovations process is the only resource for competitive advantage.

Thus, dynamic aspects and tools for simulation of innovation policy should be discussed. In terms of dynamics it might look as if it were self-reinforcing *causal loops*, which are using *feedback* to strengthen enterprises resources and fuel the companies' innovation. The *causal loops model* is a graphical tool with a higher level of generality and robustness. Our causal loop model aids in

visualizing how interrelated variables - *Innovation level*, *Evolution of innovation process*, *Gap of desired functionality x implemented functionality* and *Implemented technology* - affect one another. The model consists of a set of nodes representing the variables connected together. The relationships between these variables, represented by arrows, can be labeled as *positive* or *negative*¹⁹. The described model consists of two loops, one of them *reinforcing* and the second *balancing*²⁰. As displayed, it does not necessarily have to be that way, there are limits which weaken the *self-reinforcing effect* and might stop it at all (see Figure 2).

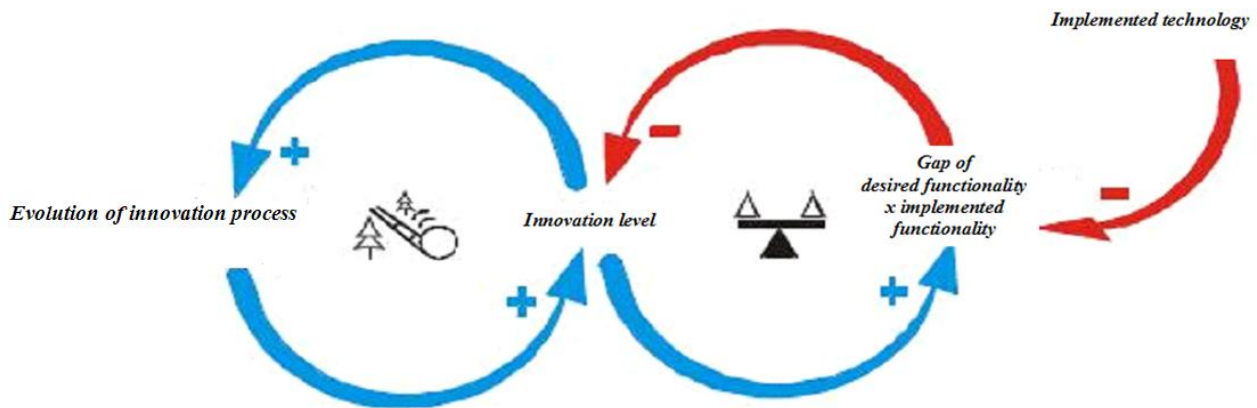


Figure 2: Causal Loop Model of the companies' innovation; (Source: Authors)

In alignment with *Systems Dynamics methodology*, the causal loop model can be adjusted to fit a *stock and flow model*. In fact, this solution already exists (Sterman, 2000).



Here, the main stock-determining dynamic of the described model is the *Innovation level*. This *Systems Dynamics* model would assist with better decision-making in innovation policy, could test decision-making strategies and policies, and more easily predict the behaviour of complex company systems. In these ways, the other described limits of ICT could be made visible. The formation of models is often considered a necessary part of concretely studying the dynamics of a complex system (Dlouhy, 2001).

5. Conclusion

This paper has described in greater depth the impacts of depending on IT and the problems underlying that dependence. We have focused primarily on the negative consequences of being

¹⁹Positive causal link means that the two nodes change in the same direction, i.e. if the node in which the link starts decreases, the other node also decreases. Similarly, if the node in which the link starts increases, the other node increases. Negative causal link means that the two nodes change in opposite directions, i.e. if the node in which the link starts increases, then the other node decreases, and vice versa" (wikipedia, 2011). Symbol is + or S for positive causal link, symbol is - or O for negative causal link).

²⁰To determine if a causal loop is reinforcing or balancing, one can start with an assumption and follow the loop around. The loop is:

- reinforcing if, after going around the loop, one ends up with the same result as the initial assumption.
- balancing if the result contradicts the initial assumption" (wikipedia, 2011). Symbol is + , R or  for reinforcing loop, and symbol is -, B or  for balancing loop).

dependent on ICT that has the technological architecture of hard systems. Systems Dynamics itself was founded as a prospective set of tools that enables us to more comprehensively understand the technical limits of ICT, and structure and dynamics' impact on the innovation process.

The problem of whether to use or not use the ICT technology does not stand, the question is which amount of this technology is most efficient for companies. Enterprises are fully dependant on ICT, at the same time technologies cannot expect to have an impact themselves if no companies use them to innovate. While using ICT, people still have to most of the work. The whole paradigm would have to change if technology was not limited to innovation and economic growth. Producers of ICT would probably have an understanding of individuals' needs, what customers use ICT for and why they use it. Instead of technological innovations, they should react more flexibly to demands on innovations from enterprises. Enterprises would then be able to focus on reengineering organizational processes, rather than technical.

Acknowledgement

This paper is a result of institutional research project VSE IP400040 supported by Faculty of Informatics and Statistics, University of Economics, Prague.

6. References

- Basl, J., Gala, L. (2009). The Role of ICT in Business Inovation. Jindrichuv Hradec 09.09.2009 – 11.09.2009. In: IDIMT-2009 System and Humans – A Complex Relationship. Linz : Trauner Verlag universitat, 2009, p. 67–76. ISBN 978-3-85499-624-8.
- Brixí, R., Brixí, S. (2009). The Association Reactor in a Human-like Robot Architecture Concept: An Interdisciplinary Approach. Jindřichův Hradec 09.09.2009 – 11.09.2009. In: IDIMT-2009 System and Humans – A Complex Relationship. Linz : Trauner Verlag universitat, 2009, p. 297–308. ISBN 978-3-85499-624-8.
- Bures, V., Cech, P. (2007). Complexity of Ambient Intelligence in Managerial Work. ACM SIGCSE Bulletin, ACM Press NY, Vol.39, Iss.3 (September 2007), pp. 325, 2007, ISSN 0097-8418.
- Dlouhy, M. (2001). Matematický model restrukturalizace odvětví a firmy [A Mathematical Model of Sector/Firm Restrukturalization]. Politická ekonomie, 2001, vol. IL, no. 4, p. 540–546. ISSN 0032-3233.
- Doucek, P. (2004). E-Society – Perspectives and Risks for European Integration. Budwais. 15.09.2004 – 17.09.2004. In: IDIMT-2004. Linz : Trauner Verlag universitat, 2004, p. 35–42. ISBN 3-85487-665-3.
- Doucek, P. (2010). Informační management – vymezení, úlohy a role [Information management – determination, roles and challanges]. In: Doucek, P. Informační management. Praha : PROFESSIONAL PUBLISHING, 2010, p. 13–27, ISBN 978-80-7431-010-2.
- Georgantzas, N.C., Katsamakos, E. (2009). Disruptive Internet-service innovation diffusion. Human Systems Management. Vol. 28, Num. 4/2009, p.163-181.
- Hanclova, J., Doucek, P. (2010). Education and ICT sector in the EU (Panel-national application). In: Proceedings of the 8th International Conference Efficiency and Responsibility in Education 2011. Prague: Czech University of Life Sciences Prague, 2011. p. 84-92. ISBN 978-80-213-2183-0.
- Jandos, J., Vorisek, J. (2009). Enterprise Web 2.0 What is it really? Marrakech 09.11.2009 – 10.11.2009. In: Knowledge Management and Innovation in Advancing Economies: Analyses & Solutions [CD-ROM]. New York: IBiMA, 2009, p. 1–6, ISBN 978-0-9821489-2-1.
- Mildeova, S. (2010). System Dynamics Supporting Complexity Management: Case Studies from a Small Economy within an Economic Integration Environment. In: Tait, A., Richardson, K. A. (ed.). Complexity and Knowledge Management: Understanding the Role of Knowledge in the Management of Social Networks. Charlotte: IAP - Information Age Publishing, 2010, p. 261–277. ISBN 978-1-60752-355-0 / 978-1-60752-356-7.
- Mulej, M. (2006). Systems, cybernetics and innovations - Introduction. KYBERNETES. Volume: 35, Issue: 7-8, p. 939-941, ISSN 0368-492X.

- Oskrdal, V., Jelinkova, P. (2010). Human resources management in ICT context – the drivers of profesonnel performance. Jindrichuv Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, p. 145–152. ISBN 978-3-85499-760-3.
- Potuzakova, Z., Mildeova, S. (2011). Systemovy pristup ke konceptu flexicurity [Systems Approach to Concept of Flexicurity]. Politicka ekonomie, 2011, Vol.59, Num.2, p. 224-241. ISSN 0032-3233.
- Prokesch, S. E. (1993). Mastering Chaos at the High-Tech Frontier: An Interview with Silicon Graphics š Ed McCracken. Harvard Business Review, Vol. 71, Nov.-Dec.1993, p.136.
- Richardson, K. A., Goldstein, J. (ed.). (2007). Classic Complexity: From the Abstract to the Concrete. ISCE Publishing, 2007, 253 p., ISBN 9780979168833.
- Salge, M. (2008). The Role of Goal-Setting and Commitment in Continuous Improvement Processes [Online]. [2008]. [Cit: 5. 04. 2011]. <<http://systemdynamics.org/conferences/2008/proceed/papers/SALGE413.pdf> />.
- Sigmund, T. (2008). Unifying Perspective between Human Beings and Technology alias Can Narrativity Be of any Use? Jindrichuv Hradec 09.09.2008 – 12.09.2008. In: IDIMT-2008 Managing the Unmanageable. Linz : Verlag Osterreich, 2008, p. 237–247. ISBN 978-3-85499-448-0.
- Sterman, J. D. (2000). Business Dynamics. Systems Thinking and Modeling for a Complex World. USA: McGraw-Hill Higher Education, 2000, ISBN 0-07-231135-5.
- Stricik, M., Hajduova, Z. (2011). Inovačné aktivity malých a stredných podnikov [Innovation activities of SMEs]. Podniková revue Business Review. 2011. Vol. X, Num. 21, ISSN 1335-9746.
- Tait, A., Richardson, K. A. (ed.). (2010). Complexity and Knowledge Management: Understanding the Role of Knowledge in the Management of Social Networks. Charlotte: IAP - Information Age Publishing, 2010, 343 p., ISBN 978-1-60752-355-0 / 978-1-60752-356-7.
- Wikipedia - Causal loop diagram. Wikipedia. [Online]. 04/09/2011. [Cited: 06/16/2011]). http://en.wikipedia.org/wiki/Causal_loop_diagram.

SUPPORTING STATE COMPETITIVENESS BY GOVERNMENT ENTERPRISE ARCHITECTURE

Pavel Hrabě

SAP ČR

pavel.hrabe@sap.com

Abstract

The aim of this paper is presentation of Government Enterprise Architecture (GEA) conceptual model as well as important steps of GEA provisioning in the Czech Republic, as a means of support of state competitiveness, taken as further development of ideas presented in DCP and NERV.

Keywords

State Competitiveness of CR, ICT, Enterprise Architecture, Government Enterprise Architecture, GEA, Value of EA, Public Value

1. Introduction

ICT (Information and Communication Technology) influence on state competitiveness comes to light in number of areas. As important areas the business area and state administration area are considered. At business area the enterprises' competitiveness, efficiency and innovativeness is significantly influenced by ICT. At state administration, ICT is an important, although not only one, means for development and operation of efficient and competitive (in comparison with other states/countries) state administration, which by feedback significantly influences the competitiveness of business area.

ICT impact on competitiveness is deeply analyzed in Digital road to prosperity (Novotný & Voříšek, 2010), where are the key objectives also in an area of e-government improvements. This topic is further elaborated in NERV (Mejstřík, 2011); Recommendation O6 requires "to introduce principles of enterprise architecture, control of architectural processes and evaluation of IT investments based on criteria of demonstrable increase of state administration processes, with a goal of reaching a higher efficiency of public administration ICT investments".

Aim of this paper is, based on international experience, presentation of GEA conceptual model as well as important steps of GEA provisioning in the Czech Republic.

2. EA/GEA background

The term Enterprise Architecture (EA) as well as related research activities, and implementations are relatively recent. Although there is no universally accepted definition of EA, we present Gartner's definition (Rollings, 2010) where "Enterprise architecture is the process of translating business vision and strategy into effective enterprise change by creating, communicating and improving the key principles and models that describe the enterprise's future state and enable its evolution" and represents "the inherent design and management approach essential for

organizational coherence leading to alignment, agility and assurance”, as stressed by Doucet (Doucet, Götze, Saha, & Bernard, 2009).

The content of EA has been developed during the time into 3 evolutionary phases. As specified by Bredemeyer and Malan (2004) these phases are following

- Phase I - Technology architecture
- Phase II - Scope of this phase has broadened, in comparison with previous phase, both in (mostly IT) issues covered as well as in considering enterprise as a whole
- Phase III – covering not only on IT, but also on business issues with an accent on this business issues

EA implementation for the government should correspond with Phase III of EA evolution. In case of government by “business issues” we understand provisioning of functionality of state i.e. provisioning of state basic functions (e.g. state defense) viewed as processes and services for public administration, enterprises and citizens.

There are several approaches towards GEA implementation used in different countries. Namely Israel 5 – layer model of e-Government (Chen & Rashty, 2002), Singapore model SGEA (Saha, 2008), New Zealand FEA (NZFEAF RM, 2009), Queensland Government EA (QGCIO (Enterprise Architecture & Strategy), 2009) and United Kingdom xGEA model (CTO Council, 2006).

From these approaches the following important experiences may be drawn for eventual implementation in the Czech Republic.

New Zealand Federated Enterprise Architecture (FEA) is based on the following concept of EA “Enterprise architecture is the process of translating business vision and strategy into effective enterprise change by creating, communicating and improving the key principles and models that describe the enterprise's future state and enable its evolution. FEA may be considered to be an extension of eGovernment strategy, formulated earlier.

The Queensland Government EA (QGEA) is a federated architecture, which acknowledges that the Queensland Government is a single enterprise composed of autonomous agencies. Agencies are responsible for their own enterprise architectures, yet are able to leverage and contribute to whole of-Government architectures and investments through a single consistent framework.

3. Government Enterprise Architecture (GEA) Model

Governmental Enterprise Architecture (GEA) is enterprise architecture applied to the state as the system the same way as would apply to large business corporation.

GEA should at minimum include:

- Functions, services & processes
- Organization & Resources (and relationships)
- Applications and interfaces
- IT Infrastructure

3.1. Functions of State and service catalog of State

The process optimization of functions of the state is related to awareness of roles of individual players. It should also be careful about the overuse of the concept of service or public service. Most of what makes the current Czech government is to ensure its stability, income, security and so on. We can say that the State serves its people, and then transferred to corporate terminology, its majority shareholder, founder and owner. Only a small part of the functions of the state is a service the state the particular individual, whether citizen or company.

In the case of search for effective support process the state by information technology is really important to understand the real needs and interests of all stakeholders. This holistic understanding is best done using the enterprise (holistic) architecture the state.

Service catalog and process model of the State are both sets of knowledge about the State, which are indispensable, complementary each to other and both together form an important part of business architecture the state.

3.2. Public transformation based on business experience

The state would are at control of its architecture order to become competitive should manage the same principles and methods as a successful innovative large corporations.

If we use a parallel to the corporation, the state is financially controlled multistage holding. If the holding company hits the ceiling of its efficiency and effectiveness, shall be transformed. Basis of such transformation is for example:

- elimination of duplicate activities, centralization and consolidation activities
- division of the activities on the commodity (context) and unique (core)
- strengthen the accountability of managers and staff management by objectives and performance

The same needs and possibilities of transformation are also valid for the state. From what has long been a state matter, it is evident that the State needs transformation and that some transformation has already begun, e.g. project of the State Treasury IS and the planned Single Collection Place. Both are good ideas, but with a quite inadequate specification, no follow-up organizational transformation and totally out of context in the architecture of State.

3.3. Core and context processes of State – SSC Concept

The state, like a holding company, will identify with high probability a huge range of activities from its own administration (back office) and from the performance of public services (front office), where is potential to achieve savings on the eventual unification and centralization of these processes. The means for the effective performance of unified processes is usually owned or outsourced Shared Service Centre (SSC). Such centers often perform services on behalf of organizations and on their account, but they do it cheaper and more efficient than those of the organization.

Shared services center can be built in a horizontal level of the hierarchy governing the state (such as one-stop contact center for all branches of a single ministry) or even across multiple levels of hierarchy (one center of calculation and payment of wages to employees the State, a management center for all debts and liabilities of State clients to the State, etc.) for all departments at once. An

important initial step forward would be to create CSS in verticals of state, in the departments. Even there are now both human and legal obstacles preventing it that are overcome, however.

The important thing is that successful building of SSC needs to be done based on deep architectural knowledge, which is right now in Czech Republic still missing.

3.4. Cardinality of the relationship between state and bodies around

During the optimization process, State should be seen as single entity, with its strategic management processes and processes for managing its resources, as well as processes to provide services to its customers and communication with them performs only once or in unified manner.

Also from the perspective of clients, there is only one State and barriers between departments are entirely artificial and a hindrance, although they are historically very ingrained. This approach is sometimes also called the Whole-of-Government Approach.

On the other hand, the external partners of the State and its clients, its suppliers and of its alliance partners (governments and international organizations) exist only once. All the images of these relations should, therefore, also (the target for a number of years) exist in the system only once.

Prerequisite of expected implementation of such a model is the existence of central registers. Building such a central register of individuals and populations, which will contain each client only once, however is not a goal but rather mandatory enabler.

3.5. GEA Model

The GEA model for Czech Republic, called e.g. CGEA or Czech GEA, is created based on proven architectural frameworks and successful governmental architecture examples.

Initial idea was to decompose governmental EA by TOGAF to Business, Data (Information), and Application and Technology architectures. Inspired by FEAF we would like to add also Performance architecture to pressure government agencies to plan, monitor and evidence its performance. This part of architecture will be aimed also to handle Public Value aspects (Cresswell, Burke, & Pardo, 2006), and can be called Performance and Value Architectures.

Reflecting also methodology of TOGAF ADM we emphasize also architectural vision and recommend building it separately.

The whole CGEA is proposed in four layer model with four levels of granularity. The highest layer is the Architectural Vision with aim to catch and demonstrate in easy understandable manner all key aspects of Czech State Architecture.

Next level is called Business Architecture like in TOGAF, but extended to maximum number of objects of interest with aim to cover on the same level of information granularity knowledge about government (State) as whole. In fact it is, following a lot of its definitions, a holistic Enterprise Architecture. The Business = Enterprise Architecture is further divided into three domains:

- The top one – Strategy, Management and Governance architecture
- The left one – Public Service architecture, covering both external and also internal processes, services and functions,
- The right one – Resource (or Asset) Architecture, covering all kinds of assets, including also all IT resources, people, knowledge, technology, facility etc.

The third layer of architectures with deeper level of granularity is called Segment Architectures. All of them are also enterprise-wide or Cross-Government-wide, but because they are focused on separate topics, they go much deeper than Business = Enterprise Architecture and can have different level of granularity each to another.

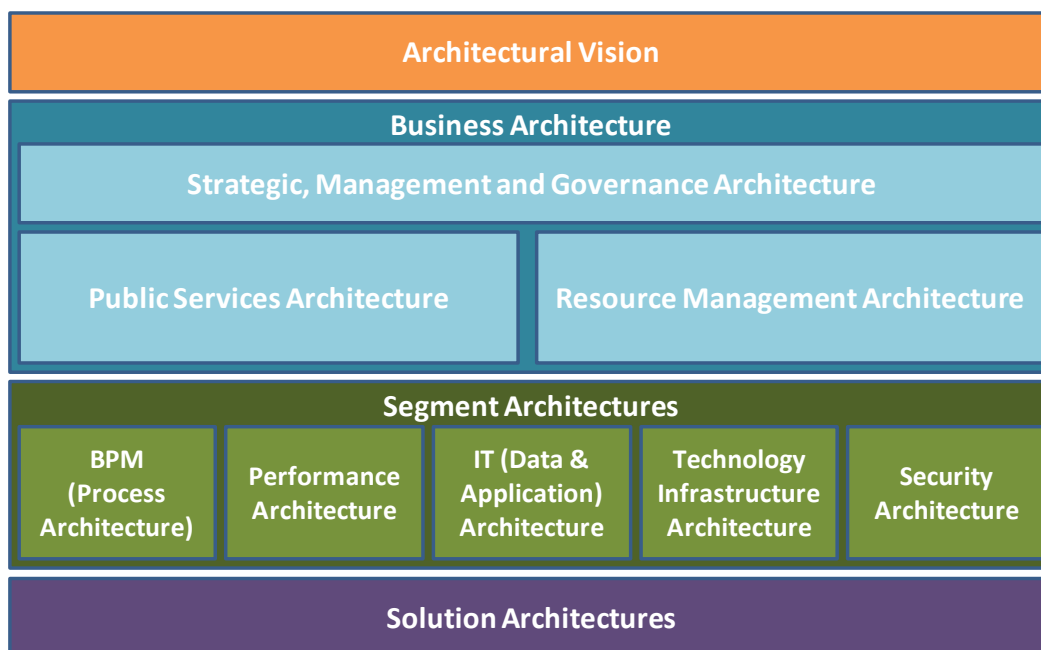


Figure 1: High level decomposition of Czech Government Enterprise Architecture

The lowest layer of GEA architectural model is group of Solution Architectures. Typical feature of these architectures is that they are really solving only one concrete opportunity for change and they are doing it across of all architectures in higher layers. For example an architecture of JIM will be based hopefully on one common vision, will elaborate objects from all domains of Business architecture, respect all standards from all segment architectures and draw feasible solution architecture containing goals and legislation, functions, roles, processes and organization, data and applications, HW and communication infrastructure, buildings, knowledge, security rules etc.

Another aspect of this architectural model of GEA is inheritance of architectural principles and standards from top to down.

Each layer of architecture can have (and usually has) its own life-cycle, but identified and executed changes in can influence all others and initiate their changes. To keep all of them consistent is the role of architectural governance.

May be most important part of GEA (and the CGEA) in current state of its development is Business Architecture. Following picture shows decomposition of Business Architecture mentioned above and all already known (identified) objects of metamodel of architecture at current stage of research. Areas of Performance, Risk and Compliance Architectures will be more elaborated in following weeks.

Asset and Activity parts of architecture are quite stable now and have to be approved in real architectural projects we plan to do with some Czech ministries.

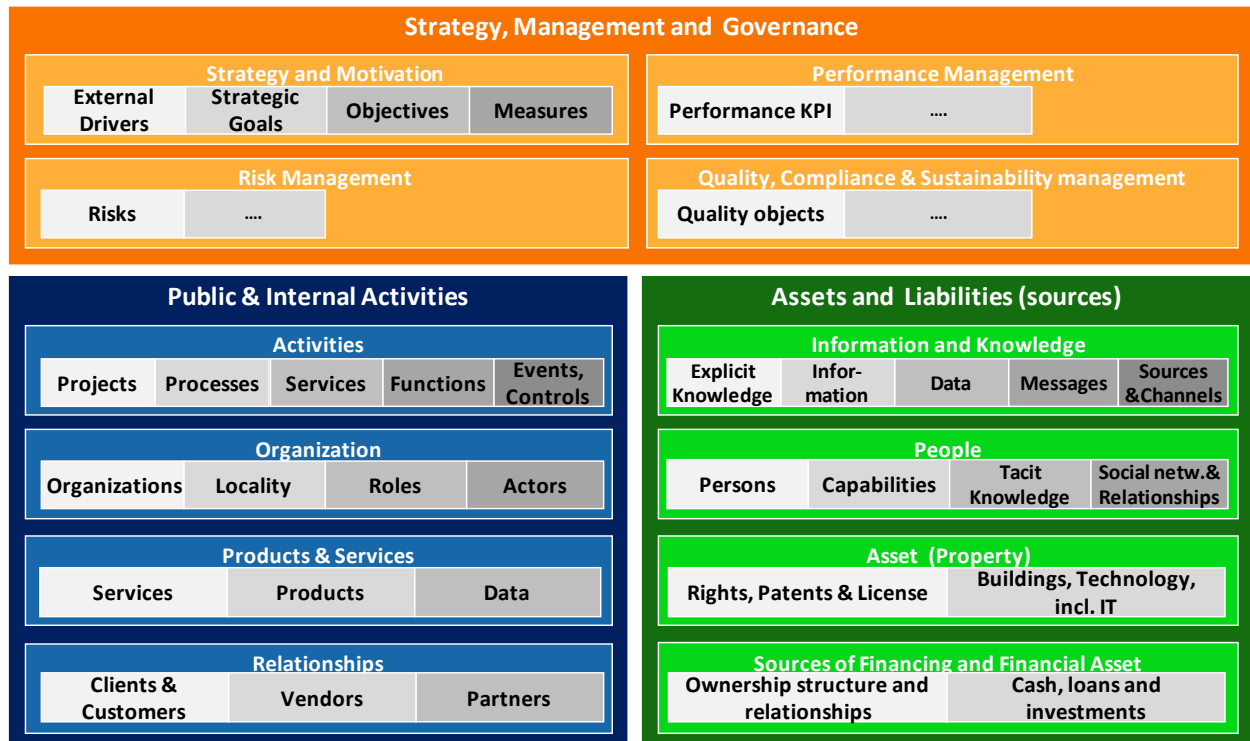


Figure 2: Domains and Objects of metamodel of Czech GEA

This model was created based on well know metamodel of TOGAF, changing the areas and adding a lot of metamodel objects, not covered in original.

New approach is that we added also projects into group of functions and new group for products and relationships.

On the other side of model is reasonable to extend metamodel with assets at all, which were not taken into account by TOGAF.

The specialty is to take some object twice, like an application or HW components, which are asset in business architecture and physical components in IT and Infrastructure segment architectures.

The same approach is used also e.g. for processes. The high level decomposition of processes the State or Agency is done in Business Architecture, at the same level of granularity like other objects (e.g. services, functions). In Process Architecture, one of segment architectures, which corresponds with BPM and quality improvement programs (like 6 Sigma or EFQM or ISO9000) are processes modeled in very big detail.

4. GEA provisioning in the Czech Republic

In this section important steps of GEA provisioning in the Czech Republic, based mostly on experiences of successful international implementations, are presented.

Development of Czech methodology and architecture, based on successful international solutions, has move further from current interoperability role, which is represented by National Registers of Subjects, to full GEA, including Business and Application Architectures. In this context we want to adopt from international solutions:

- Governmental CIO principle

- GEA principle, including architectural principles and layers
- „Whole-of-Government” principle
- Governance principles (both of IT and EA)
- at a more detailed level also assign to “Registers” the proper weight and place in GEA

It will result in developing GEA concept for the Czech Republic, including:

- GEA Framework
- GEA Governance
- GEA Implementation Roadmap

Replenish Czech GEA concept with content, develop catalogue of public administration services as a part of GEA, include existing process models and technology architecture into GEA Framework and provide proper personal support of GEA development, management and governance. In this context the human resources, i.e. also qualified enterprise architects (Gála & Jandoš, 2010a, 2010b), are needed.

5. Value of CGEA

By (Gøtze & Christiansen, 2007), only 18 % of countries having implemented GEA measure costs and gains influenced by GEA. For Czech GEA we want to establish methodology which will include evaluation of impacts to so called Public Value, see (Cresswell, Burke, & Pardo, 2006).

Implementation of Czech GEA should bring both business and IT benefits. Although business benefits like enablement of core government reform are much more important, positive ROI of CGEA and pay back will be enough based on IT savings only. Different studies showed savings by organizations with matured EA from 30 to 64 percent of IT budget. Being conservative we estimate annual savings related to CGEA approximately 10% of Czech state IT budget only, at least hundreds of millions of Czech annually. Implementation cost of Czech GEA we estimate around 1-2 hundreds of millions of Czech crowns.

6. Conclusion

In accord with the main topic, the paper is oriented towards several conceptual resources for GEA. One possible model of GEA is presented as possible partial global basis for the Czech solution. Based on analysis of international solutions the core activities, which should be implemented for GEA implementation, management and governance in the Czech Republic, are specified. Based on the fact that – based on our analysis – the Czech GEA has not been till now elaborated, we consider our point of view to be a possible basic starting point presented at coarse conceptual level.

Acknowledgment

The work reported in this paper was supported by the project GA CR P403/10/0303 Enterprise Architecture as Management Principle for SMEs. The analysis done in the project GA CR P403/11/1899 Sustainability support of SME based on ICT innovations also influenced this paper.

7. References

- Bredemeyer, D., & Malan, R. (2004). What It Takes to Be a Great Enterprise Architect. Retrieved Červenec 3, 2008, from Cutter Consortium: <http://www.cutter.com/promotions/ear0408/ear0408.pdf>
- Chen, B., & Rashty, D. (2002). The Five Layers Model of e-Government. Ministry of Finance, Israel.
- Cresswell, A. M., Burke, B. G., & Pardo, T. A. (2006). Advancing Return on Investment Analysis for Government IT. A Public Value Framework. University at Albany, Center for Technology in Government. Albany: University at Albany.
- CTO Council. (2006, 10 31). Enterprise Architecture for UK Government. An overview of the process and deliverables for Release 1. Retrieved 4 13, 2011, from eGovernment Resource Centre: <http://www.egov.vic.gov.au/focus-on-countries/europe/countries-europe/united-kingdom/trends-and-issues-united-kingdom/enterprise-architecture-united-kingdom/enterprise-architecture-for-uk-government-in-pdf-format-193kb.html>
- Doucet, G., Götze, J., Saha, P., & Bernard, S. (2009). Coherency Management. Architecting the Enterprise for Alignment, Agility and Assurance. Bloomington: authorHouse. ISBN: 978-1-4389-9606-6.
- Gála, L., & Jandoš, J. (2010a). Enterprise Architecture Based Innovations: Competencies Perspective. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz : Trauner, 2010, p. 33–40. ISBN 978-3-85499-760-3.
- Gála, L., & Jandoš, J. (2010b). Enterprise Architecture University Education. Cairo 06.11.2010 – 07.11.2010. In: Information Management Association [CD-ROM]. New York : IBiMA, 2010, p. 168–176. ISBN 978-0-9821489-4-5.
- Federal Enterprise Architecture Program Management Office, OMB. (2007). FEA Practice Guidance. Retrieved June 6, 2009, from The White House: http://www.whitehouse.gov/sites/default/files/omb/assets/fea_docs/FEA_Practice_Guidance_Nov_2007.pdf
- Götze, J., & Christiansen, P. E. (2007). Trends in Governmental Enterprise Architecture: Reviewing National EA Programs – Part 1. Journal of Enterprise Architecture , 3 (1).
- Mejstřík, M. (2011). Framework of Competitiveness Strategy of the Czech Republic. Prague.
- Moore, G. A. (2005). Dealing with Darwin: How Great Companies Innovate at Every Phase of Their Evolution. New York: Penguin Group.
- Novotný, O., & Voříšek, J. (2010).. Digital road to prosperity. Praha 08.06.2010 – 09.06.2010. In: Systems Integration [CD-ROM]. Prague : Oeconomica, 2010, p. 1–8. Text in Czech. ISBN 978-80-245-1660-8.
- NZFEAF RM. (2009). New Zealand Government Architecture Reference Models Version 2.0. State Services Commission, New Zealand.
- QGCIO (Enterprise Architecture & Strategy). (2009). Queensland Government Enterprise Architecture Framework 2.0. Queensland Government Chief Information Office , Enterprise Architecture & Strategy. The State of Queensland (Department of Public Works) 2009.
- Rollings, M. (2010). Marginalizing Enterprise Architecture. Retrieved July 15, 2010, from burton GROUP BLOGS: Executive Advisory: http://eapblog.burtongroup.com/executive_advisory_progra/2010/01/marginalizing-enterprise-architecture.html
- Saha, P. (2008). Government Enterprise Architecture in Singapore: Issues, Practices and Trends. Government Enterprise Architecture as Enabler of Public Sector Reform. Washington DC: The World Bank.
- The Chief Information Officers Council. (1999). Federal Enterprise Architecture Framework. Version 1.1. Retrieved 11 16, 2008, from CIO.GOV: www.cio.gov/documents/fedarch1.pdf

Information about Human Well-Being in Organizations

HUMAN'S WELL-BEING: A CAUSE OR A RESULT OF SOCIAL RESPONSIBILITY

Simona Šarotar-Žižek

Faculty of Economics and Business Maribor (EPF)

University of Maribor

simona.sarotar-zizek@uni-mb.si

Matjaž Mulej

University of Maribor, Slovenia, and IRDO Institute for Development of Social Responsibility, Maribor, Slovenia, and IASCYS International Academy for Systems and Cybernetic Sciences, Vienna, Austria

mulej@uni-mb.si

Amna Potočnik

Maribor Development Agency, Slovenia

amna.potocnik@mra.si

Abstract

The basis of each society consists of humans, being also essential parts of the concept of social responsibility (SR). SR is a contemporary version of informal systemic behavior aimed at requisite holism of behavior of influential persons and their organization. It requires their honest behavior, care, and end of abuse of their ownership rights in treatment of employees, business partners, broader society, and natural preconditions of humankind's survival; in ISO 2600 the topics of SR are even 7 and linked by principles of holism and interdependence. SR extends to governors, managers, and governments the managerial principle called 'process owners' that entitles subordinates to run parts of organizations with responsibility including their right of (efficient and effective!) use without their right of abuse.

Standardizations cannot solve all the problems the society is facing, especially not if standards such as ISO 2600 are not mandatory but only recommendatory. Let's put it another way: when would the organization take the SR more seriously and even be more holistic? Shall SR be an intangible asset of the organizations, incorporated as goodwill in financial statements? Then the high SR would enable organizations to be more competitive and survive. This solution would mean collecting and interpreting the data in a new, slightly different, but also broader, way, based on opportunity costs that are not visible in the usual accountancy.

Well-being (WB) as a SR's component can rarely be attained without ethics of interdependence of professional specialists enabling requisite holism of approach and requisite wholeness of outcomes of work and life processes. WB as a complex construct is more than the absence of illness or pathology. WB has subjective and objective dimensions. It can be measured at the level of

individuals, or organizations, or society, and it accounts for elements of life satisfaction that cannot be defined, explained or primarily influenced by economic growth.

Many studies indicated significant life benefits for people with high subjective WB. Thus, the interventions to increase subjective WB are important, not only because people feel good about themselves: they have more positive work behavior and exhibit other desirable characteristics. The social and natural environmental conditions directly impact quality of people's life and their actual choices (where to live, work), human health and wealth (through climatic variations, natural disasters). From the strategic point of view, the governments or organizations or managers are responsible to set up the framework conditions in which the potentials of co-workers can be revealed, results obtained and objectives attained. Their happiness is then a source of organizational viability and not vice versa. All mentioned concepts shall be treated in the complementary way in order to achieve the requisite holism/wholeness (RH).

Keywords

Social Responsibility, Subjective Well-Being, Requisitely Holism, Systemic Behavior, Goodwill

1. The selected problem and viewpoint

Recently there has been a major change in the nature of the triangular relationship between companies, the state/government and the society. Companies are starting to consider the interest of the general public. The idea that companies can do well by doing good has caught the attention of executives, business academics, and public officials. A coherent SR strategy, based on integrity, sound values and a long-term approach offers clear business benefits to companies and also a positive contribution to WB of society. The annual report of virtually every large company claims its mission is to serve some larger social purpose besides making profits. Hence, strictly economic benefits are not the only positive effect of appropriate use of SR.

Growing amount of evidence asserts that corporations can do well by doing good. Many well-known organizations have already proven that they can differentiate their products, services and reputations, if they take responsibility for the well-being of the societies and environments in which they operate. CEOs have long been accountable to serve a varied group of stakeholders – employees, communities, and investors. The nature of these relationships is now changing in ways that significantly affect corporate performance. In part due to the emergence of the Internet and continuing globalization, organizations are becoming accountable for labor issues and working conditions in their partners' operations as well as their own (Pohle and Hittner, 2008). In climbing the Corporate Social Responsibility Value Curve from compliance to growth, companies must:

1. Align and incorporate Corporate Social Responsibility (CSR) with business strategy and integrate it across all operational functions. Thus, they make it easy to invest (not spend) the funds necessary to achieve their objectives.
2. Implement an open information strategy for more information-sharing with multiple stakeholders.
3. Leverage transparency to increase the level of engagement of key constituents and costumers.

When these activities are combined, CSR can become a dimension of a company's successful competitive strategy. Done right, CSR offers a company improved relationships with all of its key

constituents, more loyal customers, lower costs, higher revenues, and its overall better standing in society.

CSR is one of the most relevant strategies that ensure ethics for the company to achieve goodwill among company's stakeholders. CSR actually consists of a wide-range of activities and programs that improve the organizations' social, environmental and economic impact, their influence on society, social cohesion, human rights, and fair trade. CSR particularly greatly focuses on environmental protection and well-being of employees, the community and civil society in general, both now and in the future; thus the organizations assure goodwill among their stakeholders (Aranganathan, 2010).

2. A brief insight in the definition of social responsibility

We are viewing SR here in perspective of systems theory as a science on attainment of requisitely holistic (RH) behavior aimed at requisite wholeness of insights and outcomes. We use the latter also to deal with innovation; we see a practical connecting point of innovation and SR in the daily experience – Values-Culture-Ethics-Norms (VCEN) need innovation toward more holism meaning less selfishness for selfish reasons ('our benefit depends on benefit of others due to mutual interdependence'; it demands 'ethics of interdependence' to be the prevailing VCEN). A narrow selfishness exposes the selfish ones to envy and protests all way to terrorism on part of those who feel that the decision makers do not decide with SR, but with a narrow and short-term, if any, responsibility except a fictitious one, etc.

SR does not ask what do e.g. entrepreneurs do, and about more or less high and even questionable awards for managers, but it ask about criteria that should be felt among people as, at the same time:

- Requisitely honest and based on real achievements, hence acceptable without envy, i.e. as ethically correct;
- Achievements enabling economic and social advancement including a RH quality of a requisitely big majority; and
- Attained by methods/products that do not ruin natural preconditions for life of humans and other living beings, without which humans cannot live, such as bees, etc.

People, times, and conditions define differently what is a socially acceptable, i.e. SR behavior. Criteria have always depended on VCEN of the most influential ones, the power holders. Their values became culture, ethic, and norms, when attracting people as followers by appeal or force (Potocan, Mulej, 2007). Their VCEN were expressed in ideologies, e.g. religions and similar tools of power providing ownership and joy to the most influential ones. These VCEN, according to official definition of SR tackle manners of the influential ones in treatment of (EU, 2000, 2001, 2006a, b):

- Their co-workers;
- Their other business partners;
- Their government, non-governmental organizations etc., i.e. broader social environments; and
- Their natural environment as the natural precondition of survival.

In all four aspects the influential ones must attain more RH behavior than earlier, i.e. innovate their practice toward SR.

The new ISO 26000 (ISO, 2010) adds some crucial attributes to the just quoted definition of SR:

1. Governance [and management] of organizations;
2. Human rights;
3. Customer issues.

What is even more crucial, the ISO 26000 defines two crucial common denominators to all seven topics:

- Holism; and
- Interdependence.

Thus, SR is a process of social-economic Invention-Innovation-Diffusion process (IIPD) / innovation and its objective for humankind to find its way out of the current blind alley. Success of this process depends on humans, of course, especially on the influential ones.

Therefore we will focus on humans' requisite holism.

3. Briefly on social responsibility's stakeholders

SR is becoming more and more a hot topic²¹. After surveying the relevant literature, Prosenak and Mulej (2008, 10) defined SR as a concept in which the care for social and environmental problems should be included in activities to achieve humans' goals. They say SR scoops three dimensions: (i) social, (ii) environmental and (iii) economic. EU definition (2001, 347 final: 5; sum. after: Mulej and Hrast, 2008, p. 43) is also important for this contribution: »...SR of companies is a concept, with which companies voluntarily implement social and environmental care into their business activities and into their interactions with participants«. But companies are people's tools; that's why SR should be considered an ethical guide to humans in action and decision making. SR can therefore be viewed as a business strategy (Esposito, 2009).

3.1. Social Responsibility of Stakeholders

SR's development in companies was a topic in many debates throughout the 20th century (Esposito, 2009). Several above authors mention both a »shareholders aspect« and a »stakeholder aspect« and the question for which of the two groups the company is responsible; answer to this question is important for easier assigning of company's position in society. Štoka Debevec (2008) summarized the CSR stakeholders: (i) employees, (ii) suppliers and customers, (iii) nature, and (iv) society.

²¹ Writing about SR can be found (also) with following authors: Božičnik et al. (2008); Daft and Marcis (2001), Daft (1994); Esposito (2009, and earlier); Steiner and Steiner (2003); Lahovnik (2008); Martin (2001); Harrison (1995); Prosenak and Mulej (2007 and 2008); Prosenak, Mulej and Snoj (2008); Schwartz and Carroll (2003); Hrast et al., ed. (2006, 2007, 2008, 2009, 2010); Rozman and Kovač (2006); Hrast and Zavašnik, ed. (2007); Knez-Riedl (2002, 2003a, b, c, 2004, 2006a, b, c, 2007a, b, c; 2010); Waddock and Bodwell (2007); Crowther and Caliyurt, ed. (2004); Crowther et al., ed. (2004); EU (2001) etc. 1.5 million hits on an official EU website about SR proves it to be an important topic (Google gives you beyond hundred million hits on SR) (Mulej et al., 2009, p. 4). A new list of selected references can be found in (KEN, 2011).

3.2. Attributes of Social Responsibility and Benefits from it

Nickels and Wood (1997, p. 92-93) say that the SR concept has expanded to all organizational areas; SR is based on the conviction that companies shouldn't only care for their profits, but should also contribute to prosperity in society. In a longer term SR contributes to their profits by helping them avoid cost of strikes, riots, lost markets, renewal of natural preconditions of life, health care etc.; these costs are not visible in accountancy, but crucial (the 2010 case of Greece nearing bankruptcy shows this; so does the case of the oil catastrophe on the south coast of US; and many others cases reported about in daily press when we are working on this research in recent years).

SR behavior reaches beyond acting according to law and avoiding unethical deeds; it includes an active involvement in society and a help with solving problems of society. By Johnson and Scholes (1997, p. 211-212) SR of companies includes their actions on internal (care for employees, working conditions and working place and working order adequacy) and external basis (care for environment, safety of products and services, market and suppliers choice, employment, and local society activities). Frideric, Davis and Post (1988, p. 33) consider the following areas as central in SR: (i) quality and safety of products, (ii) consumers relations, (iii) employees relations, (iv) charity and care for people, (v) society relations, (vi) care for environment, and (vii) economic influences.

Need of many to emphasize SR as necessary feature of companies, shows us how distant have companies become from their natural role: companies became self-purposed. Goerner et al. (2008) emphasize that the American capitalism has changed into something against what it has arisen centuries ago; they even claim it is anti-constitutional and call it feudal capitalism. Toth (2008) similarly thinks that the current model of capitalism is obsolete and needs renovation. Božičnik et al. (2008) talk about negativism of capitalism due to its lack of systemic and hence SR behavior. Klein (2009) calls it the disaster capitalism. Klein (after Štefančič, 2008) explains in her book *The Shock Doctrine*, 2007, where lies the trick of the modern world and modern capitalism, modern wars and modern catastrophes. Data in (Rop, 2011) confirm they are right.

The main economic benefits of SR working of organizations – to be added to the above mentioned prevention of costs – include: (i) better image and reputation, (ii) higher capability to attract capital, partners, customers etc., (iii) better opportunities for establishing and maintaining connection with decision-makers, policy creators and other stakeholders, (iv) higher productivity and quality, (v) higher sales and consumers loyalty, (vi) better supervision and risk-handling, and (vii) higher loyalty of employees and continuity of employees (ISO, 2010; Rebernik et al., 2002, p. 95). The practicing businessman Quinn (2006) made similar conclusions: SR pays, in a longer term, at least.

Prosenak and Mulej (2008, p. 10-11) state that SR is welcomed also as a help concerning the following issues: (i) climate change, (ii) natural resources limitation, (iii) growing differences and stress, and (iv) global competition, etc. These issues are becoming objectified circumstances letting humans forget about the humans' impact over their making. On the other hand, SR helps people at large enjoy benefits of a broader and longer-term treatment of nature around them.

Mulej and Hrast (2008, p. 47) also summarize the common denominator of definitions of SR and of its benefits. SR can also mean an upgrade of non-formal system thinking methods. But it can also mean a lot more – a new way from the humanity's blind alley. From the phases of competitiveness based on (1) ownership of natural resources, (2) investing, and (3) innovating, humankind is coming closer and closer to its (4) phase of affluence (summarized after Porter, 1990). Affluence is considered to be both a climax in human wishes and a blind alley: more and more people, because they have everything they consider necessary, no longer have motivation to work and shop. SR can also mean a path towards peace in the world. SR, combined with behavior matching requisite holism, and with creativity, oriented towards Fromm's passage of human from owner to creator,

could save the current human civilization, so the latter wouldn't deteriorate like all the others have in their time of affluence.

SR is a process of social innovation and the humans' rightfully wanted goal (Mulej and Hrast, 2008, p. 41). This process is crucial for supporting human well-being (WB), which is a way to requisitely holistic/systemic behavior of humans.

3.3. Criticism about the current practice of Social Responsibility

There are also some weak attributes in the SR's development. We will summarize some propositions that will help us develop our own view concerning SR as a tool for rising WB. SR is supposed to constructively contribute to solving of complex issues discussed above. Though, Prosenak and Mulej (2008, p. 10-12) consider deficiency in the then prevailing concept of SR to include: (i) problems-solving in un-holistic manner, (ii) morally questionable activities, and (iii) one-sidedness, instead of holistic pressure on companies' leaders by share-holders and other owners and other stakeholders. Therefore these authors find the concept of SR before ISO 26000 no requisitely holistic solution; that is why we need the dialectical-systemic approach to the problem, which will include and connect all necessary aspects in a new synergy for achieving requisite holism. WB of many rather a few only should result.

Considering that all subjects are inter-connected and even interdependent, we should strive at as-holistic-as-possible quality of life (requisitely holistic objective and subjective WB) and at human solidarity as a part of equality and brotherhood along with freedom. WB has its roots in acknowledging the meaning and strengthening of ethics of interdependence, and respect for ecological sensibility and natural limitations; SR hence demands reconciliation of narrower and broader, short-term and long-term perspectives with ecological and other nature-respecting views as necessary elements of values of people, expressed as SR (Prosenak & Mulej, 2008, p. 13).

This shows that SR could be an efficient concept also against the current so-called financial crisis, but it must be completed up with the law of requisite holism/wholeness, which helps humans to attain requisite holism of behavior, which is a foundation to SR working. WB of many rather a few only should result.

3.4. Link between SR and humans' subjective well-being

What-ever the views are like in literature and political documents; we detected very little attention to the single human beings as the background of implementation of SR in practice. This brings us to the topic of subjective well-being (SWB).

4. Briefly on well being and well-being (SWB)

4.1. Well-being

Well-being is a complex construct; its meaning remains contested and its key distinction is between:

1. Hedonic and eudemonic well-being; and
2. Objective and subjective measures (SDRN, 2005, p. 4).

Ryan and Deci (2001) present hedonic tradition, in which psychologists have concentrated on the assessment of "subjective well-being". This consists of three elements: (i) life satisfaction; (ii) the

presence of positive mood; and (iii) the absence of negative mood. All this together is summarized as happiness (ibid, p. 144).

Ryan and Deci (2001, 146/7; summarized after SDRN, 2005, p. 5) mention that the eudemonic theorists argue that well-being and happiness are distinct, for not all sources of pleasure foster well-being. They presented the self-determination theory, which posits that there are three basic psychological needs – autonomy, competence and relatedness – and theorized that fulfillment of these needs is essential for psychological growth and well-being (Ryan and Deci, 2001, 146/7; summarized after SDRN, 2005, p. 5)

Felce and Parry (1995) presented objective domains of well-being and subjective evaluations of well-being, the two main approaches to measuring well-being in research. The objective well-being includes material and social circumstances, which influence an individual's personal objective well-being; it consists of the following dimensions (McAllister, 2005, 9; summarized after: Prosenak and Mulej, 2007, p. 3): material, physical, social, and emotional well-being, development, and activity. McAllister (2005) and Arthaud-Day et al. (2005; summarized after Prosenak and Mulej, 2007, p. 3) mention, that subjective well-being stems from individual's perception of objective well-being.

Because the perception depends on individual's subjective starting points (knowledge, emotions, mentality and values), a high objective well-being does not necessary simultaneously mean a high subjective well-being (Prosenak and Mulej, 2007, p. 3),

Well-being literature suggests the following points of common ground (SDRN, 2005, p. 6):

- “Well-being is more than the absence of illness or pathology.
- Well-being has both subjective and objective dimensions. It can be assessed in subjective terms (seeking individuals' views in surveys) or objectives terms (by measuring access to physical, environmental, social and other resources). There are pros and cons to each approach. Both types of information are useful and together they provide a fuller picture of well-being.
- The terms »life satisfaction«, »happiness«, »quality of life« and »well-being« are often used interchangeably. The significance of seeing the terms as interchangeable is that they express a global assessment of satisfaction, rather than capturing a momentary mood. Such measures of well-being potentially give policymakers an indication of overall levels of satisfaction in the population and suggest the impact of living in the current regime.
- The burgeoning literature on happiness (e.g. Layard 2005, Martin 2005) is concerned with subjective well-being, and draws on the same pool of survey evidence regarding »quality of life« and »life satisfaction«.
- Most researchers agree about the domains that make up well-being: physical well-being; material well-being; social well-being; development and activity; emotional well-being. The elements can be paraphrased as physical health, income and wealth, relationships, meaningful work and leisure, personal stability and (lack of) depression. Mental health is increasingly seen as fundamental to overall health and well-being. These elements are sometimes viewed as »drivers« of well-being.
- Both individual and societal well-being is important and measurable. Veenhoven (1997) describes quality of life as »the presence of conditions deemed necessary for the good life, and the practice of good living as such«. The interaction between the two is where much of the link with policy comes: what enhances personal well-being may be negative for society,

or possibly vice versa, and the balance of well-being now and well-being in future must be taken into account.

- Well-being is an important area for future policy as it accounts for elements in life experience that cannot be defined, explained, or primarily influenced by economic growth.”

4.2. Subjective well-being

Many studies indicated significant life benefits for people with high SWB. For example, individuals reporting high SWB had stronger social relationships than less happy individuals (Diener & Seligman, 2002). In longitudinal studies, people with higher levels of SWB were more likely to be married at a later measurement (Marks & Fleming, 1999). High individual SWB is a strong predictor of marital satisfaction (Glenn & Weaver, 1981). In the workplace, employees that are higher in dispositional positive affect receive higher supervisor ratings and better pay (Diener, Nickerson, Lucas, & Sandvik, 2001). In stressful circumstances, positive affect is associated with more effective coping and better overall outcomes (Fredericson & Joiner, 2002). High SWB is associated with lower levels of suicidal ideation and behavior (Diener & Seligman, 2002). Thus, SWB is related to successful outcomes in a variety of life domains. People with high levels of SWB are more successful in relationships, more successful on the job, and better equipped to successfully cope with stress (Pavot and Diener 2004, p. 116). When we summarize we can say, that SWB is associated with improved social connectedness, positive health outcomes, and increased resistance to the negative effects of stress, and success in the workforce and society (Pavot and Diener, 2004, p. 129).

4.3. Interventions to raise subjective well-being

As the subjective well-being is important for several reasons, the interventions to increase subjective well-being are important as well. They are important not only because it feels good to volunteer more, have more positive work behavior, and exhibit other desirable characteristics (Diener et al., 2002, p. 69). Few direct intervention efforts have been implemented. Fordyce (1977, p. 1983; summarized after Diener et al., 2002, p. 69) published several studies in which he evaluated a program designed to boost people's happiness. This program was based on the idea that people's subjective well-being can be increased if they learn to imitate the traits of happy people, such as being organized, keeping busy, spending more time socializing, developing a positive outlook, and working on their healthy personality. »Fordyce found that the program produced increases in happiness compared with a placebo control, as well as compared with participants in conditions receiving only partial information. In a follow-up 9 to 28 months later, Fordyce found that there were lasting effects of his intervention (Diener et al., 2002, p. 69). Pavot and Diener (2004, p. 129-130) suggested the following examples of interventions, which might increase subjective well-being: day-care programs, other forms of respite care, increased opportunities for physical exercise, and opportunities for older adults to maintain involvement and engagement in the life of their communities.

SR is therefore part of the WB. The later one shall be observed and noticed not only on the individual but also on larger scale, being intimate circle of individuals (e.g. their families), and communities (as nets/networks) as well the nation(s) and the Gaia as whole.

But what is the primary aim of the organizations? It is to become and remain viable, capable to survive in the long run. Since the accounting is no new invention and the bookkeeping by double entry as has been used in the modern times originates in 12th/13th century (or at least there is written evidence of its existence in 15th century), the question is, how the SR and WB could be

incorporated in the accountancy in order to contribute to the viability of organization. Let's consider the concept of Goodwill.

5. Goodwill

In recent decades companies have been beginning to realize the fact that in order to gain strategic initiative and to ensure continued existence, business practices may have to be molded from the normal practice of solely focusing on profits to factors in public goodwill and responsible business etiquettes (Reynard and Forstater, 2002). Thus, the current trend of globalization has brought a realization among the firms that in order to compete effectively in a competitive environment, they need clearly defined business practices with a sound focus on the public interest in the markets (Gray, 2001). The increase in competition among the multinational companies to gain first-mover advantage in various developing countries by establishing goodwill relationships with both the state and the civil society is ample testimony to this transformation (Khanna and Gupta, 2011, p. 178). But a massive wave of goodwill write-offs swelled by the global recession has crested, but companies can expect regulators and auditors to be as skeptical as ever about goodwill that exists on corporate balance sheets (Whitehouse, 2011, p. 28).

Defining goodwill is a difficult task. A major focus of many goodwill researches has been on what goodwill represents. Goodwill is defined in law, accounting, and economics. The accounting definition focuses more on the value of goodwill than on its nature. This definition – that goodwill represents the premium paid for a business – identifies goodwill in connection with its sale. Likewise, the economic definition – that goodwill is “excess earnings power” – implicates its value rather than its character (Ibrahim, 2005, p. 7). Through time goodwill has been interpreted as representing the value of expected excess future earnings discounted over a number of years (Walker, 1938; Emery, 1951; Nelson, 1953; Gynther, 1969; Ma and Hopkins, 1988). It also has been interpreted as a measure representing the difference between the fair values of the identifiable assets and the price paid for the firm as a whole (Emery, 1951; Miller, 1973; Colley and Volkan, 1988; Ma and Hopkins, 1988). Another interpretation sees goodwill as representing a momentum or an initial push comprised of unrecorded characteristics/components such as managerial skill, economies of scale, and customer relations (Emery, 1951; Nelson, 1953; Barlev, 1973). Nelson (1953) describes goodwill as a momentum – a marketing or promotional push comprised of characteristics such as customer lists, organization costs, copyrights, trademarks, patents and franchises. Empirical support for this view of goodwill's association with certain characteristics is provided by Chauvin and Hirschey (1994). In addition to the finding that goodwill is values relevant they find that advertising, research and development, and intangible assets are positively and significantly associated with goodwill (Churyk, 2001).

5.1. Business Goodwill

The most prevalent of goodwill is business, or »enterprise«, goodwill. Its prevalence (and the relative obscurity of personal goodwill) is revealed by the tendency of legal writers to refer to business goodwill as simply »goodwill«. Thus we can define goodwill as a business reputation, patronage, and other intangible assets that are considered when appraising the business, especially for purchase; the ability to earn income in excess of the income that would be expected from the business viewed as a mere collection of assets (Ibrahim, 2005, p. 8).

Relationship-quality between the marketing department (an internal stakeholder) and the firm's customers (an external stakeholder) cannot be viewed in the same way as the relationship between marketing and a distal stakeholder such as a consumer advocacy group. Relationship quality

between marketing and a consumer advocacy group may best be characterized in terms of business goodwill (or business image). Business goodwill can consequently be described in terms of six dimensions. These are: (i) good product/service, (ii) well managed, (iii) profit motive, (iv) involved with community, (v) responds to consumer needs, and (vi) good to work for (Javalgi et al., 1994).

5.2. Personal and professional goodwill

The premium paid by buyers represents goodwill. Goodwill is usually attached to a business, but it can instead be attached to a business owner when the corporation's intrinsic value is derived from the owners' individual reputation, expertise, or contacts. This is "personal goodwill". Personal goodwill is attached to an individual rather than business. It is present when the unique expertise, reputation, or relationships of an individual give a business its intrinsic value. Personal goodwill is often found in professional businesses. These businesses are able to offer unique services due to the advanced education and special skills of their owners. In this context, personal goodwill is often referred to as »professional goodwill«.

Assuming that personal goodwill gives a business its intrinsic value, a buyer of that business, by paying a premium, manifests an intention to purchase the personal goodwill. But how to characterize personal goodwill is the subject of much dispute. There are two predominant lines of thought on the subject. One contends that personal goodwill – or at least the subset of professional goodwill – is property, and as such can be bought and sold. The other contends that personal goodwill merely represents the present value of future earnings potential, and is inextricably attached to the individual (Ibrahim, 2005, p. 5).

Characterizing personal goodwill as property produces two main benefits in corporate acquisition. First, it reflects reality; buyers pay for this goodwill. Therefore, the law should allow its benefits to inure to buyers. A common argument against the property view is that what is personal to an individual cannot be transferred to another. Second, personal goodwill as property can provide significant tax benefits to buyers and sellers, and can therefore be the catalyst for facilitating a stalled acquisition. The sale of personal goodwill creates an ancillary transaction to the sale of the corporation's assets or stock. Corporation sellers who own personal goodwill benefit because its sale is not double taxed. Buyers receive a cost basis in personal goodwill, and the corresponding amortization tax deductions. Accordingly, the sale of personal goodwill, as an ancillary transaction, can result in a more favorable after-tax result for buyer and seller who are forced to structure the primary corporate acquisition in their non-preferred manner (Ibrahim, 2005, p. 6).

6. Conclusions

The link between SR and SWB is much closer than the accessible literature has shown us. SWB is actually the basic purpose rather than a side-effect of economic activity and social-economic development. Without attainment of SWB that is based on creativity and innovation reaching beyond the technological innovation, no economic development makes sense. The current global social-economic crisis shows this fact. SR is the humans' way out of it. Therefore is time to make intangible assets of the organizations at least equally important as the tangible are and therefore allow more SR/SWB oriented organizations to easier survive.

Acknowledgement

This contribution is based on the basic research project: 1000 - 09 – 212173 that is supported by the Public Agency for Research, Republic of Slovenia.

7. References

- Aranganathan, P. (2010). Corporate Social Responsibility (CSR): An Unique Business Strategy in Achieving Organizations' Excellence, Trichy, MIET Engineering College.
- Arthaud-Day, M. L., Rode, J. C., Mooney, C. H., & Near, J. P. (2005). The Subjective Well-being Construct: A test of Its Convergent, Discriminant, and Factorial Validity. *Social Indicators Research*, 74, 445–476.
- Barlev, B. (1973). Business combinations and the creation of goodwill. *Accounting and Business Research*, Autumn, 304-308.
- Blanchflower, D. G., & Oswald, A. J. (2000). Well-being over time in Britain and the USA. Presented at the Conference of Subjective well-being (Oxford, UK, February 2000).
- Božičnik, S, Ećimović, T, & Mulej, M. (Eds.) (2008). Sustainable future, requisite holism, and social responsibility. Maribor: ANSTED University, Penang in co-operation with SEM Institute for climate change, Korte, and IRDO Institute for Development of Social Responsibility. On CD.
- Churyk, N.T. (2001). Goodwill: Characteristics and Impairment, University of South Carolina.
- Chauvin, K.W. and M. Hirschey. 1994. Goodwill, profitability and the market value of the firm. *Journal of Accounting and Public Policy*. 13, 159-180.
- Clark, A. E., & Oswald, A. J., (1994). Subjective Well-Being and Unemployment, *The Economic Journal*, 104, 648-659.
- Colley, J.R. and A.G. Volkan. (1988). Accounting for goodwill. *Accounting Horizons*. March, 35-41.
- Crowther, D, & Caliyut, K T. (Eds.) (2004). Stakeholders and Social Responsibility, Penang, ANSTED University.
- Crowther, D, Barry, D.M., Sankar, A, Goh, K.G., & Ortiz Martinez, E. (2004). S.R.W. Social Responsibility World of RecordPedia 2004, Penang, Ansted Service Center (Ansted University Asia Regional Service Center).
- Daft, R.L. (1994). Management, Third edition, The Dryden Press, United States of America.
- Daft, R, & Marcis, D. (2001). Understanding Management, Thomson Learning, London.
- Diener, E., & Biwas-Diener, R. (2000). Income and subjective well-being: Will money make us happy? Department of Psychology, University of Illinois, Mimeo.
- Diener, E., & Seligman, M.E.P. (2002). Very happy people, *Psychological Science*, 13, 81-84.
- Diener, E., & Seligman, M.E.P. (2004). Beyond Money; Toward an Economy of Well-being, *Psychological Science in the Public Interest*, 5(1), 1–31.
- Diener, E., Nickerson, C., Lucas, R.E., & Sandvik, E. (2001). Dispositional affect and job outcomes, Manuscript submitted for publication.
- Diener, E., Lucas, R.E., & Oishi, S. (2002). Subjective Well-Being, In *Handbook of positive psychology*, Ed. Snyder, C. R., and S. J. Lopez. Oxford University Press, New York.
- DiTella, R., MacCulloch, R. J., & Oswald, A. J., (2001). Preferences over Inflation and Unemployment; Evidence from Surveys of Subjective well-being, *American Economic Review*, 91, 335-341.
- Emery. K.G. (1951). Should goodwill be written off? *The accounting Review*, 26, 560-567.
- Esposito, M. (2009). Put you corporate responsibility, act together! Tate Publishing and Enterprises, Mustang, Oklahoma.
- Esterlin, R. A., (1974). Does Economic Growth Improve the Human Lot? Some Empirical Evidence. In P. A. David and M. W. Reder (Eds), *Nations and households in Economic Growth* (Academic Press, New York, 1974).
- EU. (2000). Communication Concerning Corporate Social Responsibility: A Business Contribution to Sustainable Development (COM, 2000)
- EU. (2001). Commission of the European Communities, 2001: Green Paper on Promoting a European Framework for Corporate Social Responsibility. COM (2001) 366 final, Brussels. Available at: http://eur-lex.europa.eu/LexUriServ/site/en/com/2001/com2001_0366en01.pdf.

- EU. (2006a). Commission of the European Communities: Implementing the partnership for growth and jobs: Making Europe a pole of excellence on corporate social responsibility, Com (2006)
- EU. (2006b). CSR Europe: A European Roadmap for Business Towards sustainable and competitive enterprise
- Falk, A., & Knell, M. (2000). Choosing the Joneses on the endogeneity of references groups. Working Paper Series of the Institute for Empirical Research in Economics, No 53., University of Zurich, Switzerland.
- Felce, D., & Parry, J. (1995). Quality of life: its definition and measurement, *Research in Developmental Disabilities*, 16(1), 51-74.
- Fordyce, M.W. (1977). Development of a program to increase personal happiness, *Journal of Counseling Psychology*, 24, 511-520.
- Fordyce, M.W. (1983). A program to increase happiness: Further studies, *Journal of Counseling Psychology*, 30, 483-498.
- Fredericson, B.L., & Joiner, T. (2002). Positive emotions trigger upward spirals toward emotional well-being, *Psychological Science*, 13, 172-175.
- Frey, B., & Stutzer, A. (2000). Subjective Well-Being, Economy and Institutions, *Economic Journal*, 110, 918-938.
- Frey, B., & Stutzer, A. (2001). What can Economists learn from Happiness Research?. CESifo Working Paper No. 503; University of Zurich Working Paper No. 80. Center for Economic Studies & Ifo Institute for Economic Research, Munich.
- Friderick, W.C., Davis, K., & Post, E.J. (1988). *Business and Society: Corporate Strategy, Public Policy, Ethics*, 6th edition, McGraw-Hill Publishing Company, New York.
- Glenn, N.D., & Weaver, C.N. (1981). The contributions of marital happiness to global happiness. *Journal of Marriage and the Family*, 43, 161-168.
- Goerner, S., Dyck, R.G., & Lagerroos, D. (2008). *The New Science of Sustainability, Building a Foundation for Great Change*, Triangle Center for Complex Systems, Chapel Hill, N.C.
- Gray, R. (2001). *Social and Environmental Responsibility, Sustainability and Accountability, Can the Corporate Sector Deliver?* Centre for Social and Environmental Accounting Research, University of Glasgow, Glasgow.
- Gynther, R.S. (1969). Some conceptualizing on goodwill. *The Accounting Review*, April, 247-255.
- Harrison, S. (1995). *Public Relations: an introduction*, Routledge, New York.
- Hornung, B.R. (2006). Happiness and the pursuit of happiness, A sociocybernetic approach, *Kybernetes*, 35(3/4), 323-346.
- Hrast, A., & Mulej, M. (Ed.). (2008). *Družbena odgovornost 2008*, Zbornik 3, IRDO Konferenca o družbeni odgovornosti, IRDO Inštitut za razvoj družbene odgovornosti, Maribor, On CD.
- Hrast, A., & Zavašnik, A. (Ed.). (2007). *Uvajanje družbene odgovornosti v poslovno prakso malih in srednje velikih podjetij v Sloveniji: Priročnik s primeri dobre prakse*, Maribor, GZS – Območna zbornica Maribor.
- Hrast, A., Mulej M., & Knez-Riedl, J. (Ed.). (2007). *Družbena odgovornost 2007*, IRDO Inštitut za razvoj družbene odgovornosti. Maribor, On CD.
- Hrast, A., Mulej M., & Knez-Riedl, J. (Ed.). (2006). *Družbena odgovornost in izzivi časa 2006*. IRDO Inštitut za razvoj družbene odgovornosti, Maribor, On CD.
- Hrast, A., & Mulej, M. (Eds.). (2009). *Delo - most za sodelovanje: odnosi do zaposlenih in različnih starostnih generacij: zbornik povzetkov prispevkov; relations with co-workers and different age generations: conference proceedings abstracts*, IRDO - Inštitut za razvoj družbene odgovornosti, Maribor.
- Hrast, A., & Mulej, M. (Eds.). (2010). 5th international conference: Social responsibility and current Challenges 2010 - "Nature and humans" conference proceedings, IRDO Inštitut za razvoj družbene odgovornosti, Maribor, On CD.
- Iaffaldano, M. T., & Muchinsky, P. M. (1985). Job Satisfaction and Job Performance: A Meta-Analysis, *Psychological Bulletin*, 97(2), 251-273.
- Ibrahim, D. M. (2005). *The Unique Benefits of Treating Personal Goodwill as Property in Corporate Acquisitions*, Delaware Law School of Widener University.

- Inglehart, R. (1996). The Diminishing Utility of Economic Growth: From Maximizing Security Toward Maximizing Subjective Well-Being, *Critical Review*, 10(4), 509-531.
- ISO 26000; See: http://www.iso.org/iso/discovering_iso_26000.pdf
- James, O. (2007). *Affluenza – a contagious middle class virus causing depression, anxiety, addiction and ennui*, Vermillion, an imprint of Ebury Publishing, Random House UK Ltd etc.
- Javalgi, R.G., Traylor, M.B., Gross, A.C., & Lampman, E. (1994). *Journal of Advertising*, 23 (4), 47.
- Johnson, G., & Scholes, K. (1997). *Exploring Corporate Strategy*, Prentice Hall Europe, Hertfordshire.
- Kahn, B. E., & Isen, A. M. (1993). The Influence of Positive Affect on Variety Seeking among Safe, Enjoyable Products, *Journal of Consumer Research*, 20(2), 257-70.
- Kasser, T., & Sheldon, K.M. (2009). Time Affluence as a Path toward Personal Happiness and Ethical Business Practice: Empirical Evidence from Four Studies, *Journal of Business Ethics*, 84, 243-255.
- Khanna, P., & Gupta, G. (2011). Status of Corporate Social Responsibility: In Indian Context, *APJRM*, 2 (1), 178-187
- Klein, N. (2009). *Doktrina šoka: razmah uničevalnega kapitalizma*, Mladinska knjiga, Ljubljana.
- Knez Riedl, J. (2007a). Kako DOP povečuje konkurenčnost, In: *Projekt CSR – Code to Smart Reality*. Maribor, GZS-OZ.
- Knez-Riedl, J. (2002). Družbena odgovornost malih in srednje velikih podjetij, In: *Slovenski podjetniški observatorij 2002*, 2. Del, ed. M. Rebernik et al., 91 – 112.
- Knez-Riedl, J. (2003a). Corporate social responsibility and communication with external community = Korporacijska društvena odgovornost i komuniciranje sa vanjskim okruženjem. *Informatologia*, 36(3), 166-172.
- Knez-Riedl, J. (2003b). Social responsibility of a family business, *MER, Rev. manag. razvoj* 5(2), 90-99.
- Knez-Riedl, J. (2003c). Corporate social responsibility and holistic analysis, In: *IDIMT-2003: Proceedings*, (Schriftenreihe Informatik, Bd 9), ed. G. Chroust and Ch. Hofer, 187-198. Universitätsverlag R. Trauner, Linz.
- Knez-Riedl, J. (2004). Slovenian SMEs: from the environmental responsibility to corporate social responsibility, In: *An enterprise odyssey: building competitive advantage*, ed. S. K. Sharma, 127-139. *International Review of Economics & Business*, Zagreb.
- Knez-Riedl, J. (2006c.) Družbena odgovornost in univerza, In: Hrast, A. et. al. Mentioned here.
- Knez-Riedl, J. (2007b). Družbena odgovornost podjetja in evropski strateški dokumenti, *Projekt CSR – Code to Smart Reality*, GZS OZ Maribor, Maribor.
- Knez-Riedl, J. (2007c). Obvladovanje celovite (družbene) odgovornosti, *Razgledi MBA*, 12 [i.e. 13] (1/2), 37-43.
- Knez-Riedl, J., & Hrast, A. (2006a). Managing corporate social responsibility (CSR): a case of multiple benefits of socially responsible behaviour of a firm. In: *Cybernetics and systems 2006: proceedings of the Eighteenth European Meeting on Cybernetics and Systems Research*, ed. R. Trappl., 405-409, Vienna: Austrian Society for Cybernetic Studies.
- Knez-Riedl, J., Mulej, M., & Dyck, R.G. (2006b). Corporate Social Responsibility from the Viewpoint of Systems Thinking, *Kybernetes*, 35(3/4), 441–460.
- Knez-Riedl, J. (2010). Prispevek okoljske ekonomike k razumevanju in reševanju problema redkosti dobrin, In: Hrast, Mulej, eds., referenced here.
- Lahovnik, M. (2008). Družbena odgovornost kot dejavnik korporacijskega upravljanja podjetij v Sloveniji, *Naše gospodarstvo*, 54(5/6), 10-21.
- Layard, R (2005) *Happiness: lessons from a new science*. Allen Lane, Penguin Group, London.
- Ma, R. and R.Hopkins. (1988). Goodwill – an example of puzzle-solving in accounting. *ABACUS*, 24 (1), 75-85.
- Martin, J. (2001). *Organizational Behaviour*, Thompson Learning, London.
- Martin, P (2005) *Making Happy People: the nature of happiness and its origins in childhood* Fourth Estate pubs.
- Marks, G.N., & Flemming, N. (1999). Influences and consequences of well-being among Australian young people: 1980-1995, *Social Indicators Research*, 46, 301-323.

- McBride, M. (2001). Relative Income Effects on Subjective Well-Being in the Cross Section, *Journal of Economic Behavior & Organization*, 45, 251-278.
- McAllister, F. (2005). Wellbeing Concepts and Challenges, Discussion Paper Prepared by Fiona McAllister for the Sustainable Development Research Network (SDRN), See: http://www.sd-research.org.uk/wellbeing/documents/SDRNwellbeingpaper-Final_000.pdf.
- Miller, M.C. (1973). Goodwill – an aggregation issue. *The Accounting Review*, 48 (2), 280-291.
- Mulej, M., & Hrast, A. (2008). Družbena odgovornost podjetij, In: Skupaj smo močnejši, Zbornik 2. konference nevladnih organizacij Podravja, 41-52, Regionalno stičišče Podravja, Maribor.
- Mulej, M., Božičnik, S., Ženko, Z., & Potočan, V. (2009). Nujnost in zapletenost ustvarjalnega sodelovanja za inoviranje in pot iz krize 2008, In: Hrast, Mulej, eds., referenced here.
- Musek, J. (2005). Psihološke in kognitivne študije osebnosti, Znanstveni inštitut Filozofske fakultete, Ljubljana.
- Musek, J., & Avsec, A. (2002). Pozitivna psihologija: subjektivni (emocionalni) blagor in zadovoljstvo z življenjem, *Anthropos*, 34(1/3), 41-68.
- Musek, J., & Avsec, A. (2006). Osebnost, samopodoba in psihično zdravje, *Anthropos*, 38(1/2), 51-75.
- Nelson, R.H. (1953). Momentum Theory of Goodwill. *The accounting Review*, 28, 491-499.
- Nickels, W.G., & Burk Wood, M. (1997). *Marketing: Relationships, Quality, Value*, Worth Publishers Inc, New York.
- Oswald, A. J. (1997). Subjective Well-Being as Predictors of Psychological Well-Being, *Social Indicators Research*, 26, 119-135.
- Pavot, W., & Diener, E. (2004). The subjective evaluation of well-being in adulthood: Findings and implications, *Ageing International*, 29(2), 113-135.
- Potočan, V., & Mulej M. (2007). Transition into an Innovative Enterprise, Univerza v Mariboru, Ekonomsko-poslovna fakulteta, Maribor.
- Pohle, G., & Hittner, J. (2008). Attaining sustainable growth through corporate social responsibility. IBM Global Services, New York.
- Porter, M. (1990). *The Competitive Advantage of Nations*. New York: Basics Books.
- Pradhan, M., & Ravallion, M. (2000). Measuring Poverty Using Qualitve Perceptions of Consumption Adequacy, *Review of Econometrics and Statistics*, 82(3), 462-471.
- Prosenak, D., & Mulej, M. (2007). How can marketing contribute to increase of well-being in transitional (and other) societies?, 1st International Scientific Marketing Theory Challenges in Transitional Societies Conference. Eds. B. Snoj, and B. Milfelner, 127-133, Maribor 20.-21. September, University of Maribor, Faculty of Economics and Business.
- Prosenak, D., & Mulej, M. (2008). O celovitosti in uporabnosti obstoječega koncepta družbene odgovornosti poslovanja = About holism and applicability of the existing concept of corporate social responsibility (CSR), *Naše gospodarstvo*, 54(3/4), 10-21.
- Prosenak, D., Mulej, M., & Snoj, B. (2008). A requisitely holistic approach to marketing in terms of social well-being, *Kybernetes*, 37(9/10), 1508-1529.
- Quinn, F. (2006). *Crowning the Customer. How to Become Customer-Driven*, 10th (revised edition), The O'Brien Press, Dublin.
- Rebernik, M., Knez-Riedl, J., Močnik, D., Širec Rantaša, K., Rus, M., & Krošlin, T. (2002). Slovenski podjetniški observatorij 2002-2.del. Družbena odgovornost malih in srednjih podjetij, EPF, Inštitut za podjetništvo in management malih podjetij, Maribor.
- Revkin, A. C. (2005). A New Measure of Well-Being from a Happy Little Kingdom, *The New York Times*, 4. 10. See: <http://www.nytimes.com/2005/10/04/science/04happ.html?ex=1171947600&en=5a41a93522961d05&ei=5070>.
- Reynard, P. and M. Forstater. (2002). *Corporate Social Responsibility: Implications for Small and Medium Enterprises in Developing Countries*, United nations Industrial Development Organisation.

- Rozman, R., & Kovač, J. (eds) (2006). Družbena odgovornost in etika v organizacijah, Proceedings of the 7th scientific conference on organization, (In Slovenian), Univerza v Mariboru, Fakulteta za organizacijske vede and Zveza organizatorjev Slovenije, Kranj; Univerza v Ljubljani, Ekonomska fakulteta, Ljubljana.
- Ryan, R. M., & Deci, E. L. (2001). On Happiness and Human Potentials: A Review of Research on Hedonic and Eudaimonic Well-Being, In s Fiske (ed) Annual Review of Psychology (Annual Reviews Inc, Palo Alto California).
- Schwartz, S.M., & Carroll, A.B. (2003). Corporate social responsibility: A three domain approach, Business Ethics Quarterly.
- Štefančič, M. (2008). Diktatura šoka, Mladina, Available at: <http://www.mladina.si/tehdnik/200801/clanek/nar-tema--marcel-stefancic-jr/>.
- Steiner, G.A., & Steiner, J.F. (2003). Business, Government and Society: A Managerial Perspective, Text and Cases, Tenth edition, McGraw-Hill, New York.
- Štoka Debevec, M. (2008). Pregled dogajanj na področju družbene odgovornosti v Evropski uniji, In: Hrast et. al. Referenced here.
- Tomer, F.J. (2002). Human Well-Being: A New Approach Based on Overall and Ordinary Functionings, Review of Social Economy, LX(1), 23-44.
- Toth, G. (2008). Resnično odgovorno podjetje, GV Založba, Ljubljana.
- van Praag, B. M. S., Frijters, P., & Feerer-i-Carbonell, A. (2001). The Anatomy of Subjective Well-being, Journal of Economic Behavior and Organizatio, Elsevier, 51(1), 29-49, Available on: <http://ideas.repec.org/p/dgr/uvatin/20020022.html>.
- van Praagh, B. M. & Kapteyn, A. (1973). Further evidence on the individual welfare function of income: An empirical investigation in the Netherlands, European Economic Review, 4, 33-62.
- van Praagh, B. M., & Frijters, P. (1999). The measurement of welfare and well-being; the Leyden approach, In: Kahneman, D. E., Diener, E. & Schwar, N. (ed.), Foundations of hedonic psychology: scientific perspectives on enjoyment and suffering (Russel Sage Foundation, New York, 1999).
- van Praagh, B. M. (1971). The Welfare function of income in Belgium: an empirical investigation, European Economic Review, 2, 337-369.
- Veenhoven, R. (1997). Advances in the Understanding of Happiness, published in French in Revue Quebecoise de Psychologie, 18, 29-74.
- Vella-Bodrick, D., & Page, K. M. (2009). The »What«, »Why« and »How« of Employee Weel-Being: A New Model, Soc Indic Res., 90, 441-458.
- Waddock, S., & Bodwell, C. (2007). Total Responsibility Management, Greenleaf Publishing Limited, Sheffield.
- Walker, G.T. (1938). Goodwill on financial statements. The Accounting Review, 13, 174-182.
- Watson, D., Clark, L.A., & Tellegen, A. (1988). Development and validation of a brief measure of positive and negative affect: The PANAS scales, Journal of Personality and Social Psychology, 54, 1063-1070.
- Whitehouse, T. (2011). Scrutiny of Goodwill Impairments to Pick Up, Compliance Week, 8(85), 28.
- Winkelmann, L., & Winkelmann, R. (1998). Why are the unemployed so unhappy? Evidence from a panel data, Economica, 65, 1-15.
- Wottiez, I., & Theeuwes, J. (1998). Well-Being and Labor Market Status, In: Jenkis, S.P., Kapteyn, A., & van Praag, B.M.S. (ed) (1998). The distribution of welfare and household production: International perspectives, Cambridge University Press, Cambridge, New York in Melbourne, 211-230.

PAY TAXES FOR BEING WELL! BUSINESS ETHICS AND TAX ACCOUNTING AS IMPORTANT ENTERPRISE SUCCESS FACTORS

Jernej Belak, Lidija Hauptman

Faculty of Economics and Business

University of Maribor, Slovenia

jernej.belak@uni-mb.si; lidija.hauptman@uni-mb.si

Abstract

Modern enterprise ethical behaviour demands conscious and positive attitude towards the planning of enterprise core values, culture, ethics, norms, and climate in a way that stimulates such tax accounting, which will importantly influence enterprise's long-term development and success. This way the enterprises' policies will be more social oriented with reflection of their ecological and social role in the environment of their functioning. Consequently the enterprises with a high level of social awareness will not tend to minimize tax liability in their business operations since they will perceive the payment of taxes as a compensation for the provision of greater prosperity and quality of the society – meaning for the higher level of our wellbeing.

Keywords

Business ethics, Corporate Governance, Tax Accounting, Wellbeing

1. Introduction

In this contribution we argue the importance of the impact of the enterprise key stakeholders (that is owners and top management) in the business ethics planning as well as the planning and implementation of such tax accounting that will foster enterprises long-term development and success based on the enterprise's ethical behaviour. The main argument we make is: when the key stakeholders of an enterprise support and enforce the modern ethics by core values they will importantly influence the planning of such type of enterprise culture and climate that will support and enable the planning and implementation of such tax accounting that will foster enterprises long-term development and success. Therefore, the modern enterprise ethical behaviour demands conscious and positive attitude towards the planning of enterprise core values, culture, ethics, norms, and climate in a way that stimulates such tax accounting, which will importantly influence enterprise's long-term development and success. Based on this argument the concept of the requisitely holistic planning of constitutional elements of enterprise ethics and tax accounting is proposed and presented here.

2. Planning of core values, culture, climate, informal as well as formal measures of business ethics

The idea of an ethical enterprise strongly depends on enterprise's key stakeholders – owners and top management. It embraces the activities of ethics and credibility initiation in an enterprise's vision, enterprise's policy (defined by Belak 2002 and 2003 as the mission, purposes, and fundamental goals), strategy, and finally in the processes and structures needed for the realization of this idea (Belak et al., 2010; Kajzer, 1997).

Planning, organizing, directing, and controlling are defined as the basic functions of governance and management process (Belak, 2002). They are of the great importance in the whole process of the realization of the idea of an ethical enterprise. In this contribution we limit our discussion to the function of planning of the holistic enterprise ethics as well as planning and implementation of tax accounting that will stimulate enterprise's ethical behaviour considered as the only possible behaviour assuring enterprise's long term development and success. Firstly, the idea of an ethical and credible enterprise should be manifested by the enterprise owners in its policy that is based on the vision of an ethical enterprise. Its mission, purposes and fundamental goals should be defined in accordance with its vision to be an ethical and credible enterprise. According to Bleicher (1994), the vision of such an enterprise must be supported by the enterprise's responsible policy and philosophy. We should emphasize that the enterprise's policy strongly depend on the enterprise owners' (and top managers') values and norms, which are expressed by enterprise culture (Rüegg-Stürm, 2002; Belak, Duh 2004). Stated policy strongly influence manager's decisions on whether to act ethically or unethically and affects the enterprise's ethical climate (Schweper et al., 1997).

At the strategic management level the process of planning the strategies and the strategic allocation of resources take place for realizing the vision, mission and goals of becoming an ethical enterprise.

The enterprise top management holds the main responsibility for making decisions on strategies and strategic allocation of resources (as described in detail by Belak et al., 2010). It is top management's responsibility to find the most appropriate strategy for realization of the vision, mission, and goals to be an ethical enterprise.

For successful implementation of strategies it is of great importance to develop an ethics program by defining the activities and the responsible performers as well as needed resources of these activities for successful implementation of such program. The purpose of such ethics program is to make strategies action-oriented. The responsibility of implementation of such ethics program lies also at the operational management level (Belak et al, 2010).

In order to successfully realize the planning process at all hierarchical levels adequate planning instruments should be developed among which especially planning methods are of great importance (compare with Belak 2002 and 2003). Whether these should be completely new methods or some of the existing methods could be adopted (proposed by different authors, e.g. Bleicher 2004, David 2008, Hinterhuber 2004, Kajzer, Duh, Belak 2008, Wheelen, Hunger 2009a, 2009b,) should be theoretically as well as empirically studied in the future. The institutional dimension within the proposed concept of holistic planning model describe the responsibilities of different stakeholders within the enterprise (that is owners and managers) regarding decision making in the planning process as well as experts and other co-workers that are in accordance with enterprise owners and managers responsible for enterprise ethical implementation and behaviour.

To conclude the present chapter on argumentation of the importance of the business ethics planning we can argue, that in a sense of enterprise long-term development and success the enterprises' key stakeholders have to attain and maintain such enterprise's core values, culture and climate, which

will support planning and implementation of tax accounting that will enable (ethical) relocation of enterprise's profits in favour of enterprise's long-term development and success. Considering the debate above, the aim for enterprise's long-term development and success can today be treated as ethical behaviour only since this way an enterprise is trying to fulfill the interest of all stakeholders. For such ethical behaviour the tax accounting and relocation of enterprise's profits plays the important role and as such it importantly influences enterprise's ethical behaviour its long-term development and success.

3. The importance of tax accounting at the political level of the governance and management process

Taxes are an important factor in setting the enterprise's goals. Bogen (1994) claims that taxes can be incorporated into the comprehensive system of corporate goals in two ways. The first option allows taxes to be included in the process of defining the goals, which means that the (economic) goals before tax inclusion are transformed into the (tax-economic) goals after taxes (e.g. the objective of maximizing the profit is changed into the maximization of net profit). The second possibility is that the enterprise sets out from the very beginning the independent tax goals (e.g. the minimization of tax burden). Tax goals at the political level arise from the vision, mission and fundamental goals of the enterprise. That is, the enterprise policy determines the fundamental tax goals, from which further strategic tax goals and operational tax goals are formed. According to Bleicher (1994), four dimensions must be taken into consideration in order to define the fundamental goals. These are the orientation of goals to interested participants, the development orientation, the economic orientation and the social orientation of goals.

In terms of the orientation of the goals towards the related stakeholders, it should be taken into account that the owners and the top management make the necessary decisions at the policy level if this is within their competence. The organization and the competences of top management are bound by the enterprise's legal form and the activity which, in turn, restricts the space for defining the fundamental goals. The owners and the top management invest their assets in the enterprise in order to increase or at least maintain their level, and their interests are realized through their participation in the management of the enterprise. The experts and the employees sustain their existence and development by working for the enterprise. The external stakeholders of the enterprise neither create the policy of the enterprise directly nor decide about it, but they have an indirect influence on it or they adjust to it (Belak, 1999; Belak, 2000). Therefore, different tax interests of internal stakeholders (i.e. the owners, the management and the employees) and external stakeholders (i.e. market participants, financial and business participants, the state, the society and the wider public) are met within the enterprise in order to influence the formulation of tax goals.

The management, which is supposed to protect the enterprise's interests, often puts its own interests to the fore. They strive to make sufficient retained earnings for business development, to increase net assets and to maximize the payments of rewards for good performance and the resources for personal development (salaries, profit sharing, favorable purchase of shares, additional pension scheme, etc.). When its own interests prevail over the interests of the enterprise, the management does not strive for the optimal tax burden of the business but rather for its own maximum benefits (regardless of the tax burden of the enterprise) and for the minimum of their own tax burden. The employees endeavor to earn a good salary and obtain a share in the profits together with other benefits (total spending and resources for personal development) regardless of the tax consequences incurred by the enterprise and their own minimum tax burden.

As regards the time orientation of the goals, taxes affect the formulation of short-term goals in terms of a legal, fast and situation-based exploitation of tax opportunities. Therefore, the enterprise sets the short-term tax goals in order to achieve certain tax savings or to achieve their deferral.

Taxes may have a significant impact on long-term business decisions, such as the choice of legal form or the restructuring of the business, the choice of the business operations location as well as the development, investment and financial decisions.

From the substantive aspect, the goals can be divided into material and formal goals. Material goals define the quantitative and qualitative aspects of the enterprise's operations whereas formal goals define the economic effectiveness and efficiency of operations. In most profit-oriented enterprises, formal goals are at the forefront, while in non-profit enterprises the primary role goes to realistic goals and formal goals are in a subordinate position (Melavc, 1995; Melavc, 2000). Taxes reduce the net asset value and affect the profitability of the entire company as well the profitability of a particular financial goal. They represent a negative component of (fundamental) financial goals as they decrease the goals' value. Therefore, the taxes have a double role when setting the fundamental goals: they are (1) the goal and (2) the criterion.

According to Ulrich (1990), the fundamental financial goals at the policy level are the goals related to the solvency, the profitability and the economy of the enterprise. Kappler (2001) additionally defines two fundamental tax goals, i.e. the maximization of the final value of the net asset and the maximization of profit. The enterprise can achieve both fundamental tax goals by minimizing the tax burden. Kappler (2001, 1998) states that the goal of minimizing the tax burden at the company policy level is complementary to the maximization of the final value of the net asset and profits; therefore, at this level it cannot be achieved in absolute terms but only in relative terms.

The social orientation of the goals is reflected in their ecological and social role. With its own definition of social (tax) goals, an enterprise defines its attitude to the state, to the government tax policies and other external actors. Furthermore, it defines the tax morality of internal participants and the tax morality of the enterprise in the relation to the external environment. The enterprise's social tax orientation largely depends on the tax interests of its internal participants. By defining the attitude of internal participants towards a variety of internal (tax) factors, the enterprise defines the current (tax) value system of the internal participants, since these values express the participants' attitude to taxes, tax policy, tax legislation and tax authorities, i.e. the tax system of each country. In short, the individual's tax values reflect the tax mentality and morality of each individual.

Therefore, the enterprises which are highly socially aware do not see and accept taxes as coercive, but as a means of ensuring the implementation of fiscal policies of the state in accordance with the accepted tax principles. A country may encourage enterprises towards social orientation by tax incentives, by tax recognition of expenses for sponsorships, donations and the recognition of investment incentives. Some tax systems have already introduced new forms of taxes, e.g. the ecological tax, which encourages enterprise ecological orientation, or have adopted a regional tax policy, which affects the choice of the enterprises' locations. An enterprise with a high level of social awareness will not tend to minimize tax liability in its business operations since it will perceive the payment of taxes as a compensation for the provision of greater prosperity and quality of the society. The enterprises that tend to minimize tax liabilities take taxes as a constraint, as a cash expenditure, the payment of which does not bring the expected benefits to them.

4. The importance of tax accounting at the strategic level of the governance and management process

Strategic tax goals are set in order to assure the achievement of fundamental (tax) goals and to define the ways of and the resources for their attainment. Since taxes are, by their nature, expenditures, they represent a negative component of the goals because they decrease their value. Therefore, by defining corporate strategic tax goals under the tax and tax accounting policy, the enterprise strives to minimize the value of taxes per a given goal. Belak (1999) and Kralj (Belak, 1993) categorize tax policy as special and partial enterprise's policy, which places it into the management process. In this context, tax policy (Kokotec-Novak, 2001) can be understood as the enterprise's decisions regarding the achievement of tax goals in order to minimize the quantitative components of the tax burden by taking into account the economic and legal constraints. Within tax policy, tax accounting policy is an instrument for the realization of business objectives through a planned utilization of various forms of evaluation and other forms of measurement of economic categories in preparing a tax balance sheet (Kokotec-Novak 2001). Strategic tax goals, therefore, include both the tax policy goals and the tax accounting policy goals.

Kokotec-Novak (2001) defines tax accounting goals established within tax accounting as:

- the minimization of tax expenses during the unchanged business process performance;
- the maximization of deferral (odložitev) of profits if the tax parameters do not change in the long run (e.g. tax rates);
- the principle of the normal line if the tax parameters change in the long run;
- an active development of tax balance sheet and the influence on the dissemination in time and the amount of tax expenditures (Kappler 2001).

An enterprise can achieve these tax accounting goals by defining its tax accounting principles, tax measurement and recognition as well as other principles that allow the enterprise to attain its fundamental goals.

At the core of the strategic management planning we find the strategic potentials and the enterprise's strategy (Belak 2000). The foundation and development planning at strategic management level comprise three steps (Belak, 1999): (1) the activities of searching for strategic options and strategies, (2) economic valuation and the selection of strategies, and (3) the programming of the realization of a planned establishment and development of an enterprise. Taxes affect all stages of strategy planning.

We believe that it is more appropriate to adopt a tax planning of strategy approach (as the pre-tax analysis of strategy implementation) than the approach in which the enterprise includes taxes in its strategy (i.e. the taxes being the criterion for the choice of strategy.) This means that, based on a certain state, the enterprise formulates a tax arrangement (saving tax model) which would allow a legal reduction of tax payment, deferral of payment or, at least, the optimization of tax payments. Therefore, tax planning of strategies can be understood as tax planning of the enterprise's tax policy implementation in the form of a tax arrangement. When searching for and selecting the strategies, the enterprise thus formulates the models of tax saving, which are not universal, but are adapted to an individual enterprise and situation. Since a good knowledge of different tax systems (i.e. different tax rates, tax deductions, and tax bases), tax and other legislation is the prerequisite for strategic planning, taxes complicate the selection of strategies. The strategies are assessed from the economic viewpoint by the application of the expert selection criteria. Since the strategy's profitability represents one of its most important economic characteristics, it can be seen also as the

tax strategy. As expenses, taxes reduce the profitability of the strategy. If the enterprise adopts the economic tax valuation of strategies, it should first make an assessment whether it is reasonable to consider the tax as the elimination criterion. In case the enterprise decides to take the tax into consideration, it should develop a tax arrangement for each strategy, enabling it to legally optimize the taxes. When planning the establishment and the development of the enterprise as well as assessing the strategies, it is necessary to consider tax uncertainty and tax risk. According to Zimmermann (1997), the latter is the consequence of the changes in tax legislation in the planned period, of the effects of the existing tax legislation and the effects of the unchanged tax legislation. Rose (1992) sees the causes of tax risks in the complexity of taxation, the indefiniteness of tax norms as well as the lack of constancy in tax norms and their interpretations. In addition, a differentiation can be made between the limited and the unlimited uncertainty of tax legislation as well as the uncertainty that stems from either tax information or non-tax information.

The realization of the chosen strategies is the basis for a direct integration of strategic management with the operational management at the tactical and operational levels. The planned strategy is implemented at a lower level in the operational process.

5. The importance of tax accounting at the operational level of the governance and management process

Operational goals enable the realization of strategic tax goals and must be defined within tax tactics and tax accounting tactics. Tax tactics are a legal, situation-based exploitation of opportunities in order to save on taxes or to defer their payment. Tax accounting tactics, as the most significant part of tax tactics, represent the modification of a tax base by applying a different valuation approach. Both tax tactics and tax accounting tactics are implemented within tax accounting.

At the operational level, tax goals can be divided into two groups, i.e. (1) the goals of tax and tax accounting tactics, both of which stem from the tax policy goals and the tax accounting policy, and (2) the tax goals originating from other company policies (e.g. financial, investment, human resource, manufacturing and sales policy).

According to Kokotec-Novak (2001), operational tax costs are defined as:

- the goals of tax tactics, which comprise the setting of the time of balancing, the definition of the adequate structure of assets and liabilities for tax purposes at the year end, the implementation of various potential write-offs for tax purposes, the creation of reserves and provisions, using tax relief, reporting policy;
- other tax goals, which include tax goals related to the company's financial policy (optimal tax financing, structure of capital, reserves, liabilities and assets, methods of financing investments, maximization of grants), investment policy (taxes as a selection criterion of investment alternatives, recognitions of investment reserves, use of tax incentives for investment in the company's assets), human resources policy (new recruits and trainees and people with disabilities and the associated benefit of tax relief), purchasing, manufacturing and sales policy (the choice of suppliers, the optimal amount of purchases, sales markets)

Tax planning at the operational level includes the operation process planning and the required capacities for its implementation and involves (a) tax planning of the results and business behaviour, (b) tax aspects of planning the required engagement of business, and (c) tax planning of the company's behaviour with the expected results.

Tax planning of the results of business operations and business behaviour carried out within tax accounting comprises tax planning of income, of expenses and of profit or loss as well as tax planning of financial results and tax planning of assets and liabilities. Such tax planning may be carried out only if business planning is carried out as well due to their interdependence since tax planning presupposes the inclusion of tax legislation and tax barriers into business planning. The company obtains the necessary information for tax planning from its environment as well as from its own internal sources. Therefore, tax planning comprises the acquisition and planning of both tax and non-tax information.

Tax aspects of planning the necessary engagement of a company include the planning of the company's partial policies (e.g. marketing, production and purchasing, human resources, investments and financing).

Tax planning of the company's operations with the expected outcomes takes into consideration tax planning of profit-sharing and the impact of the allocation of net profit to capital. The prevailing practice in the majority of tax systems is that the profit is taxed before distribution. For that reason, tax accounting can affect tax liability only before preparing a tax return. As regards the distribution of profit, the company must plan its dividend policy, which means planning the decisions on the retention of profit or the payment of profit as dividends. The decisions concerning the redistribution of profit are adopted by the top management in line with the company's policy and strategic management.

6. Conclusions

Our contribution clearly shows that enterprises' key stakeholders' core values, culture and ethics strongly impacts the enterprises' core values, culture and ethics and therefore also enterprises' ethical behaviour. Without enterprises' ethical behaviour their long term existence and success is endangered since such behaviour has to consider the fulfillment of all enterprise stakeholders' interests meaning internal (i.e. the owners, the management and the employees) as well as external stakeholders (i.e. market participants, financial and business participants, the state, the society and the wider public). Following such (responsible) philosophy the enterprises' policies will be more social oriented with reflection of their ecological and social role in the environment of their functioning. Consequently the enterprises with a high level of social awareness will not tend to minimize tax liability in their business operations since they will perceive the payment of taxes as a compensation for the provision of greater prosperity and quality of the society – this way world's enterprises will contribute to a higher level of our wellbeing. Therefore our proposition for further research is in main focus to understand the impact and influences to the enterprises key stakeholders' values, culture and ethics to achieve real stimulation for such tax accounting planning, which would through set enterprises' fundamental goals and tax policies actually put the world's wellbeing to a higher level.

7. References

- Belak, J., Duh, M., Mulej, M., Štrukelj, T.: Requisitely holistic ethics planning as pre-condition for enterprise ethical behaviour. *Kybernetes: The International Journal of Systems & Cybernetics*, Vol. 39, No. 1, pp. 19-36, 2010.
- Belak, J. in soavtorji (1993): *Podjetništvo, politika podjetja in management*. Maribor: Založba Obzorja.
- Belak, J. (1999): *Politika podjetja in strateški management*. Gubno: MER Evrocenter.
- Belak, J. (2000): *Podjetniško planiranje kot funkcija managementa*. Gubno: MER Evrocenter.

- Belak J. and co-authors. (2003): MER-ov model integralnega managementa (MER Model of Integral Management). In: Integralni management in razvoj podjetja (Integral Management and Enterprise Development), Mer Publishing House, Maribor.
- Belak J. (2002): Politika podjetja in strateški management (Enterprise policy and Strategic Management). Mer Publishing House, Maribor.
- Belak J., Duh M. (2004): MER Model of Integral Management: Concept and Basic Features. In: Proceedings, Jubilee Conference, Budapest.
- Bleicher, K. (2004): Das Konzept Integriertes Management. Visionen, Missionen, Programme, Campus Verlag, Frankfurt am Main.
- Bleicher K. (1994): Normatives Management: Politik, Verfassung und Philosophie des Unternehmens, Campus Verlag, Frankfurt.
- Bogen, E. (1995): Steuerliche Zielvorstellungen in Unternehmen und Möglichkeiten ihrer Realisierung. Frankfurt am Main: Peter Lang GmbH.
- David, Fred R. (2008): Strategic Management: Concepts and Cases: International Version. 12th Edition. Pearson Education, Inc., Upper Saddle River, New Jersey.
- Hinterhuber, Hans, H. (2004): Strategische Unternehmensführung. 7. grundlegend neu bearbeitete Auflage, Band I und Band II, Berlin – New York.
- Kajzer, Š., Duh, M., Belak, J. (2008): Integral management: Concept and Basic Features of the MER Model. In: Zeitschrift für KMU und Entrepreneurship. Sonderheft 7. Beiträge zur Betriebswirtschaftslehre der Klein- und Mittelbetriebe. Festschrift für Josef Mugler zum 60. Geburtstag. Herausgeben von Schweizerischen Institut für Klein- und Mittelunternehmen an der Universität St. Gallen: Hermann Frank, Herbert Neubauer und Dietmar Rößl. Duncker & Humboldt GmbH, Berlin, St. Gallen.
- Kajzer Š. (1997): Unternehmensentwicklung und –strukturierung. In: Belak Janko et al.: Unternehmensentwicklung und Management. Zürich: Versus Verlag.
- Kappler, R. (2000): Steuerbilanzpolitik kleiner und mittlerer Unternehmen unter Berücksichtigung der jüngsten Entwicklungen des Steuerrechts. Bonn-Berlin: Stolfuss.
- Kokotec-Novak, M. (2001): Dodatno študijsko gradivo za predmet Davčno računovodstvo in davčno svetovanje. Maribor: Tempus Joint European Project 9635.
- Melavc, D. (2000): Kako gospodariti. Kranj: Moderna organizacija.
- Rüeg-Stürm J. (2002): Das Neue St. Galler Management-Modell. Grundkategorien einer integrierte Managementlehre: Der HSG-Ansatz. Bern: Haupt.
- Schwepker Jr. C. H., Ferrel O.C., Ingram T.N. (1997): The Influence of Ethical Climate and Ethical Conflict on Role Stress in the Sales Force. Journal of the Academy of Marketing Science, Vol. 25 No.2, pp. 99-108.
- Ulrich P. (1997): Integrative Wirtschaftsethik. Bern, Stuttgart, Wien: Peter Ulrich.
- Wheelen, T. L., Hunger, J. D. (2009a): Strategic Management and Business Policy: Achieving Sustainability. 12th Edition. Pearson Education International, Pearson Education, Inc., Upper Saddle River, New Jersey.
- Wheelen, T. L., Hunger, J. D. (2009b): Concepts in Strategic Management and Business Policy. 12th Edition. Pearson Education International, Pearson Education, Inc., Upper Saddle River, New Jersey.
- Zimmermann, M. (1997): Steuercontrolling: Beziehungen zwischen Steuern und Controlling. Wiesbaden: Gabler Verlag.

THE MULTI-CRITERIA MEASUREMENT OF WELL-BEING

Vesna Čančer, Simona Šarotar-Žižek

Faculty of Economics and Business

University of Maribor

vesna.cancer@uni-mb.si, zizek@uni-mb.si

Abstract

Measurement of well-being in organizations requires a hierarchy / network of requisitely holistic factors and indicators. Regarding several definitions of subjective well-being that take into account multiple dimensions we made a selection of factors to be structured in the multi-criteria model. The synthesis of the local alternatives' values into the well-being measures as the aggregate values is possible by using the additive model and the fuzzy Choquet integral; the last is needed when the synergies among factors are taken into consideration in criteria's weighting.

Keywords

Multi-Criteria Decision-Making Model, Requisite Holism, Synergy, Well-Being

1. Introduction: The Critical Questions Addressed

Measurement of well-being (WB) requires a hierarchy / network of relevant requisitely holistic factors and indicators. They should replace the traditional factors for measuring economic growth. Subjective well-being (SWB) is the main subject in the context of positive psychology (Musek and Avsec, 2006, p. 51) and has an important place within WB. It is defined as a person's cognitive and affective evaluations of his or her life, which include emotional reactions to events as well as cognitive judgment of satisfaction and fulfillment (Diener et al., 2002, p. 63). The second chapter summarizes the definitions of SWB that take into account multiple dimensions (factors, criteria). It briefly describes previous attempts to measure SWB in organizations.

Multi-criteria decision-making (MCDM) methods that have already turned out to be very applicable in business practice support requisite holism by applying systems theory in an informal style (Čančer and Mulej, 2008). There are several reasons why MCDM can be used in measuring WB in organizations:

- The problem itself is not well-defined,
- The situations involve several interested parties,
- There are many uncertainties and often a lack of reliable data, and
- There is a need of a degree of agreement among the parties involved (Mingers, 2011).

We have already developed and presented the frame procedure for multi-criteria decision-making (by using the group of methods, based on assigning weights) that complements intuition and helps us to master interdisciplinary cooperation on formal and informal principles (Čančer and Mulej,

2010). We concluded that the problems should be approached step-by-step (Čančer and Mulej, 2010): *Problem definition, Elimination of unacceptable alternatives, Problem structuring, Measuring local alternatives' values, Criteria's weighing, Synthesis and Ranking, and Sensitivity analysis*. When defining a problem, relevant criteria and alternatives should be described. In this paper, special attention is given to structuring / model building: the third chapter presents the multi-criteria model of SWB in organizations. We recommend how to obtain the data on each attribute in organizations and how to measure them to obtain the local alternatives' values. In synthesis, the additive model is used when calculating the global (i.e. aggregate) alternatives' values (Bouyssou et al., 2000); such synthesis may hide synergies, and so does the alternatives' ranging. If the criteria can interact with each other – which is the case when measuring WB, as described in the subchapter of the second chapter, not only the weights on each criterion (i.e. the criterion on the lowest hierarchy level) but also weighing on subsets of criteria should be considered – see e.g. (Moaven et al., 2008; Sridhar et al., 2008). We have already delineated how to complete the additive model into the multiplicative one with synergic and redundancy elements (Čančer and Mulej, 2009). When synergies and / or redundancies exist among criteria, several authors (Marichal, 2000; Moaven et al., 2008; Sridhar et al., 2008) recommend the use of a well-defined weighting function on a subset of criteria rather than a single criterion during global evaluation. Since fuzzy integrals (e.g. Choquet integral) are able to model the interaction among criteria in a flexible way (Grabisch and Labreuche, 2005), they have already been used as tools for criteria aggregation (Grabisch and Labreuche, 2005; Marichal et al., 2000; Moaven et al., 2008; Sridhar et al., 2008). In the fourth chapter, the formulas for the synthesis of the local alternatives' values into the WB measures as the aggregate values are written when using the additive model, and the fuzzy Choquet integral; the latter is needed when the synergies among factors are taken into consideration in criteria's weighing.

2. Briefly on Definition and Measuring of Subjective Well-being

2.1. Definition of Subjective Well-being

Diener and Seligman (2004) define SWB or welfare as the evaluation of an individual's life taking into account his or her positive emotions, work, life satisfaction and meaning. For Musek and Avsec (2002, 10) SWB is the main notion, which combines a series of evaluations, which refer to the individual's life, cognitive and emotional, general and more specific. SWB is a measure of a person's WB that incorporates all life events, aspirations, achievements, failures, emotions and relations of human beings, as well as their neighboring cultural and moral environment (Rojas, 2004, p. 2).

Diener (1984, pp. 543-544) mentions the following three hallmarks of SWB:

- It is subjective – it resides within the experience of the individual.
- It includes positive measures – it is not just the absence of negative factors, as it is true of most measures of mental health.
- SWB measures typically include a global assessment of all aspects of a person's life.

Lucas et al. (1996, summarized after Diener et al., 2002, p. 64) demonstrated that multi-item life satisfaction, pleasant affect, and unpleasant affect scales formed factors that were separable from each other, as well as from other constructs such as self-esteem. This means that the concept of SWB covers three components: (i) the positive emotions and humors, (ii) the absence of negative emotions and humors, and (iii) the evaluation of life satisfaction (Musek, 2005, p. 178). A second

factor of SWB tackles the emotional aspect of WB, which is composed of two independent components – positive and negative effect. A measuring device had to be built for measuring the three above mentioned components. Watson et al. (1988; summarized after Musek, 2005, p. 178) mention that positive and negative affection (PA and NA) is measured by numerous instruments and most of the time the PANAS (Positive Affect Negative Affect Scale) questionnaire is used.

Diener and Biswas-Diener (2000; summarized after Musek, 2005, p. 179) claim that the dimensions optimism and the feeling of fulfillment should also be considered as a part of the concept of WB. Therefore we can speak about the emotional components of the SWB, which are composed of positive and negative effects, and about cognitive components, which are composed of, for instance, life satisfaction. Although the mentioned components correlate, they do not have the same meaning (Diener and Biswas-Diener, 2000; summarized after Musek and Avsec, 2002, p. 12).

2.2. Implications of Subjective Well-being

Many studies indicated significant life benefits for people with high SWB. According to Diener and Seligman (2004, p. 1) the individual's income, when increasing, is becoming less relevant for the growth of WB; on the other hand interpersonal relations and satisfaction at work are becoming more and more relevant. Non-economic indicators of social WB are found important by these authors, such as social capital, democratic management and human rights, having effect on the satisfaction and profitability at the workplace. Diener and Seligman (2004, p. 1) claim that the expected (economic) results are most often impacted by WB than vice versa. They also discovered that people who are at the top of the WB scale have more income and are more successful at work as those in the lower region of such a scale. Satisfied employees are better co-workers and therefore help their colleagues in various ways. Furthermore, people with a higher level of WB have better social relations. Such people are more likely to get married, stay married and have a successful marriage. And finally, WB is also connected with health and longer living, but the connections between them are far from being completely understood. Therefore a high level of WB is not precious only in the context of WB, but it can also be economically useful. These facts show that monitoring of WB at the organization and state levels is necessary for WB to become a central topic for the creation of the policy of management, and that accurate measuring of WB forms a basis of such a policy (Diener and Seligman 2004, p. 1). Authors suggest that for the purpose of measuring of WB positive and negative emotions, commitment, purpose and meaning, optimism and trust as well as a wide concept of a full life be used as variables. At the same time they point out that for the measuring of WB researches are important, which refer to social conditions, income, physical health, and mental disorders. James (2007) warns about the border between WB and the end of motivation because of the affluence combined with complacency: the border is not objective, but subjective.

It could be added that on this basis one should monitor the SWB, which supports people's creative work and cooperation, which can then lead to an increased objective and personal WB. Hornung (2006; summarized after Prosenak and Mulej, 2007, p. 6) provides an interesting common denominator: happiness counts as people's constant goal and also as a comprehensive synergetic indicator of comprehensive WB, good performance, physical, psychological and social health of a person. Hornung (2006, pp. 334–337; summarized after Prosenak, Mulej and Snoj 2008, p. 6) states that for the good WB the following needs should be met: material needs, informational and, at the level of individuals, psychological needs, security needs, needs for freedom and action, needs for adaptability, needs for efficiency, and needs for responsibility.

As the SWB is important for several reasons, the interventions to increase SWB are important as well. They are important not only because it feels good to volunteer more, have more positive work

behavior, and exhibit other desirable characteristics (Diener et al. 2002, p. 69). Few direct intervention efforts have been implemented. This is a reason for programs (Fordyce 1977, 1983) or examples (Pavot and Diener 2004, 129-130) designed to boost people's happiness.

2.3. How to rise Subjective Well-being of Employees

The human WB is important due to its positive effects on the work as well as on the life in general terms. Although the psychical WB might be empowered by the persons themselves, the organization can and shall essentially contribute to it, too. They can cope with it within the human resources management field. So we have to distinguish between activities that generally contribute to the WB of individuals, and those that are implemented by the organizations with the aim to create the WB atmosphere between the co-workers. Figure 1 delineates the strategy to raise SWB of employees and implications of WB in organizations.



Figure 1: Strategy to Rise SWB of Employees and Implications of WB in Organizations

The individuals can increase their own WB by the imitation of the happy people features, e.g. the features such as: pleasant appearance, coping with the meaningful things, devoting more time for social engagement (sociability), developing positive attitudes toward life, striving for healthy personality. The various techniques could also positively contribute to the WB, e.g. techniques for physical balance, spiritual maturity, social integration, as well the economic stability.

Due to the reason that individuals are frequently in the roles of co-workers, their WB at work is also important. So the organizations as well as the employers can significantly contribute to the enhancement of WB of the co-workers. We are pointing to the: (i) motivation, (ii) variety management, (iii) individual role and its empowerment, (iv) balancing work and personal lives, (v) enabling health improvement, (vi) preventing harm and managing health risk, (vii) management style and workplace culture, (viii) communication and managing conflicts, (ix) age management, (x) managing time, (xi) teamwork and creativity, and (xii) development of employees.

These activities have also benefits for the organization: (i) attendance, (ii) satisfaction and morale, (iii) productivity, (iv) quality, (v) innovativeness, (vi) climate, (vii) loyalty and advocacy, and (viii) problem solving.

3. The Multi-criteria Model of Well-being in Organizations

In MCDM, a complex problem which consists of a goal, criteria, very often some levels of sub-criteria, and alternatives is structured in a hierarchical model. When structuring the criteria hierarchy for the goal “Measurement of SWB in organizations” that is presented in Figure 2, we considered the definitions and previous attempts to measure SWB, described in the second chapter.

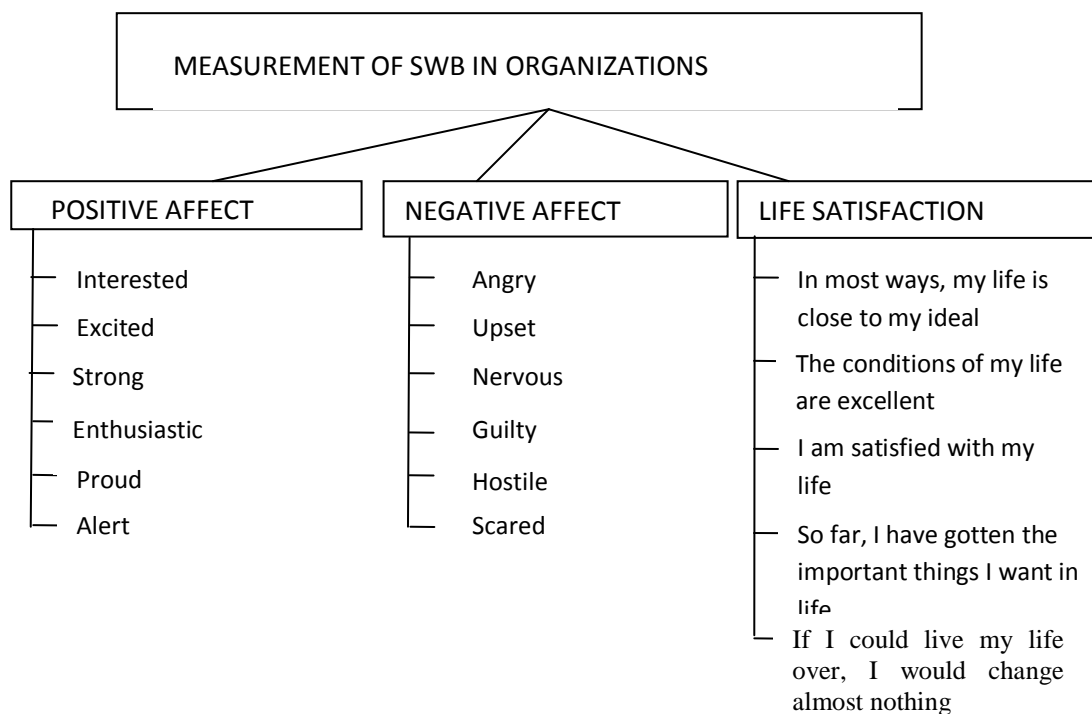


Figure 2: The criteria hierarchy for measuring SWB in organizations

The emotional and cognitive components of SWB are included as the 1st level criteria: positive affection, negative affection, and life satisfaction. The variables describing the positive affection (alert, enthusiastic, excited, interested, proud, and strong) and the ones describing the negative affection (scared, nervous, hostile, guilty, upset, and angry) in the PANAS questionnaire (Watson et al., 1988), and the variables used to describe life satisfaction (1. In most ways, my life is close to my ideal. 2. The conditions of my life are excellent. 3. I am satisfied with my life. 4. So far, I have gotten the important things I want in life. 5. If I could live my life over, I would change almost nothing.) (Diener et al., 1985) are included as the 2nd level criteria - attributes.

The 5-level PANAS scale (1- very slightly or not at all, 2 – a little, 3 – moderately, 4 – quite a bit, 5 – extremely) (Watson et al., 1988) can be used to obtain the data about positive and negative affection. The attributes describe different feelings and emotions. Employees indicate to what extent they feel this way at the present moment. The 7-level Satisfaction with Life Scale (7 – strongly agree, 6 – agree, 5 – slightly agree, 4 – neither agree nor disagree, 3 – slightly disagree, 2 –

disagree, 1– strongly disagree) (Diener et al., 1985) can be used to obtain the data about life satisfaction. Employees indicate their agreement with each item (variable, attribute) local alternatives' values with respect to life satisfaction. When alternatives are organizations, the data about SBW in each organization can be obtained as the mean of the employees' data for each attribute. Since the above mentioned measurement scales are the interval ones, the local alternatives values with respect to the attributes of the positive affection and the life satisfaction can be obtained by using the direct method or by increasing value functions, whereas the local alternatives' values with respect to the attributes of the negative affection can be obtained by using the decreasing value functions.

The criteria's importance can be expressed by using the methods based on ordinal (e.g. SMARTER), interval (e.g. SMART, SWING) and ratio scales (AHP) (Belton and Stewart, 2002; Bouyssou et al., 2000). Our empirical research has shown that there is synergy between positive affection and life satisfaction, and redundancy between negative affection and life satisfaction. The judgments' expression about the importance of the synergies among factors requires additional efforts for decision makers to determine the appropriate weights.

4. Considering Synergies among Criteria by Fuzzy Choquet Integral

During synthesis, the additive model is usually used, in which the reciprocal preferential independence of criteria is assumed (Bouyssou *et al.*, 2000). When the criteria are structured in one level only, the aggregate alternatives' values are obtained by:

$$v(X_i) = \sum_{j=1}^m w_j v_j(X_i), \text{ for each } i = 1, 2, \dots, n, \quad (1)$$

where $v(X_i)$ is the value of the i^{th} alternative, w_j is the weight of the j^{th} criterion and $v_j(X_i)$ is the local value of the i^{th} alternative with respect to the j^{th} criterion. When the criteria are structured in two levels, the aggregate alternatives' values are obtained by:

$$v(X_i) = \sum_{j=1}^m w_j \left(\sum_{s=1}^{p_j} w_{js} v_{js}(X_i) \right), \text{ for each } i = 1, 2, \dots, n, \quad (2)$$

where p_j is the number of the j^{th} criterion sub-criteria, w_{js} is the weight of the s^{th} attribute of the j^{th} criterion and $v_{js}(X_i)$ is the local value of the i^{th} alternative with respect to the s^{th} attribute of the j^{th} criterion. Since the criteria of measurement of SWB in organizations interact with each other, as mentioned in the previous section, not only should the weights of each criterion (i.e. the criterion of the lowest hierarchy level – attribute) be considered, but also the weighting on subsets of criteria as well. A suitable aggregation operator, which generalizes the weighted arithmetic mean, is the discrete Choquet integral. Following (Grabisch, 1995; Marichal, 2000), this integral is viewed here as an m -variable aggregation function; let us adopt a function-like notation instead of the usual integral form, where the integrand is a set of m real values, denoted by $v = (v_1, \dots, v_m) \in \mathfrak{R}^n$. The (discrete) Choquet integral of $v \in \mathfrak{R}^n$ with respect to w is defined by:

$$C_w(v) = \sum_{j=1}^m v_{(j)} [w(K_{(j)}) - w(K_{(j+1)})], \quad (3)$$

where (\cdot) is a permutation on K – the set of criteria, such that $v_{(1)} \leq \dots \leq v_{(m)}$. Also, $K_{(j)} = \{(j), \dots, (m)\}$.

5. Conclusions

The complex problem “Measuring subjective well-being in organizations” can be structured in a network, as well. In this case we can use the Analytic Network Process, because it allows for both interaction and feedback within clusters of elements (inner dependence) and between clusters (outer dependence). It is a process that allows one to include several types of criteria, tangible and intangible.

By using the multi-criteria decision-making methods, we can assess the level of well-being – the aggregate value of well-being measure, benchmark the well-being performance of enterprises, determine the key success and failure factors, and benefit from good examples. They can be used as the information for the interventions to increase subjective well-being in organizations.

6. References

- Belton, V., & Stewart, T. J. (2002). *Multiple Criteria Decision Analysis: An Integrated Approach*, Kluwer Academic Publishers, Boston (MA), Dordrecht, London, ISBN 0-7923-7505-X
- Bouyssou, D., Marchant, T., Pirlot, M., Perny, P., Tsoukiàs, A., & Vincke, Ph. (2000). *Evaluation and Decision Models: A Critical Perspective*, Kluwer Academic Publishers, Boston (MA), London, Dordrecht, ISBN 0-7923-7250-6
- Čančer, V., & Mulej, M. (2008). Informal Systems Thinking in the Form of Operations Research. In: Chroust, G., Doucek, P., & Klas, J. (eds.): *Proceedings of the 16th Interdisciplinary Information Management Talks IDIMT-2008*, Schriftenreihe Informatik 25, Trauner Verlag, Johannes-Kepler-Universität, Linz 2008. ISBN 978-3-85499-448-0
- Čančer, V., & Mulej, M. (2009). The Multi-Criteria Assessment of (Corporate) Social Responsibility. In: Doucek, P., Chroust, G., & Oškrdal, V. (eds.): *Proceedings of the 17th Interdisciplinary Information Management Talks IDIMT-2009*, Schriftenreihe Informatik 29, Trauner Verlag, Johannes-Kepler-Universität, Linz 2009. ISBN 978-3-85499-624-8
- Čančer, V., & Mulej, M. (2010). The Dialectical Systems Theory's Capacity for Multi-Criteria Decision-Making. *Systems Research and Behavioral Science*, 27(3), 285-300.
- Diener, E. (1984). Subjective Well-being. *Psychological Bulletin*, 95(3), 542-575.
- Diener, E., & Biswas-Diener, R. (2000). *Income and subjective well-being: Will money make us happy?* Department of Psychology, University of Illinois, Mimeo.
- Diener, E., & Seligman, M. E. P. (2002). Very happy people. *Psychological Science*, 13, 81-84.
- Diener, E., & Seligman, M. E. P. (2004). Beyond Money: Toward an Economy of Well-being. *Psychological Science in the Public Interest*, 5(1), 1–31.
- Diener, E., Lucas, R. E., & Oishi, S. (2002). Subjective Well-Being. In *Handbook of positive psychology*, Ed. Snyder, C. R., and S. J. Lopez. New York: Oxford University Press. ISBN 0195135334
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, 49, 71-75.
- Fordyce, M. W. (1977). Development of a program to increase personal happiness. *Journal of Counseling Psychology*, 24, 511-520.
- Fordyce, M. W. (1983). A program to increase happiness: Further studies. *Journal of Counseling Psychology*, 30, 483-498.
- Grabisch, M. (1995). Fuzzy Integral in Multicriteria Decision Making. *Fuzzy Sets and Systems*, 69(3), 279-298.
- Grabisch, M., & Labreuche, Ch. (2005). Fuzzy Measures and Integrals in MCDA, in: j. Figueira, S. Greco and M. Ehrgott (eds.), *Multiple Criteria Decision Analysis*, Kluwer Academic Publishers, 2005. ISBN 0-387-23067-X

- Hornung, B. R. (2006). Happiness and the pursuit of happiness: A sociocybernetic approach. *Kybernetes*, 35(3/4), 323-346.
- James, O. (2007). *Affluenza – a contagious middle class virus causing depression, anxiety, addiction and ennui*. Vermillion, an imprint of Ebury Publishing, Random House UK Ltd etc.
- Lucas, R. E., Diener, E., & Suh, E. (1996). Discriminant validity of well-being measures. *Journal of Personality and Social Psychology*, 71, 616-618.
- Marichal, J. L. (2000). An Axiomatic Approach of the Discrete Choquet Integral as a Tool to Aggregate Interacting Criteria. *IEEE Trans. Fuzzy Systems*, 8, 800-807.
- Mingers, J. (2011). Soft OR comes of age – but not everywhere! *Omega*, doi: 10.1016/j.omega.2011.01.005. forthcoming.
- Moaven, S., Ahmadi, H., Habibi, J., & Kamandi, A. (2008). A Fuzzy Model for Solving Architecture Styles Selection Multi-Criteria Problem. In: *Second UKSIM European Symposium on Computer Modeling and Simulation*, IEEE Computer Society, 388-393.
- Musek, J. (2005). *Psihološke in kognitivne študije osebnosti*. Znanstveni inštitut Filozofske fakultete, Ljubljana, ISBN 86-7207-163-8
- Musek, J., & Avsec, A. (2002). Pozitivna psihologija: subjektivni (emocionalni) blagor in zadovoljstvo z življenjem. *Anthropos*, 34(1/3), 41-68.
- Musek, J., & Avsec, A. (2006). Osebnost, samopodoba in psihično zdravje, *Anthropos*, 38(1/2), 51-75.
- Pavot, W., & Diener, E. (2004). The subjective evaluation of well-being in adulthood: Findings and implications. *Ageing International* 29(2), 113-135.
- Prosenak, D., & Mulej, M. (2007). How can marketing contribute to increase of well-being in transitional (and other) societies? In: Snoj, B., & Milfelner, B. (eds.): *1st International Scientific Marketing Theory Challenges in Transitional Societies Conference*, 20.-21. September, Maribor, University of Maribor, Faculty of Economics and Business, Maribor, 127-133. ISBN 978-961-6354-67-7
- Prosenak, D., Mulej, M., & Snoj, B. (2008). A requisitely holistic approach to marketing in terms of social well-being. *Kybernetes*, 37 (9/10), 1508-1529.
- Rojas, M. (2004). *Well-being and Complexity of Poverty. A Subjective Well-being Approach*. Research Paper No. 2004/29. UNU World Institute for Development Economics Research, Helsinki.
- Sridhar, P., Madni, A. M., & Jamshidi, M. (2008). Multi-Criteria Decision Making in Sensor Networks. *IEEE Instrumentation & Measurement Magazine*, February 2008, 24-29.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of a brief measure of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063-1070.

SOCIAL BENEFITS OF FORESTRY INVESTMENTS

Robert Mavsar

Mediterranean Regional Office
European Forest Institute
robert.mavsar@efi.int

Vesna Čančer, Jožica Knez-Riedl

Faculty of Economics and Business
University of Maribor
vesna.cancer@uni-mb.si, jozica.knez@uni-mb.si

Abstract

Forests represent a significant part of Europe's landscape. Although they provide a great variety of goods and services that are important for the wellbeing of people, their economic importance is rather limited. This is mainly because an important share of forest goods and services is not marketed and are considered as public goods. However, to efficiently manage the forests it is crucial to understand and know their contribution to the social wellbeing. Economics has developed a number of different methods that enable the valuation of non-market goods and services. This paper provides a short overview of some of these methods and an example of application for the valuation of afforestation investments in Spain.

Keywords

Forest, Non-Market Goods, Valuation Methods, Afforestation, Choice Modeling

1. Introduction

Forests cover almost 50% of the territory of the European Union. Nevertheless, their economic importance is in most Member States rather limited. For example, only in Austria, Finland and Sweden the GDP contribution of forestry exceeds 1%. One of the main reasons for this low level of economic importance is that the traditional systems of national accounts (SNA) consider only production and income derived from market goods. However, in the case of forests and other ecosystems, it should be acknowledged that they provide a multiplicity of goods and services of crucial ecological, social and economic importance for the sustainability of our society, but not all of them are traded in traditional markets and therefore, are not considered in the traditional SNA. Nevertheless, they can contribute significantly to the social well-being.

This paper is focusing on human well-being, both in personal and social context. However, when discussing about well-being we are aware of its multidimensional character that besides human well-being the well-being of non-human beings is critical, as well (Butler, Oluoch-Kosura 2006). Considering well-being in its broader sense supports the urgent shift from harmful anthropocentric view on natural environment to the ecocentric view. According to it a man is a part of nature and

not in superior position. It means that not only human needs matter, but needs of ecosystems as well (Raiklin, Uyar 1996; Knez-Riedl 2010). Anthropocentric view, resulting in degradation of natural systems, is one of the major reasons why both environmental and ecological scarcity are dramatically increasing (Knez-Riedl 2010). Disturbances in functioning of ecosystems are threatening the supply of ecosystem services which are of vital importance primarily for survival of beings. But they are indispensable for the quality of their life, as well. This paper presents the approaches that could help to alleviate the harmful consequences of both environmental and ecological scarcity, even more, to prevent them.

2. Forest goods and services

Forest goods and services represent the benefits that human populations derive, directly or indirectly, from forest ecosystems functions (MEA 2005). Therefore they are an inherently anthropogenic concept, since it is the presence of human beings as valuing agents that enables the translation of the basic ecological structures and processes of forests into value-laden entities. The Millennium Ecosystem Assessment report (2005) divides forest goods into five main categories (Figure 1): resources; ecological; biospheric; social; and amenities. The resources category refers to all (tangible) goods that may be obtained from forests (wood and non-wood); the ecological services are those related to protection of water, soil and health; the biospheric services are mainly climate regulation and biodiversity protection; while social and amenity services comprise different types of recreational activities and the cultural importance of forests. Moreover, a study conducted by Mavsar et al. (2008) listed over 200 different end forest products and services. Nevertheless, the authors claim that the elaborated list is most likely not complete, because of the continually changing uses the society ascribes importance to different forest goods and services. It means that new goods and services are appearing or already existing goods and services are used in new ways.

However, one of the main issues related to forest goods and services is their economic nature. A fundamental distinction in economics is made between market and non-market goods and services. Goods and services in a free market economy are sold for prices that reflect a balance between the costs of production and what people are willing to pay.

Only a fraction of forest goods and services, such as timber, are traded in markets; thus their value can be directly observed (market prices). Conversely, a non-market good or service is something that is neither bought nor sold directly, and does not have an observable monetary value. Thus, by using the label non-market goods and services it is referring to those forest goods and services that cannot be bought or sold in a traditional market and are provided to the community as a whole free of charge, or to individual consumers either free of charge or at a symbolic fee which is well below production costs (OECD 2000). Most of forest goods and services can be classified as non-market ones. For example, considering the classification of forest goods and services presented in Figure 1, the majority of the goods and services contained in the classes ecological, biospheric, social and amenities can be considered as non-market ones.

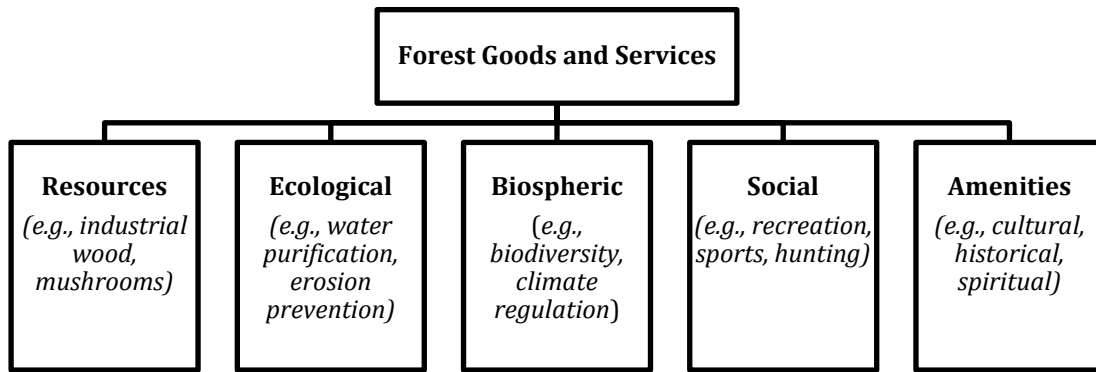


Figure 1: Major classes of forest goods and services (Source: MEA 2005)

However, even if these goods have no established market prices, they still contribute to the well-being of the societies. To measure the contribution of these goods to the public welfare (in monetary terms) a number of valuation approaches were developed. Economic valuation of environmental (forest) goods and services relies on the notion of willingness to pay (WTP). Willingness to pay for a particular good is defined as the maximum amount of other goods (e.g. money) an individual is willing to give up in order to obtain that good. WTP is determined by motivations which can vary considerably, ranging from personal interest, altruism, concern for future generations, environmental stewardship, etc. The economic value of the good to an individual is reflected in the willingness to pay of the individual for that good. Thus, economic valuation (based on the concept of economic value) is essentially anthropocentric – it stresses values that bring benefits to human beings, either directly or indirectly – and is preference based.

3. Valuation of forest goods and services

The wide range of benefits that forests provide creates multiple challenges for analysis. A coherent analytical framework based on the concept of Total Economic Value (TEV) has been developed as a guarantee that the benefits are considered systematically and comprehensively, without any double counting. In recent years, the TEV has been widely used to quantify the full value of the different components of ecosystems. In general, this framework disaggregates the value of ecosystems into use and non-use values (Pearce & Moran 1994) (see Figure 2).

Use values are related to the direct, indirect or future use of a natural resource. Direct use value is defined as the value of actually using a good or service, (e.g. timber, hunting, bird watching, or hiking). Use values may also include indirect uses, where individuals benefit from ecosystem services supported by a resource (e.g. water regulation, carbon sequestration). Option value is the value that people assign to having the option of a good or a service (i.e. something to enjoy) in the future, even though they may not currently use it. These future uses may be either direct or indirect. For example, a person may hope to visit a natural area sometime in the future, and would thus be willing to pay something extra to preserve the area, as a way of securing that option.

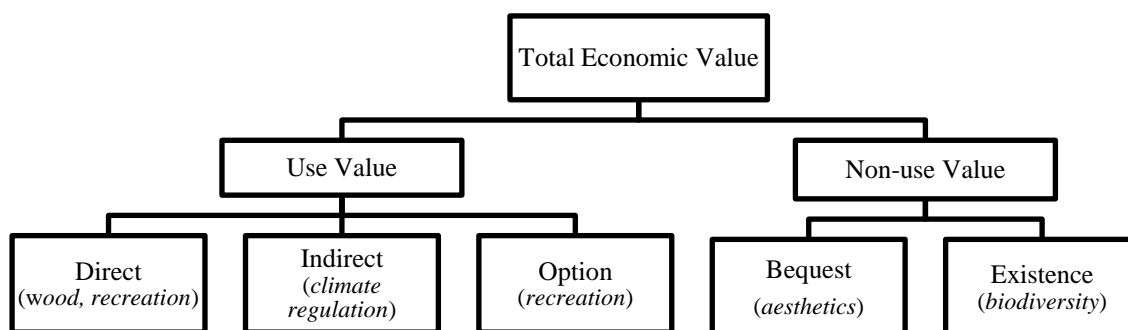


Figure2: Total Economic Value approach classification (following Pearce and Moran 1994).

On the other hand, **non-use values**, also referred to as “passive use” values, are values that are not associated to the actual use or even the option to use a good or service. These values are derived from the knowledge that the natural resource is preserved. Existence value is the non-use value that people place for simply knowing that something exists, even if they never see it or use it. Bequest value is the value that people place of simply knowing that future generations will have the option to enjoy something. Thus, it is measured by peoples’ willingness to pay to preserve the natural environment for future generations. Altruistic value is the value attached by an individual to another individual’s use or enjoyment of an ecosystem service in the current generation.

It is clear that a single person may benefit in more ways than one from the same ecosystem. Thus, the total economic value is the sum of all the relevant use and non-use values for a good or service.

The most common reasons for undertaking a valuation of ecosystems are (i) to assess the overall contribution of ecosystems to social and economic well-being, (ii) to understand how and why economic actors use ecosystems as they do, and (iii) to assess the relative impact of alternative actions, as a decision support tool (MEA 2005). The latter can provide a way to justify and set priorities for programs, policies, or actions that protect or restore ecosystems and their services. This type of valuation can provide useful information to policy-makers by highlighting the economic consequences of an alternative course of action.

Economic valuation methods attempt to elicit the monetary value of a certain change in the quantity and/or quality of the environmental goods and services. The main types for these methods are Revealed Preference (RP) and Stated Preference (SP) methods. These are based on the fundamental principles of welfare economics; whereby the changes in the well-being of individuals are reflected in their willingness to pay or willingness to accept compensation for changes in their level of use of a particular service or bundle of services (Hanley et al. 2001).

The RP methods are based on actual observed behaviour data, including some techniques that deduce values indirectly from behaviour in surrogate markets, which are assumed to have a direct relationship with the ecosystem service of interest. The main valuation techniques in this group of methods are:

- **Market Prices Method** is used when the actual market for the valued good or service exists. In this case, the valuation is done on the basis of observed market prices. The market valuation technique uses the standard economic methods for measuring the economic benefits from market impacts, based on the quantity demanded and supplied at different prices. Where market values exist, they should be preferred to any other valuation technique. However, it should be remembered that market prices represent only a lower range estimate of value; some people may in fact be prepared to pay much more than the market price.

- **Avoided Cost Method** is based on the idea that the cost of replacing the goods and services provided by an environmental resource can offer an estimate of the value for that resource. The main underlying assumptions for this approach refer to the predictability of the extent and nature of physical expected damage (there is an accurate damage function available) and that the costs to replace or restore damaged assets can be estimated within a reasonable degree of accuracy. It is further assumed that the replacement or restoration costs do not exceed the economic value of the service. The latter assumption, however, may not be valid in all cases. The value of the service may fall short of the replacement or restoration costs; either because there are few users or because their use of the service is in low-value activities.
- **Travel Cost Method** uses the costs of consuming the services of the environmental asset (e.g. outdoor recreation site) as a proxy for value the consumers place on it. These costs include travel costs, entrance fees, on-site expenditures and outlay on capital equipment necessary for consumption. This method requires that the visitor surveys provide information on travel expenditures (transportation mode, time and distance), socio-economic characteristics (age, gender, income, etc.) and purpose of visit. The travel cost method is mainly used to estimate economic use values associated with ecosystems or sites that are used for recreation (Hotelling, 1949; Freeman, 1992).
- **Hedonic Pricing Method** is used to estimate economic values for those goods and services that directly affect market prices of some other (related) goods or services. The basic premise of the hedonic pricing method is that the price of a market good is related to its characteristics, or the services it provides. It identifies value according to the idea that price is determined by both internal characteristics of the goods and external factors affecting it. For example, the price of a house reflects the characteristics of that house (size, age, comfort, location, air quality, etc), as well as the characteristics of the surrounding neighbourhood (accessibility to schools and shopping, level of water and air pollution, value of other homes, etc). Therefore, it is possible to value the individual characteristics of a house or some other good by looking at how its price changes when the characteristics change. The hedonic pricing method is most often used to value environmental amenities that affect the price of residential properties (Rosen, 1974), although it could also be used to estimate the value of the “green premium” on environmentally friendly consumer goods, or the value of environmental risk on human health through wage differentials.

The SP methods are based on hypothetical rather than actual data on behaviour; for the former the value is inferred from people’s responses to questions describing hypothetical markets or situations. They consist of the following main valuation techniques:

- **Contingent Valuation** – assigns monetary values to environmental goods and services that do not involve market purchases and may not involve direct participation. It is carried out by directly asking individuals about their willingness-to-pay to obtain an environmental good or service. A description of the service involved is given to the individual, along with details about how it will be provided. The WTP value can be obtained in a number of ways, such as asking respondents to name a figure, either from multiple choice questions, or by giving them specific amount (in which case, follow-up questions with higher or lower amounts are often used). Contingent valuation can be used to estimate economic values for projects changing the supply of all kinds of ecosystem and environmental services (Mitchell and Carson, 1989).
- **Choice Modelling** - is a newer approach to obtaining stated preferences. It consists of asking respondents to choose their preferred option from a set of alternatives, which are

defined by attributes (including the price or payment). These alternatives are designed so that the respondents' answer reveals the marginal rate of substitution²² between the attributes and money. These approaches are useful in cases when there is interest in the value of several attributes in a given situation or when the decision lends itself to respondents choosing from a set of alternatives described by attributes. Like Contingent valuation it can be applied to estimate the value of most goods and services (Henscher et al. 2005).

Very often, time and resources are limited and new primary environmental valuation studies cannot be performed before making important decisions. When searching for the most cost-efficient techniques, decision makers try to transfer economic estimates from previous studies that have similar changes in environmental quality and thus, providing a value for the environmental changes in question. This procedure is often termed as **benefit transfer**. There are two approaches to value transfer: (i) Unit Value Transfer and (ii) Function Transfer (Navrud 2007). The former builds on the transfer of actual value estimates from other studies, appropriately adjusted for inflation, the differences in purchasing power of income across regions and, in some cases, the income variation. The latter approach is more ambitious and suggests transferring value functions from other studies. Benefit transfer has been the subject of considerable controversy, as it is often used inappropriately. The consensus seems to be that benefit transfer can provide valid and reliable estimates under certain conditions. These conditions include the requirement that the commodity or the service being valued must be very similar to the ones on which the estimates were made. The estimates – i.e. the site, the populations affected – must have very similar characteristics. Of course, the original estimates being transferred must themselves be reliable in order for any attempt at transfer to be meaningful (SEPA 2006).

Some of the valuation techniques are broadly applicable, some are applicable to specific issues, and some are tailored to particular data sources. A number of factors and conditions determine the choice of specific measurement methods. In general, measures based on observed behaviour are preferred to measures based on hypothetical behaviour. However, the choice of valuation technique in any given instance is dictated by the objectives and characteristics of the case and data availability. In general, estimating the change in the value of an ecosystem good or service is only one step in the whole valuation process. First the baseline situation of an ecosystem needs to be identified, then the changes that may occur (e.g. due to improved management), in the next step this changes are quantified and the impact on human welfare is assessed and only in the last step the changes of ecosystem services are valued.

4. Social benefits of an afforestation programme in Spain

As an example of the application of economic valuation of forest goods and services, and the information it can provide, we present summarized results of a study conducted in Spain (Mavsar and Riera, 2008). The objective of the study was to estimate the social benefit of an afforestation programme that would convert abandoned agriculture land in the Spanish Mediterranean region into oak (Cork and Holm oaks) forests. In the study it was assumed that the newly established forests would provide new recreation opportunities, increase number of plant species (increased biodiversity) in afforested areas, and increase the total amount of sequestered carbon and the

²² Marginal Rate of Substitution is the rate at which a customer is ready to give up one good in exchange for another good while maintaining the same level of satisfaction (Samuelson and Nordhaus, 2004).

share of forests in the region (for details see Table 1). However, the implementation of the afforestation programme would require an annual payment, mandatory for all Spanish citizens.

Good	Current situation	Situation with afforestation
Recreation access permitted	Yes	Yes, No
Number of plant species on afforested areas	40	90, 140
Carbon sequestration increase in the region	+ 0 t CO ₂ year ⁻¹	+ 9,500 t CO ₂ year ⁻¹ , +19,000 t CO ₂ year ⁻¹ , + 30,000 t CO ₂ year ⁻¹
Increased size of oak forests in the region	+ 0 ha	+ 140.000 ha, + 420.000 ha, + 700.000 ha
Annual payment required	0 €	20 €, 40 €, 60 €, 80 €, 100 €, 120€

Table 1: Considered changes in forest goods and services (Source: Mavsar & Riera, 2008)

To estimate the economic value of these changes a choice experiment was conducted. The implementation of the study was through a questionnaire that was conducted on the national level and included 284 respondents. In the questionnaire the current situation and a number of different alternatives (with respect to the provided changes in the quantity of the forest goods) were presented to respondents, which had to select their preferred alternative.

The results of the study showed that the afforestation of the abandoned agricultural land and the related changes in the quantity of forest goods have a positive social value. For example (see Table 2), on average a person would be willing to pay 14.74 € per year for having access for recreation to the newly established forest, 0.29 € per year for each additional plant species on the afforested areas, 0.025 € per year for each additional tonne of CO₂ that would be sequestered by the forest and 3.18 € per year for each additional hectare of oak forest area.

Good	WTP (€ person ⁻¹ year ⁻¹)
Recreation	14.74
Plants	0.29
Carbon sequestration	0.025
Forest area	3.18

Table 2: Marginal willingness to pay (WTP) for the changes of forest goods (Source: Mavsar & Riera, 2008)

This indicates that the implementation of that afforestation programme would increase the social welfare of the Spanish population. For example, considering a programme that would grant access for recreation to the afforested areas, increase the oak forest area by 420,000 hectares, increase the number of plant species on the afforested areas by 50, and sequester additional 19,000 t of CO₂ per year would increase the welfare of the Spanish citizens by 4,568.4 million € per year (126.9 € per person per year).

5. Conclusions

This study clearly indicates that when evaluating the contribution of forests to the public welfare it is important to consider the whole range of goods and services that are provided. The established valuation methods offer different types of valuable information when evaluating the contribution of forests to the public welfare. Where we define information as an influential message, which in its turn has semantic content and consist of data made of signs in a syntactical order (see Čančer and Mulej, 2007). Nevertheless, even though that the applied methodology and understanding of the

information provided in non-market valuation have improved considerably, and enable sound estimation of economic values of all types of forest goods and services, still they should be applied taking into consideration the good practice standards and their strengths and limitations.

6. References

- Butler, C.D. and Oluoch-Kosura, W. (2006): Linking Future Ecosystem Services and Future Human Well-being, *Ecology and Society*, Vol. 11, No.1 [download 17.4.2011]
- Čančer, V., & Mulej, M. (2007). Information capacity of new systems theories. In: Chroust, G., Doucek, P., & Hoyer, Ch. (eds.): 15th Interdisciplinary Information Management Talks, IDIMT-2007, September 12-4, Budweis, Johannes-Kepler-Universität Linz.
- Freeman, A. M. (1992): The measurement of environmental and resource values: theory and methods. Resources for the future, Washington, DC.
- Hanley, N., Shogren, J.F., White, B. (2001): Introduction to Environmental Economics. Oxford University Press.
- Hensher, D.A., Rose, J.M., Green, W.H. (2005): Applied Choice Analysis: A Primer. Cambridge University Press.
- Hotelling, H (1949): Letter to the Director of the National Park Service in Roy A. Prewitt, The Economics of Public Recreation. The Prewitt Report. Washington, D.C. Department of the Interior. (Letter dated June 18, 1947).
- Knez-Riedl, J. (2010): The contribution of environmental economics to understanding and solving the problems of the scarcity of goods. In: Hrast, A. et al. (Eds.) Nature and humans; proceedings of the 5th International Conference, Maribor: IRDO – Institute for development of social responsibility, pp. 1- 6 (invited paper)
- Mavsar, R., Riera, P. (2008): Valoración económica de las principales externalidades de los bosques mediterráneos españoles - Informe final. CTFC, Solsona, Spain, 90 p.
- MEA (2005): Ecosystems and Human Well-Being: A Framework for Assessment. Millennium Ecosystem Assessment Series. [URL: <http://www.millenniumassessment.org/en/Framework.aspx#download>]
- Mitchell, R.C., Carson, R.T. (1989): Using surveys to value public goods: the contingent valuation method. Resources for the future, Washington, DC.
- Navrud, S., Ready, R. (Eds.) (2007): Environmental Value Transfer: Issues and Methods. Springer Verlag.
- OECD (2000): Services: Statistics on Value Added and Employment, OECD, 2000 edition, Introduction, p. 11.
- Pearce, D., Moran, D. (1994): The Economic Value of Biological Diversity. Earthscan.
- Raiklin, E. and Uyar, B. (1996): On the relativity of the concept of needs, wants, scarcity and opportunity cost, *International Journal of Social Economics*, Vol. 23, No. 7, 49-56
- Rosen, S. (1974): Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *Journal of Political Economy*, 82, pp. 34-55.
- SEPA (2006): An instrument for assessing the quality of environmental valuation studies. The Swedish Environmental Protection Agency, Stockholm, Sweden.
- Samuelson, P. A. in W. D. Nordhaus (2004). Economics, McGraw-Hill.

RESPONSIBILITY FOR WELL FUTURE BEING: VALUE, INFORMATION AND MEASUREMENT – SYSTEMIC CONCEPT

Antonín Rosický, Antonín Pavlíček

Department of Systems Analysis
Faculty of Information and Statistic
University of Economics, Prague
rosicky@vse.cz, pavlant@vse.cz

Everything said is said by an observer.

(Heinz von Forrester)

Abstract

Article deals with a nature of information and its consequences for well-being. Referring to Maturana's and Varela's ideas we stress, that individual's cognition is presented through natural language, while language itself is a source of communicated semantic information. In the article phrases such as "information of well being", "measurement of well being" and "well being" are discussed. We are considering what a meaningful information is and how language and knowledge coexist. Maslow's hierarchy of human needs as well as revised Boom's taxonomy are called to the attention in the quest of finding relation between well being and responsibility.

Keywords

Language, Knowledge, Values, Well-Being, Systemic

1. Introduction

Motto of this article points out to a nature of a common thought of information. In this concept information is identified with (or rather replaced by) a message presented through language, forgetting that a source of information is someone - particular and unique person - having distinct knowledge, values and pursuing some intention. Let us emphasize that such message / information is far from objective – it is rather delivery of author's opinion. Hence Heinz Forester modifies Maturana' and Varela's original idea (1980) *Everything said is said by someone* and supplies: *Everything said is said by an observer*.

Individual's cognition is presented through natural language; language itself is a source of communicated semantic information. The basic elements of final understanding are langue-tied concepts - ideas initiated by words and numbers. Or better - such ideas result from symbols that are interpreted in some context - typically sentences of some message. In other words: Human information originates from an individual cognition and/or cogitation it is not objective reflection of reality. This predication is valid generally and will be the basic premise for discussion of such phrases as "information of well being", "measurement of well being" and "well being" itself after all.

2. Cognition: belief and doing

Many prominent scholars of different areas - from philosophy, cognitive psychology, knowledge management to second order cybernetics – point to the nature of human cognition. Despite of diverse points of view, research methods and used terminologies they congruously insist on a disparity of human knowledge on the one side and reality on the other. Human cognition / understanding results from intrinsic processes of observers – i.e. individual organisms.

Nevertheless common people - including many academics and professionals from informational field (informatics) - do not distinguish reality from knowledge and do not ponder over considerable implications. Our ordinary cognition, resulting from sensual experience a culturally formed/shared belief, is denoted as naive realism. Let us remember Bernard Russel (co-founder of analytic philosophy) having near upon formal logic and fundamentals of computer science:

We all start from "naive realism", i.e., the doctrine that things are what they seem. We think that grass is green, that stones are hard, and that snow is cold. But physics assures us that the greenness of grass, the hardness of stones, and the coldness of snow, are not the greenness, hardness, and coldness that we know in our own experience, but something very different. The observer, when he seems to himself to be observing a stone, is really, if physics is to be believed, observing the effects of the stone upon himself.

... Naive realism leads to physics, and physics, if true, shows that naive realism is false naive realism, if true, is false: therefore it is false. And the behaviorist, when he thinks he is recording observations about the outer world, is really recording observations about what is happening in him.

Two fundamental but unknown or misjudged actualities have two consequences being significant with regard to the topics of this article:

1. Human cognition / knowledge plays an essential role in human communication, meaningful consideration, culturally forming knowledge and pragmatic (intentional) doing.
2. Due to dramatically advancing “informatization” amount of mediated information – that is product of human cognition – increases, widening also a gap between material and social reality.

These facts applied to a concept of well being and appropriate human activities (incl. understanding and measurement) as well as responsibility not only for intended results but also for their actual consequences.

On this place we should remember two facets of human cognition traditionally designated as rationalism and empiricism and/or two ways of thought: inductive and deductive. Consistent understanding facilitates to discern quality and quantity in mutual references. Basic terms provide for better insight are seen in the table 1.

empiric cognition	rational cognition
perception	abstraction
unique	pattern
instance	class
element	set
grade of separate attribute(s)	set of attributes

(systems identity)	
quantity	quality
<i>values as needs</i>	<i>values as attitudes</i>

Table 1: Quantity and quality, resulting from two facets of human cognition

In this way we can expand concept of patterns and connect them, not only with hard and soft information, but also with concept of measurement. A conception of the measurement is usually understood in the sense of a dimension of some physical dimension and/or quantity. In such case the result of measurement is a number that is acquired through a comparison with a given (specific) unit of such observed entity. Indeed a number and/or quantity are only data and have no meaning without knowledge of quality given by set of attributes...

In the event of such unit is missing we cannot measure in the sense mentioned above. We also use the scale, however allocation of particular dimension is not objective - it is result of observer's value judgment. Such ordinal scale allows a differentiation in the sense "better – worse" and also ordering however the result (i) is an individual opinion and (ii) is not number. Nevertheless such opinion presents information and we should to look on carefully any more than to deduce.

However a number in itself has no sense / meaning, it hasn't a purport. To obtain the meaning it must be coupled with some – denoted or recognized – phenomenon (entity). Due to knowledge men are able to ascribe quality to identified (and known) entities that is specified through set of (known) attributes. Such entity has general (abstract) nature and represents a whole of particular elements: All of them have the same attributes, however they differentiate through their actual degree (level) often denoted as "value of a variable". Such name is inveterate but also considerably misguided - the veritable value is derived from known attributes that somehow support or inhibit our rational doing. These qualitative aspects immediately bear on human intentionality (Rosický, 2010) and primarily emerge from individual experience. Nevertheless people are able - by virtue of language or better information represented by language - to relay on the knowledge of others. This fact stands for next level of abstraction that deepens a gap between human knowledge and reality. Instead of physical reality man frames "social reality". It is accordant with "naïve reality" mentioned above, it is called "cyberspace" - representing "virtual word" of human ideas and knowledge that is "*justified true belief*" (Nonaka, 1995).

Conventional thought - often called "rational" or "exact" - is oriented just on acquisition of such numerical value of query variables. Two problems bear on such approach:

1. Used numbers don't result from the measurement and haven't an expectant "objective nature". Moreover correct mathematical operation later executed with them, depends on the type of used scale (arithmetical or geometrical). Results of many computations find rather "matchstick figures" than correct grounds for next consideration.
2. Such numbers (values) are fed into mathematical formulas that are formalized models of a reflected situation. A validity of such models (formulas) is not actually tested (it is just assumed) in practice and their (reputed) general relevance is a workaday ingredient of naïve realism mentioned above.

These facts results from the rationalistic ("positive" in the philosophical sense) point of view and affect our conception of knowledge as well as treatment of it. It is far from advanced concept of cognition (epistemology) and authorities from many areas: From philosophers (Popper, Kuhn...) and gurus from knowledge management (I. Nonaka, Krogh...) along systemic and cybernetics (von Forrester, H. Maturana & F. Varela). Also famous scientists - namely physicians (A. Einstein, W.

Heisenberg, Gell-Man) - point out this fact. Polanyi – who points out the tacit knowledge (1962) consider to be philosopher, occupies a distinctive In spite of an importance of it more detailed discourse of this theme is not an importance of this article (and greatly outreaches its possibilities).

However let us accentuate an essential force of an incorrect comprehension of knowledge and so much the more their improper used. It is elusive that we - talk about “information/knowledge society” - ignore the nature of knowledge and information. Due to dramatically progressive “informatization” disproportion between our cognition and knowledge on the one side and reality in the other side accrues and produces many problems in the global world. Also concept of “well being” belongs among them and we can explore roots of contemporary financial (economics) crisis in its traditional notion.

3. Meaningful information: language and knowledge

Advanced systems theory and cybernetics explain many concepts mentioned above and form new background for our understanding of the world as well as for our doing. Such agency is often called as “sustainable” and reflects on basic systemic ideas that refer to the nature of systems emerging from the interaction of its components (elements) as well as to mutual (circular) influence of systems and its environment. In other words: The nature (identity, quality) of systems results not only from interaction of its elements but also from environment and it participates on the formation of this environment. Such dynamic and “procedural approach” after it glosses co-evolution i.e. natural changes of the society (and world in wider context) as well of ourselves (Hayles, 1999) including culturally formed and shared knowledge.

Information and its influence on such co-evolution come into these processes in this point we can remember Bela Banathy (in. Rosicky, 1999): “... in living systems in general, and social systems in particular, evolution and information are so tightly interrelated that it is not appropriate to discuss one without the other.”

This opinion corresponds to general notion of information, which is the difference *that makes a difference* (Bateson, 1972). Such information actuates changes (differences) resulting from interaction of systems on physical level. In the case that “receiving” is a man the information initiates processes within nervous systems (Maturana, Varela, 1980) the man interpret it - he attributes meaning to it. Just the static concept/belief of information destitute of meaning is misguided however it is familiar not only in society but also in the professional domain called “informatics”. However many criticize its orientation on technological facilities and talk rather of “information systems” basic approach is not too altered: This situation is elusive and produces many increasing problems, such us often presented “information overload”. Much less mentioned but more important problems relate just to meaning of information and/or human and worsen knowledge (Liessman, 2007]. Present state results from more reasons. Let us summarize three cardinals:

1. Rationalistic based background of knowledge (or world-view) that muses on information as an objective entity (alike knowledge) being independent on (receiving) system;
2. Pragmatic thinking and doing that is oriented on technology and doesn't reflect evolution, development and/or social and technological progress.
3. Utilitarian approach to relatively new professional activities that need special acquirements (skills) and forms new lucrative careers.

Let us now pay attention to traditional theory of information narrowly mated to Shannon (Shannon). It is sometime called “Magna Charta” of information society but also this concept is imprudent: This theory has laid the foundations of computing and/or digital information and communication technology²³⁾, but it wholly ignores meaning. For what remains: Shannon himself call attention to it initially (second paragraph of famous article) and adduce an engineering position of its envisage communication:

The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem.

This matter of fact is typical and we don’t differ between information having the meaning on the one side and data on the second side. Together with new importance ascribed to (misunderstood) knowledge new attempts to explain mutual among data, information and knowledge. Most of them miss and isn’t able to clarify it the radically due to common linear (causal) way of thinking. To accept circularity that is representing a fundamental principle of (advanced) systems thinking and cybernetics, we can explain newly and better and also point out to foggy concepts of information and knowledge. From this point of view actual knowledge is just the tacit (implicit) knowledge and “explicit knowledge” is just information represented by symbol. Let us remember two kinds of information alluded by Kamps (in Rosický, 1999): (1) information as action and (2) information as knowledge. From the point of view related in this article both types of information initiate receiver’s activities: The first are visible (external, physical) while the others are mental (invisible) called as consideration, thinking, decision, understanding... and also ability to realize insufficient knowledge and to acquire new information (so called “information needs”).

Just language and meaning of information represented by it plays an essential role mentioned above. From the formal view language is systems of words (signs, symbols) and rules for their linking to higher wholes (sentences). Many (most?) consider language to be only way of coding and are interested in appropriate syntactical aspects. However language – natural language emerges from biological roots (Maturana, 1978). Kamps (ibid) finds this unambiguously: “... natural language is not ‘code’ ...it is (such) component system that according to our claim characterize minds and cultural systems and lead to the human linguistic faculty and expression.”

Just information (re)presented through language frames message of its meaning emerges in process of semiosis which involves three subjects: sign (or symbol), entity denoted by it and also interpreter (i.e. receiver/observer). He uses his individual and tacit knowledge in this process in two mutually (circularly) coupled its aspects: semantic and pragmatic.

The first from them refers to considered (real or abstract) entity and such reference is commonly named by term “representation” that produces frequent misunderstanding: It is not possible to simply replace denoted entity by used sign - representation just refer to ideas, concepts and notions/beliefs.

The second constituent of semiosis refers to pragmatic aspects of meaning that is indivisible but essential of human intentionality (Rosický, 2010) and rational (goal oriented) doing. Semiotic theory characterizes it as relation signs and their users. Also this concept misses intentional nature

²³⁾ By the way also terms computer and digital technology are faulty – most of computing has nothing to do with numbers and computation and binary encoding appertains not only to digits but to all coded (elementary) signs [Rosický, 2010]. To change commonly used terms would be a struggle against windmills in Spain, but they fog understanding of information and ICT in a significant way.

of human knowledge which spontaneously emerges - alike semantic aspects - from (1) intrinsical experiences and (2) is communicated among people.

The concept of such tacit knowledge corresponds to the notion of more or less complex mental models. This term is important in advanced system thinking (system dynamics) famed namely due to P. Senge (1990) which defines them as follows: “Mental models are deeply held internal images of how the World works, images that limit us to familiar ways of thinking and acting. Very often, we are not consciously aware of our mental models or the effects they have on our behavior.”

Probably most will agree with a statement that computer treats only data no information and many use a popular locution that data are “value free”. In despite of an agreement we should change this idea and to enunciate more appositely “*data are meaning free*”. Just meaning is a fundamental difference between data and information and we - our culturally based knowledge - doesn't sufficient me importance to it. The meaning seems to be apparent and true alike knowledge and mental models. Also an essence of our thought (meta-knowledge or Weltanschauung) concerning world and resulting to our everyday agency we account for given.

Let us remark that concept of data isn't understood expressively and some authors get it in a different way. Floridi (2010) talks about “analogue data” and differs them from “digital data” and the British Standard (BS 3527) defines them as follows: “*Representation of facts, concepts, or instruction in a formalized manner...*”. The ambiguous concept of representation has been mentioned above now we accent this formalized way of such representation that (1) inhibit the meaning and (2) make possible computing and use of ICT (informatization) at the same time.

Exactly this appears to be main problem of the “information society” - we share huge amount of data having an appropriate knowledge for the interpretation of meaningful information. Our knowledge - formed on past, in different world often characterized as “modernity era” - embodies many fails/flaws on both individual as well as cultural level. New and unprecedented ways of communication of information that doesn't reflect world objectively and we can paraphrase Maturana and Forrester: “*Anything said is said by one observer to another observer*”. In other words - imperfect and individual knowledge on observer embedded to his messages - information influences others a produce some degree of an uncertainty. We misjudged namely an essential impact of this processes impact on culturally constituted knowledge and namely its value aspects.

4. Values as a facet of the intentional knowledge

Naturally such “knowledge” is far from traditional conception of objective and generally valid (objective) that restrict knowing to static and explicitly express “piece of knowledge”. The nature of knowledge (knowing) is explained by 2nd order cybernetic as a phenomena emerging from processes in physical systems. The basic role plays concept of the observer that is biological (i.e. physical) system that - due to its interaction within its surroundings - forms individual cognition or better “knowing” as dynamic notion of knowledge. Circularity nature of these processes results in a spontaneous formation of patterns differentiated within an external environment. Such patterns are coupled not only with qualitative facets of entities (see above) but also with value and/or evaluation that are derived from feelings and emotions.

Just these aspects of human cognition and knowledge that is disdained as a result of culturally shared Cartesian rationality. Nevertheless emotions recently get into a centre of interest not only among psychologists but also in cognitive domain. Even guru of the artificial intelligence Marvin Minsky (2006) points out their importance in constitution of human mind.

From briefly sketched cybernetic position we can observe understood as physical (biological) in which empirically perceive feelings forms emotion as patterns. These are coupled with qualitatively specified entities... Basic dimension of any values is distinction between “*good (well)*” and “*wrong (poor)*” and both basic conceptions are derived from distinction between pleasurable and disagreeable emotions (Pstružina, 1998). Also Osgood (1967) musing upon the “Measurement of Meaning” uses three scales each of them is determinate two poles:

- Basic evaluation: *good / wrong*
- Potency or intensity: *powerful / poor*
- Incentive doing: *active / passive*

Namely the first level is derived from an empirical experience that has physical nature and is evolves primarily within material environment and results from physical information.

On this place we can remember important concept of knowledge put forth by Bloom and newly innovated by Anderson and Krathwol (2001). Authors don't restrict knowledge to traditionally construed cognition, but define other two components of it - see fig. 1.

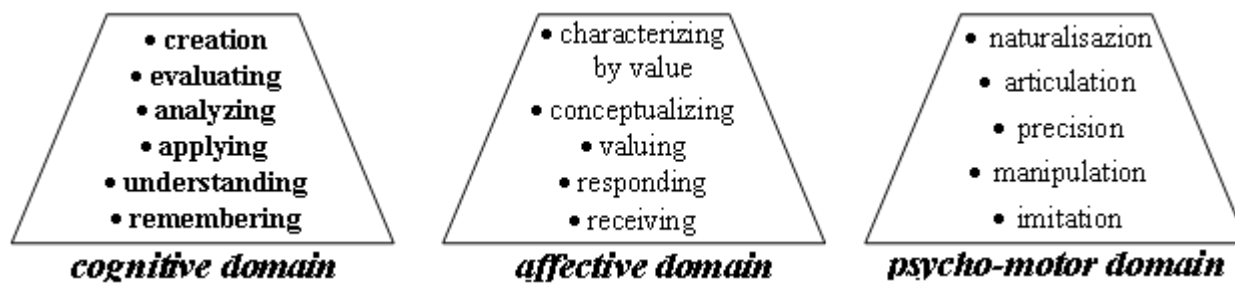


Figure 1: Revised Bloom's taxonomy defines three mutually affecting domains of knowledge

In spite of Bloom's taxonomy has nothing to do with cybernetic explanation of knowledge its holistic conception embodies a high accordance. However such model has a static nature it involves a holistic nature of knowledge and observer. Author has also accentuated value aspects of knowledge coupled primarily with affective domain of feelings and sensation.

In final of this part we should refer to two facets or concepts of knowledge. The first notion understood value as an ability of some phenomena (entity, process, service) to satisfy man's (observer's) need. Such conception being near upon an idea of “*economic good*” has enacted an important role during an emergence of economy (Adam Smith) and acts it in real economy forever (namely “Austrian School”). Such needs have a retroactively nature and is saturated/recognized through real processes within a social and/or physical environment. Practical tacit knowledge – its value facets - of individuals is spontaneously (re) formed in relevant circular loops.

In the considered context we remember famous hierarchy of human needs formulated by Abraham Maslow. He has defined five levels of needs and has arranged them to the hierarchy (see. fig. 2). While the basic (physiological) level actually represents a necessity the other needs are rather connected with requirements. The higher needs and requests become actual and are felt as more urgent in the case of relative satisfaction of needs from lower stage.

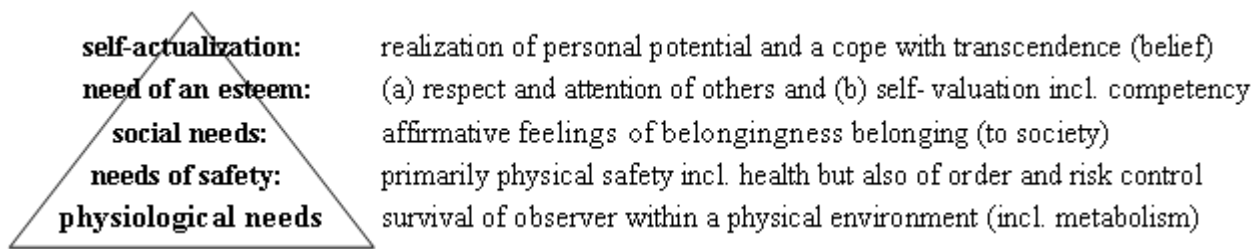


Figure 2: Maslow's hierarchy of human needs

The second concept of values is representing rather attitudes (Cakirpaloglu, 2009) that are inferred from communication and from known attributes of cogitated entity. They are an eminent ingredient of our knowledge / thought and as such they constitute human expectations and doing. Let us consider three noticeable facts be concerned with these knowledge and values:

- They are constituted in the past but they initiate doing / making towards the changing future.
- Their roots lie in the industrial era or “modern” culture and formed meanings and values aren't appropriate for global word and its increasing complexity.
- Due to reforming knowledge that emerges through interaction within changing environment some values that has been essential for the nature of last society (world).

More detailed discourse of changing environment is very wide theme moreover depending on the angle of approach - not only of disciplines (sociology, philosophy, economics, and environmental sciences) but also of weltanschauung. However contemporary many sociological streams have to (see Martucelli, 2008) and Luhman (1995) is considered to be as well sociologist as cyberneticist. He points out social communication and its meaning for social self/organization (autopoiesis) and is representing newly emergent discipline – sociocybernetics (Gyer & van Zouwen, 2001). From similar point and in the context of this article we outline four facts being important for changing knowledge ad value, more complex environment as well for necessity of our thinking and doing:

- Technological development has enabled extensive increasing of labor productivity and consequently also an enhancement of a standard of living. Due to this an also to political condition (in “developed” countries) vast majority satisfy both lowest of needs and people move their activities to third - social level (jut here we can see great “success of social nets).
- Contemporary world replete with artificial systems (technical achievements) discharge (bounds) disagreeable feelings and orient people to an achievement of cheerful emotion. This trend graduates and aims society at fruitions (Petrusek, 2006). Some affirm that “culture is replaced by amusement” and connect it with “crisis of values”.
- Monetary approach change natural effect of real economy and profit measured through money turns a central role of business as well as workday agency. Only few understood it symbol of universal value that has virtual nature. Banking is based on this fact and real worth of their “activities” isn't bottomed on real economics good but only on trust a belief in further prosperous. Nevertheless perpetual motion doesn't exist debts (as well personal as state) affect unprecedented problems (and insertion of further money only shifts off crash).

We should continue and to indicate other aspects of changing reality as well as to expand any of them. Instead, let us refer to basic nature of all these problems that is gap between our knowledge (inc. value) and reality, between embedded and natural order. Unfortunately also our hopes on information technology were belied – just due to wrong concept of information and/or its meaning - actually growing use (1) graduate extensive development and move us along to virtual reality.

5. Well being and responsibility

Concept of well being participates in this problem by a considerable way and its misty and also understood by many different and often fairly opposite way. Critical reflection on well being as well as to its appreciation calls for a pregnant definition that is missing. Or better many different authors stems from different point of view and associate it with some other aspects such as society (family, nation) or an environment...

Stanford Encyclopedia of Philosophy point out to three theories of well being - hedonism, desire theory and Objective list theory. Meaningful definition is replaced by a characterization through set of attributes, for example health, happiness, prosperity and welfare. Of course basic concept is coupled with individual mental state and WHO associate it with mental health...

Perhaps best definition of well being is "... *a good or satisfactory condition of existence*". But prevailing and familiarly accepted notion is simplified and good life is reduced for welfare and or happiness. In first case it is measured through money and interposed numbers that are interpreted by simplified way without wider context (for example GDP). In the second case we connect Happiness with such attributes as (i) *the company of friends* (ii) *engaging leisure...* and *sufficient* (??) *money* at least (see *Eckersley, 2005*). Such ideas are connected with other abstract concepts such as *progress*. It is comprehended as obvious result of technological development and or as a collateral phenomenon of evolution. Very conformable is a fancy of (everlasting) economic development ascribed namely to economics but gladly accept by wide public. Nevertheless despite unprecedented economic prosperity and welfare in the last decade's most do not feel better individually or as communities.

Moreover some facts and information indicate new and unusual problems from economy and ethics (Sigmund, 2010) to ecology that deteriorate *condition of existence*...

It seems that depreciation of values and their replacement by attitudes and unreal expectations are most important aspect of such evolution. It seems that just our (hedonistic) conception of well being participates in this process. In this sense we can remember famous Potsman's idea:

*What Orwell feared were those who would ban books. What Huxley feared was that there would be no reason to ban a book, for there would be no one who wanted to read one. Orwell feared those who would deprive us of information. Huxley feared those who would give us so much information that we would be reduced to passivity and egoism. Orwell feared that the truth would be concealed from us. Huxley feared the truth would be drowned in a sea of irrelevance. Orwell feared we would become a captive culture. Huxley feared we would become a trivial culture, preoccupied with some equivalent of the feelies, the orgy porgy, and the centrifugal bumble puppy. As Huxley remarked in *Brave New World Revisited*, the civil libertarians and rationalists who are ever on the alert to oppose tyranny "failed to take into account man's almost infinite appetite for distraction." In 1984, Huxley added, people are controlled by inflicting pain. In *Brave New World*, they are controlled by inflicting pleasure. In short, Orwell feared that what we hate will ruin us. Huxley feared that what we love will ruin us.*

Our responsibility has reference to our activities that result from our knowledge and dealing with information, from understanding (not from remembering that is replaced by surf through internet). The situation - despite to advancing informatization - do not improves, more to the contrary.

Acknowledgement

Paper was processed with contribution of GAČR by handling tasks GAČR 402/09/0385 "Human Capital in IS/ICT Operations and Development: Competitiveness of Czech Tertiary Education Graduates".

6. References

- Banathy, B. (1996) Information-based Design of Social Systems, Behavioural Science, 41:104-123, 1996;
- Bateson, G. Steps to an Ecology of Mind, Ballantine Books, 1972;
- Cakirpaloglu, P. (2009): Psychologie hodnot (Psychology of Values), Palackého Univ. Olomouc.
- Eckersley, R. (2005) What is wellbeing, and what promotes it?; in: [tp://www.wellbeingmanifesto.net/wellbeing.htm](http://www.wellbeingmanifesto.net/wellbeing.htm), (15. 3. 2011);
- Floridi, L. (2010) Information: A Very Short Introduction, Oxford Univ. Press, ISBN978-0-19-95137-8;
- Foerster, H. von (1979). Cybernetics of cybernetics. In K. Krippendorff (Ed.), Communication and control in society, Gordon and Breach, NY;
- Geyer, R. & van Zouwen, J. (eds.) (2001) Sociocybernetics: Complexity, Autopoiesis, and Observation of Social Systems, Prager;
- Hayles, K. (1999) How we became Posthuman, University of Chicago Press.
- Liesmann, K.: (2008) Teorie nevzdělanosti (Theorie der Unbildung - Die Irrtümer der Wissensgesellschaft), Academia, Praha, CR;
- Luhmann N. (1995) Social Systems, Stanford University. Press;
- Martucelli, D. (2008) Sociologie modernity: Itinerář 20. století, (Sociologies de la Modernité: l'itinéraire du XX^e siècle, 1999) Centrum pro studium demokracie a kultury, Praha;
- Maturana, H. (1978) Biology Of Language: The Epistemology Of Reality, in: Miller, G. & Lenneberg, G (1978) Psychology and Biology of Language and Thought, Academic Press, NY;
- Mildeova, S. (2006) The Network of National and EU Projects To Support Systems Thinking And System Dynamics, IDIMT-2006 Book Series: Schriftenreihe Informatik Volume: 19 Pages: 309-318 Published: 2006, ISBN: 978-3-85499-049-9
- Minsky, M. (2006) The Emotion Machine: Commonsense Thinking, Artificial Intelligence, and the Future of the Human Mind, Simon & Schuster;
- Osgood, Ch., Suci, G., Tannenbaum, P. (1967) The Measurement of Meaning, University of Illinois Press;
- Oskrdal, V., Jelinková P. (2010) Human Resources Management in ICT Context - The Drivers Of Personnel Performance. IDIMT-2010: Information Technology - Human Values, Innovation And Economy Book Series: Schriftenreihe Informatik Volume: 32 Pages: 145-152 Published: 2010, ISBN: 978-3-85499-760-3
- Pavlicek, A. (2010) Human Resources in ICT-Information And Technological Literacy as the Qualification Prerequisites IDIMT-2010: Information Technology - Human Values, Innovation And Economy Book Series: Schriftenreihe Informatik Volume: 32 Pages: 153-159 Published: 2010 ISBN: 978-3-85499-760-3, ISBN: 978-980-6560-80-2
- Petrusek, M. (2006) Společnosti pozdní doby (Societies of late time), Sociologické nakladatelství, Praha
- Pstružina, K. (1998): Svět poznání: K filosofickým základům kognitivní vědy (The World of cognition: Towards philosophical roots of cognitive science), Nakl. Olomouc, Olomouc;
- Polanyi, M. (1962) Personal Knowledge: Towards a Post-Critical Philosophy, Routledge & Keegan;
- Postman, N. (2010) Ubavit se k smrti (Amusing Ourselves to Death), Mladá fronta, Praha.
- Rosický, A. (1999) Information & Human Co-evolution: Understanding Information Within Social Systems, the ISSS conference, Toronto;

- Rosický, A. (2010a) Informace a systémy: Základy teorie pro úspěšnou praxi (Information and systems: Basic theory for successful practice); Acta Oeconomica, Praha.
- Rosický, A., Pavlíček, A. (2006) Information and Internet change society: emerging constitution of the social system Internet Society II: Advances in Education, Commerce & Governance Book Series: Wit Transactions On Information And Communication Technologies Volume: 36 Pages: 201-213
- Russell, B. (1950) An Inquiry Into Meaning and Truth,
- Sigmund T. (2010) Is Business Ethics Possible? Idimt-2010: Information Technology - Human Values, Innovation and Economy Book Series: Schriftenreihe Informatik Volume: 32 Pages: 303-310 Published: 2010 ISBN: 978-3-85499-760-3
- Senge, P. (1990) The Fifth Discipline: The Art and Practice of the Learning Organization, Doubleday;
- Skrbek J, Kvíz J. (2010) Critical Areas Of Early Warning System. Idimt-2010: Information Technology - Human Values, Innovation And Economy Book Series: Schriftenreihe Informatik Volume: 32 Pages: 193-200 Published: 2010. Isbn: 978-3-85499-760-3
- Veenhoven, R. (2000) Wellbeing In The Welfare State: Level not higher, distribution not more equitable, Journal of Comparative Policy Analysis, 2000, vol 2, pp 91-125

REQUISITE HOLISM OF INFORMATION ABOUT WELL-BEING

Katja Rašič

Ministry of Transport, Slovenia

katja.rasic@gov.si

Vesna Čančer, Matjaž Mulej

Faculty of Economics and Business

University of Maribor

vesna.cancer@uni-mb.si, mulej@uni-mb.si

Abstract

Without quality information it is impossible to fulfill the law of requisite holism, when it comes to well-being. Only indirect indicators are feasible. Because the development is complex, the data on material wealth, on the growth of gross domestic product and gross national product are insufficient. Requisite holism of information is the basis and the prerequisite for decision making and action. This paper presents some modern tendencies of information about well-being.

Keywords

Gross Domestic Product, Human Development Index, Indicators, Sustainable Development, Welfare, Well-Being

1. Introduction

Defining a system of the well-being indicators is a complex process. The concept of economic advancement and progress of the country (real growth and the calculations of gross domestic product (GDP) and gross national product (GNP)) is linked up to material wealth.

Economic growth is defined as quantitative and value growth of output, while economic development depends on the technological development, research and development (R&D), etc. The economic concept of welfare (Murn, 2010) is based on the rapid growth of GDP, while the broader concept of well-being reaches beyond GDP growth. It aims to cover the distribution of important basic living conditions that are subsistencial for the prosperity of society, such as educated population, health, safety, good interpersonal relations, etc. In addition to economic indicators, the State requires other indicators to measure social development (well-being), explaining the situation and development of individuals and companies. The development is complex. It is necessary to define the objectives of development, because economic development does not tell enough. The interdependence of welfare as a goal of reaching development and economy as recourse of achieving shows the need for the interdependence of indicators with targets. Which spheres of well-being have the biggest influence on welfare and what are the technical measurement problems related to well-being in both theory and practice?

2. Information on the State of Welfare

State of the (material and immaterial) welfare applies both to economic resources (income) and to non-economic impacts (well-being). They should not be ignored when increasing productivity, employment rates and focusing on economic activities with higher added value. Evolution is the basic mechanism which we operate with. There are four key evolutionary phases in the development of business systems: working society (hard work and productivity), learning society (the knowledge and quality), minded society (creativity and innovation) and informed society (intuitive and life energy). Preliminary stages are difficult; they often confuse an organization as an operating system so that it loses the contact with its vitality and the mission of each new phase of its existence in an urgent need of vital force of its predecessors. In evolutionary positioning, business contents play a leading role; they are linked to the method of management and the resources which create added value, competitive differentiation, etc. For instance, in a market economy without adequate long-term productivity, we cannot provide stable business results through quality and winning factor, or innovation, which cannot by itself guarantee the existence minded environments without quality control and productivity (Bulc, 2006). Mulej's (2009) opinion considers that in such changed circumstances it is necessary to renew the basic concept of socio-economic practices, not just products and processes of work. It is not possible to get out of the crisis with the methods and decisions which have caused the crisis.

3. Information on Well-being in an Innovation Society

Reinforcement of innovation is necessary in transition organizations; therefore management staff needs an unusual background. Meaning of achievements, measured by economic criteria, is part of the contribution to satisfaction and well-being. Economic measurements do not tell us the essence of the well-being and they provide no comprehensive basis for appropriate steps. Therefore, policy in organization should consider the indicators of the well-being of workers, self-evaluation and feelings of their lives. The usual business policy is too narrowly based on economic data, while it is ignoring and even misleading about what actually motivates people. Important non-economic indicators of welfare – the ones of motivating people – include: social capital, democratic leadership and human rights. At work, such seemingly non-economic indicators are affecting the satisfaction, success and productivity (Šarotar Žižek et al., 2009).

Technical-technological-invention-innovative-diffusive processes (TTIIDP) reduce employment and increase the added value. TTIIDP open the question of how to increase both, without destroying the well-being and in particular the natural conditions for survival of the current civilization, etc. Employees need the skills and knowledge at a higher level, and the ability to adapt to changes, as well. Investing in human capital is therefore crucial to increase research, development and innovation efforts (Komisija Evropskih skupnosti, 2007, p. 2). It should also include the well-being; it is not acceptable to consider people as the appendages of machines and also ask them for superior motivation, efficiency and performance. Namely, productivity growth that ignores these aspects of the content and consequences, is more fictitious and problematic than real.

4. Information on Sustainable Development

Sustainable Development Commission (2010, pp. 1-3) parts existing indicators of sustainable development of well-being to objective and subjective methods of measurements. Both types of

indicators are relevant to the well-being. The question that arises is the understanding of the well-being itself. Whatever the mode of measurement, it is necessary to concentrate on the design of such indicators, which have a positive or negative impact on people's satisfaction or dissatisfaction. Study of the well-being deals with the scope and indicators: health (mental and physical), leisure activities (work, leisure, and community affiliations), standard of living (income), achievements (education, training), knowledge and confidence (fear of crime and safety, faith, a sense of control and behavior, relations to the environment), relationship status (marriage, social network and support, community and neighborhood). Dolan et al. (2006) believe that personal characteristics such as age, gender, ethnicity, disability, etc. are important indicators of the well-being. Discrepancies between the different indicators are possible.

5. Information provided by Composite Indicators of Well-being

In recent years there has been increasing interest in composite economic and social indicators of the well-being. Many communities in Canada and the U.S. have tried to develop social indicators to monitor trends and well-being for the benefit of their citizens. The report on economic and social indicators shows the main well-being indicators that were developed at national and international levels (Sharpe, 1999). Sharpe (1999) based on the assumption that the report covered all the important indices of economic and social well-being, including economic prosperity, genuine progress indicator, and an index of economic well-being, index of human resource development, social health index, and index of social well-being. Individual indices are divided into three sections: indices, which define the grade of the achieved prosperity of the historical estimates of trends in Canada; the indices, which provide cross-national assessment of prosperity for the given year in several countries, and indices, which give an assessment of trends in welfare in each region of Canada. The author therefore parts well-being on economic and social indicators.

We are trying to find such indicators, which would separate the essence of design and cover only and all, essential indicators. Content that the indicators reflect is therefore essential, so it should be chosen.

European Commission decided to accelerate the introduction of flexicurity and improve understanding of this area, not only in terms of flexibility of employees but also of employers and governments. The latter would thus take on a heavier burden of responsibility for investing in people and their safety, indirectly that means the well-being. But the GDP in 2009 fell by 4 percent; unemployment has surpassed 23 million, so the Europe Union 2020 strategy has to give an effective response to the economic and financial crisis. EU should carry out its ambitious social agenda: the elimination of early school drop-out and promotion of lifelong learning (Suvorov et al., 2010). Without indicators that is not possible to achieve.

The previous indicators had to be substituted with the more relevant ones. But this is not necessarily sufficient for success nor is it necessary that the selected variables are the most appropriate for measuring social responsibility, which corresponds to the practice of the well-being, the factors and the status of financial, economic and social crisis.

Suvorov et al. (2010) warn that the definition of welfare distinguishes between the current welfare and the assessment of its sustainability. Prosperity now means more than material goods, and mainly refers to human welfare, housing and relationships. Key indicators of well-being of people are: the material standard of living, health, education, personal activity including work, voting rights and management, social ties and relations, environment and safety and danger in the material and physical sense. Svetlik's survey (1994) provides well-established indicators of well-being in the areas of labor and employment, housing and living environment, health, knowledge and educational

opportunities for children and social protection, spending their free time, in his approach to the analysis of life scenarios, such as migration history, occupational history, changing the housing. It describes detailed issues of health and well-being, problems, illnesses, health habits, medication, smoking and drinking alcoholic beverages and nutrition. In addition to the issues of employment, it includes working conditions, earnings, relations to superiors and peers, and distribution of working time. Free time includes: vacation, holidays, leisure and satisfaction and barriers to leisure time, activity in other societies. The questionnaire also gives general assessment of the conditions of life and feeling such as hopeless situation.

Most researchers (Stiglitz, 2009) define the measure of the well-being with different concepts of welfare. Most of the measures are derived from the starting point that people's well-being is not only economic growth. The country doesn't have to have an active role in providing opportunities for prosperity, while it needs requisites for the measurement of welfare. Social indicators are the statistics of direct normative interest which facilitates effect on the conditions of the most important aspects of life. Social indicators measure the changes and give a picture of progress. As direct rates they allow the measurement of social welfare policy (Mars, 1994).

The holistic concept of social development includes the following basic dimensions of values: to have, to love and to be. Allard (1973) proposed four dimensions of meeting needs: economics, power (political system, defense, diplomacy, and legal certainty), subsystem integration (family, religion, and network association and social transfers), and knowledge (education, research and culture). The availability of the services country provides to its citizens ranks: schools, health care and health, which can be measured with hard variables: economic status, number and size of housing, wages, etc.

In the early 1990's the United States developed a United Nations Development Programme, which promoted the concept of development on the basis of development and prosperity in the concept, reaching beyond economic growth. Indicator of development - human development index (a composite of GDP, education, and health) largely replaces a one-dimensional indicator of GDP and other economic-oriented indicators. Based on the indicator of development - human development index, the following indicators have been developed: "gender development indicator", the human development index that is modified with regard to gender, "gender equality measure", a measure of power and sex, "poverty index of developed and developing countries", etc. Human development index is up to now the most widely accepted measure of utility in addition to GDP. Disadvantages of the human development index, according to Vintar Mally (2010), are as follow: deficiencies of included indicators, failure to include aspects of political freedom, social security and justice, environment, etc. Trends indicate a slow increase in value as a consequence, except for down-falls as indicators of the crisis. The most important social indicators (Hanžek, 2010) show the determination of the basic criteria for determining indicators of development. Although some researchers tried to build a single indicator that would show the development of society, the main effort remained in determining the indicators of individual horizons. They cover a very broad and complex area of science, education, welfare, population, mobility and people's material needs. Soft, subjective data (obtained from the public opinion poll) as well as hard, objective data from the various statistics should be used for the evaluation. Indicators should be operational, comprehensive, global and local at the same time.

OECD (1982) identifies the following social indicators: health (length of life and lifestyle), education (the use of educational facilities, learning), employment and quality of working life (employment opportunities, the travel time to work, the average number of hours worked, number of injuries to work, etc.), leisure (use of leisure time), social environment, personal safety, psychological environment, etc.

6. Conclusion

None of the known indicators “each of its own” provides a reliable basis for decision making and activities actions. There is therefore a need to combine them and achieve their synergy, which will tell more than individually. Otherwise we get misinformation instead of information. A dialectical system of indicators shows the way.

7. References

- Allard, E. (1973). A Welfare Model for Selecting Indicators of national Development. *Policy Science*, 1(4), 63-74
- Bulc, V. (2006). *Ritmi poslovne evolucije*. Vibacom, Ljubljana, ISBN 961-91806-0-7
- Dolan, P., Peasgood, T., Dixon, A., Knight, M., Phillips, D., Tsuchiya, A., & White, M. (2006). Research on the relationship between well-being and sustainable development. Final report for Defra. http://www.stopstanstedexpansion.com/documents/SSE18_Appendix_11.pdf
- Hanžek, M. (2010). Kompas razvoja in blaginje - Razvojne strategije in merjenje njihove uspešnosti: kako izmeriti blaginjo? <http://www.planbzasslovenijo.si/upload/kazalci/hanzek-besedilo.pdf>
- Komisija Evropskih skupnosti. (2007). Sporočilo Komisije z raziskavami in inovacijami do konkurenčnih evropskih regij. Prispevek k večji rasti ter k povečanju števila in kakovosti delovnih mest. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0474:FIN:SL:PDF>
- OECD - Organisation for Economic Co-operation and Development. (1982). *The OECD List of Social Indicators*. OECD, Paris, p. 13, ISBN 9264123024
- Mars, R. E. (1994). The revolutionary and the marginal-positivist: does the social indicators movement open up new possibilities for a dialogue? *SIR* 1-229-242, p.14
- Murn, A. (2010). Ali je BDP in njegove izpeljanke pravo merilo napredka države in blaginje njenih prebivalcev? Umanotera, Slovenska fundacija za trajnostni razvoj, Ljubljana. <http://www.planbzasslovenijo.si/upload/kazalci/murn.pdf>
- Mulej, M. (2009). *Uvajanje inoviranja v podjetja ob krizi 2008*. Univerza v Mariboru, Ekonomsko-poslovna fakulteta, Maribor.
- Sharpe, A. (1999). *A Survey of Indicators of Economic and Social Well-being*. Centre for the Study of Living Standards, Ottawa. <http://www.csls.ca/reports/paper3a.pdf>
- Stiglitz, J. (2009). Towards a better measure of well-being. *The Financial Times Limited* 2009, September 13 2009, <http://www.ft.com/cms/s/0/95b492a8-a095-11de-b9ef-00144feabdc0.html#axzz1IpRKSJld>
- Sustainable Development Commission. (2010). Proposal for wellbeing indicators framework. <http://www.sd-commission.org.uk/s>
- Suvorov, M., Rutar, T., & Žitnik, M. (2010). *Kazalniki trajnostnega razvoja za Slovenijo*. SURS - Statistični urad republike Slovenije, Ljubljana, ISBN 978-961-239-206-2
- Svetlik, I. (1994). *Kvaliteta življenja v Sloveniji 1994: Retrospektivna študija 1974-1994*, Center za družbeno blaginjo, Ljubljana, <http://www.adp.fdv.uni-lj.si/opisi/lo194.xml>
- Šarotar Žižek, S., Mulej, M., & Treven, S. (2009). Dobro počutje sodelavcev v tranzicijskih organizacijah s primerjavo inovativnih in manj inovativnih. In: Mulej, M. (ed.): *Globalna finančna kriza ter trajnostni razvoj*, Zbornik Posvetovanje ob 50. obletnici Ekonomsko-poslovne fakultete Univerze v Mariboru, May 27 2009, Maribor, Slovenija, Univerza v Mariboru, Ekonomsko-poslovna fakulteta, Maribor, ISBN 978-961-6354-91-2
- Vintar Mally, K. (2010). Kompas razvoja in blaginje – Soočanje socialno-ekonomskih in okoljskih meril napredka: Indeks človekovega razvoja in ekološki odtis, <http://www.planbzasslovenijo.si/upload/kazalci/vintar.pdf>

ENTERPRISE POLICY FOR SOCIAL RESPONSIBILITY AND ENTERPRISE STAKEHOLDER WELL-BEING

Simona Šarotar-Žižek

Faculty of Economics and Business (EPF)
University of Maribor
zizek@uni-mb.si

Tjaša Štrukelj

Faculty of Economics and Business (EPF)
University of Maribor
tjasa.strukelj@uni-mb.si

Matjaž Mulej

EPF and IRDO Institute for Development of Social Responsibility
mulej@uni-mb.si

Abstract

Enterprise policy as an enterprise's basic, general, and long-term orientation arises from enterprise vision, and should express its need for social (and other) responsibility, part of which is also the enterprise stakeholder well-being discussed here. What enterprise policy will be determined, enterprise shareholders decide (sometimes also top managers): the more spiritually conscious they are, the more ethical and responsible enterprise policy they will define. If they are not spiritually intelligent, they are short-term oriented; their enterprise policy cannot be responsible; it causes (enterprise) crisis and diminishes well-being. Thus their spirituality influences their enterprise's vision/policy's responsibility and enterprise stakeholders' well-being.

Keywords

Enterprise Governance, Spiritual Intelligence, Enterprise Ethics, Well Being, Management

1. Introduction

Enterprise shareholders and managers, as multilayered beings, both individually and in synergy, are: (i) physical, (ii) psychical, (iii) social, (iv) economic/professional, and (v) spiritual beings. They are marked by holistic pattern of relatively long lasting attributes, by which individuals, even as specialized experts differ from each other. As individual spiritual beings they choose their spiritual evolution to express their own spiritual nature. Spirituality that is based on subjective feeling and trust serves the search for life's purpose and fulfils life's mission. By Frankl's opinion (1962) these two exceed other aspects of positive psychology and present its highest range. To us,

spirituality also serves the determination of enterprise basic, general and long-term characteristics: its vision and policy.

The information for properly oriented enterprise vision and policy arises from enterprise's (stakeholders') values, culture, ethics, and norms (VCEN; Potočan, Mulej, 2007). To overcome the crisis the planet Earth faces, this enterprise vision/policy should include social responsibility (SR) of behavior motivating the enterprise stakeholders toward a modern, requisitely holistic, VCEN and behavior, for all stakeholders' well-being (WB), and long-term survival of their enterprises. With such an enterprise policy all enterprises' stakeholders' WB will be accomplished. Thus our hypothesis reads: enterprise's stakeholders' WB results from properly oriented enterprise vision/policy (aimed at social and other responsibility). To reach a responsible enterprise policy that directs enterprise toward SR and all stakeholders' WB, enterprise shareholders should have consciousness that this is needed/important; this arise, among others, from their spiritual intelligence, we are dealing with in chapter 2. In chapter 3 we will introduce enterprise vision and (responsible) enterprise policy, and in chapter 4 well-being. The last chapter is dedicated to our concluding remarks.

2. Spiritual intelligence influences enterprise governance and management

To explain how spiritual intelligence influences enterprise governance and management we will first explain the human as a spiritual entity. Each individual feels also her spiritual dimension, as a dimension of one's freedom. Being the dimension of one's freedom, the spiritual dimension does not underlie the deterministic laws. Zalokar Divjak (1998, p. 21) points out that the freedom means the freedom for something: for a free viewpoint concerning these phenomena, the option of choice regarding the response of own destiny. This author also believes (ibid) that the spiritual dimension shows the way leading from the freedom to the responsibility, being at the same time the way to personality's maturity. Here, it should be pointed out that the more freedom one takes the bigger is one's responsibility.

Every human is a spiritual being, so are enterprise shareholders and managers, hence we all must develop our spirituality to gain the reasonableness of our lives. This is why spirituality and spiritual intelligence is important. We must develop our spiritual intelligence for our psychic WB and adopt proper business decisions. This is why we will now discuss spirituality.

Spiritual perception of the world by Kononenko (2006 p. 1) is the basis of all teachings of great wise men of important philosophical and religious schools and also of holy texts from east and west, such as Aurobindo (1991); Jogananda (2003); Krishnamurti et al. (1993); Meera (2002); de Mello (1989); Milčinski (1992); Osho (1998); Pilgrim (1999); Po (1977); Shah (2000); Shankar (2000); Tolle (2002). Even though all teachings carry their own little distinctions in details, approaches and techniques of spiritual paths, they have the same foundations and common ideas (Kononenko, 2002, p. 1): Human being is built of personality (ego, lower nature), individual soul and common spirit (higher nature). Personality is composed of physical body, life force (energetic body), emotions (emotional body) and common sense (mental body). Spirit is composed of (higher, pure) intelligence (wisdom), (unconditional) love (goodness) and (free) will (power). The soul is an intermediary part connecting personality with the spirit. Purpose of individual's life is learning of wisdom and nurturing of spiritual values (simplicity, modesty, humbleness, acceptability, tolerance and patience, persistence, honesty and courage, faith, trust and love, and compassion). Wise man expands his metaphysical heart across all people and does not look for differences between them anymore. Since his consciousness expands, he acknowledges inter-personal relations among all of them. The basic principle that allows learning and progressing on a spiritual level is reincarnation.

According to Kononenko (2005, p. 1) spirituality is based on subjective feeling and trust, and it can be neither overruled nor confirmed with reason. We also cannot make it an objective fact because of the necessity of subjective experience of spirituality – it is un-measurable and unrepeatable in the sense of objectivity. Prosenak and Mulej (2008, p. 13) also demonstrate their findings from the field of sciences that are researching spirituality as well as some natural sciences (especially quantum physics) and some sociological sciences (Bell and Morse, 2005; Capra, 1991; Khisty, 2006; McTaggart, 2004; Schumacher, 1989; Senge et al., 2004; Targ and Hurtak, 2006). These are the following:

- All subjects are interpersonally connected (at least from viewpoint of energy) and therefore interdependent; human makes an essential mistake, if recognizing herself as a subject that is independent from other subjects of society and nature [all life species];
- Presupposition of interdependence leads him into un-holistic, one-sided acting which yields unpredictable and often unwanted consequences.

To create wealth (spiritual capital) that derives from the purpose of life, life values and basic sense of life, one must have one's sense for the purpose of life and its values as well as sense for the basic meaning of life (spiritual intelligence). Spiritual intelligence (Zohar, 2006: 13) is the one that enables him to find the deeper purpose of life, its highest values, purpose and deepest motives. It is the way of using individual's process of thinking when he is making decisions and doing things he thinks are worth doing.

The spiritual intelligence is about the philosophy of being, cooperation and leading which also places into new context the meaning and purpose of governing and conducting/managing business aimed at assuring the WB. Therefore a spiritual intelligence, upgraded with spiritual capital, contributes significantly to the modern leading and modern enterprise governance and management; it also sets up a new paradigm of it.

Individuals, and especially enterprise's shareholders and (top) managers, must focus on the development of their own responsibility in all circumstances, respect for others no matter how many mistakes they have made and how negative their personality is. They also must trust and take care for others even before they start to take care for their own needs; they also must be empathic. The above mentioned attributes express the personal spiritual power with its roots based deep inside the sub-consciousness. Therefore emotional and spiritual intelligence lie in complex connection; understanding of basis of spiritual intelligence is a precondition for the development of emotional intelligence. Spiritual intelligence is aimed at higher connectedness and deeper connection with inner side of human and consequentially with the whole world. Its highest form is pure and unconditional love in the absence of human conscious mind which gathers information for living from the mentioned outside world and helps enterprise shareholders to develop responsible enterprise policy that tries to satisfy various viewpoints of responsibility discussed in chapter 3.

3. Enterprise governance, oriented toward social responsibility

Every organization, as an institution of interest linking people and property (Belak, 2002, 2010) defines its basic, general and long-term characteristics in its enterprise policy as its important management instrument influencing development and operation. Enterprise policy includes its mission, purpose and basic goals that result from vision – starting point for start-up and developmental enterprise planning; it also incorporates vision. Enterprise vision is based on the entrepreneur's values (Zimmerer, Scarborough, 2005: 71). They reflect in organizational VCEN (See Potočan, Mulej, 2007). When they are oriented toward enterprise's SR, enterprises (and

humans) have more possibilities for their WB and long-term survival, because they are less one-sided and short-term.

A new benefit for the current and coming generations should be provided through innovations (see Mulej et al., 2009c). The innovation of planning and management criteria must be oriented toward more SR and requisite holism (Mulej et al., 2009a, 2009b). Our economies need radical changes to get out of the current 2008- (VCEN-based) crisis, also through the governance and management process innovation (see Štrukelj, Mulej, 2009) and requisitely holistic ethics planning as pre-condition for enterprise ethical behavior (Belak et al., 2010). In the concept of SR (Wheelen, Hunger, 2006, p. 56) a private corporation has responsibilities to society beyond making its profit. Strategic decisions often affect more than just the corporation. Managers (ibid: 57) must be able to ethically deal with many conflicting interests to formulate a viable strategic plan [originating in the enterprise vision and enterprise policy]. Among many world-wide acknowledged models of integral management that stress the governance and management process let us expose authors considering the above systems connection, e.g. Barney, Hasterly (2011), Belak (2010), Bleicher (2004), David (2011), Hinterhuber (2004), Kajzer, Duh, Belak (2008), and Wheelen and Hunger (2010). But we must be aware (see Štrukelj, Mulej, 2008; 178–179) that also all these models have presented only a partial (although rather integrative) view of organizational development and business, depending on subjective viewpoints of cooperating authors and schools. Thus, models are only frameworks for precise organizational investigation. Theoretical approaches to schools of thought in strategic management from the integrated strategic management perspective were briefly explained by Criado, Galván-Sánchez and Suárez-Ortega (2010: 109–112); for brief introductions to schools of strategic thought see for example (Grant, 2007: 14–22; Stegmann, 2007; and Matthews, 2005); for empirical survey of integral management importance see Duh, Štrukelj (2011). About the need for SR of enterprise governance and management (process innovation) read (Štrukelj, Mulej, 2008, 2009; Štrukelj et al., 2010). For enterprise to attain its long-term survival the principles of stakeholder interests, enterprise developmental, economic and social (SIEDES) responsible (enterprise) policy should be followed (see: Bleicher, 1995: 100–120 in Belak, 2002; Bleicher, 2004; adapted and supplement with own comprehension) (Table 2).

The principles of SIEDES responsible (enterprise) policy
1. To reach its business excellence and hence to find its way out from its crisis, responsible enterprise policy should stress the regular innovating in its policy.
2. Arising from VCEN innovations, expressed as persons interests, the enterprise's general definitions of its policy depend on interests of its important stake-holders.
3. Enterprise stakeholders should be conscious about their long-term well-being interdependence with all life species.
4. All of them should once again rethink their long-term interests (benefits), and
5. Their (process, product/services, information etc.) consequences, and
6. Their willingness/ability to innovate them toward their responsible, requisitely holistic behavior concerning all other humans (families, co-workers, other citizens and planet Earth residents, life forms, and nature – with predominating of long-term interests concerning all of them).
7. Enterprise's developmental orientation (e.g. exploitation of opportunities of its internal and external environmental development),
8. Their economic orientation (with striving for politics of economic responsibility toward all inhabitants of the world),
9. Their social orientation (toward ecological, socially, and else-how responsible goals and social desire consideration, also toward social community) should also be innovated all the time.

Table 1: The principles of stakeholder interests, enterprise developmental, economic and social (SIEDES) responsible (enterprise) policy

Many entrepreneurs practice the modern VCEN with clear business benefits; their criteria of benefit are often not short-term and narrow-minded (Mulej et al., 2009d, p. 240). Organizational vision provides an overall picture of where the organization would like to be in the future... It should also reflect the organization's commitment to SR and ethical decision making (Coulter, 2005: 48). The lack of suitable VCEN, based on SR seemed to be one of important (economic) factors that caused the (economic, social, environmental, financial) global crises of 2008-. And just now, if not earlier, the necessity of enterprise's SR is hence more urgent and needed than otherwise. This need has to be included into the enterprise vision and enterprise policy. Whether this will really match this description depends upon shareholders'/owners' spiritual intelligence and consciousness that SR is important and influences all stakeholders' WB and consequently also their own interests satisfaction.

This is a very good reason for SR to be included into an enterprise vision, enterprise policy, its strategic and operative management, and its basic-realization process: SR makes WB of enterprise stakeholders grow. We took this into consideration also in our next chapter.

4. Enterprise stakeholders' well-being

Positive psychology captured within the discussed responsible enterprise policy develops WB. "WB has subjective (self-assessed) and objective (ascribed) dimensions; it can be measured at the level of individuals or society; it accounts for elements of life satisfaction that cannot be defined, explained or primarily influenced by economic growth." (SDRN 2005: 2). The WB is a complex construct. Its meaning remains contested and key distinctions are there between: (i) hedonic and eudemonic WB; and (ii) objective and subjective measures (SDRN 2005, p. 4).

The literature on defining positive psychological functioning (WB) includes many perspectives. There are Maslow's (1968) conception of self-actualization, Rogers's (1961) view of the fully functioning person, Jung's (1933) formulation of individuation, and Allport's (1961) conception of maturity (Ryff 1989: 1070). "A further domain of theory for defining psychological WB follows from life span developmental perspectives, which emphasize the differing challenges confronted at various phases of the life cycle. Included here are Erikson's (1959) psychological stage model, Buhler's basic life tendencies that work toward the fulfillment of life (Buhler, 1935; Buhler, Massarik, 1968) and Neugarten's (1968; 1973) descriptions of personality change in adulthood and old age" (Ryff 1989: 1070). Musek (2005: 175) states that Jahoda (1958) was probably the first author, who has, researching the positive psychic health, analyzed the existing scientific literature on variables related to normal, optimal psychic activity on one hand and pathologic psychic activity and emotional functioning on the other hand. She was particularly interested in optimal and successful functioning in respect of content and not only as an absence of a negative behavior.

All of these are bases of a multidimensional model of WB. Ryff and Keyes (1995: 720) mentioned that the model of WB included six distinct components of positive psychological functioning. "In combination, these dimensions encompass a breadth of wellness that includes positive evaluations of oneself and one's past life (Self-Acceptance), a sense of continued growth and development as a person (Personal Growth), the belief that one's life is purposeful and meaningful (Purpose in Life), the possession of quality relations with others (Positive Relations With Others), the capacity to manage effectively one's life and surrounding world (Environmental Mastery), and a sense of self-determination (Autonomy). We believe that enterprise stakeholders attain higher levels of positive psychological functioning concerning all discussed dimensions when enterprise policy is responsible to them, too.

A high level of WB is not precious only in the context of WB, but it can also be economically useful. According to Diener and Seligman (2004: 1) individual's income is becoming increasingly less relevant as far as the differences in the growth of WB are concerned; on the other hand interpersonal relations and satisfaction at work are becoming more and more relevant. As important non-economic indicators of social WB the social capital, democratic management and human rights are mentioned, while at work non-economic indicators have effect on both satisfaction and profitability. Diener and Seligman claim (*ibid*) that the expected (economic) results are most often the effect of WB than vice versa. They detected that people who are at the top of the WB scale have more income and are more successful at work as those in the lower region of such a scale. Satisfied employees are better co-workers and therefore help their colleagues in various ways. Furthermore, people with a higher level of WB have better social relations. Such people are more likely to get married, stay married, and have a successful marriage. And finally, WB is also connected with health and longer living, but the connections between them are far from being completely understood.

These facts show that information from monitoring of WB at the organization (and state) levels is necessary for WB to become the main topic for the creation of the enterprise (and state) policy; accurate measuring of WB forms a basis of such a policy (Diener and Seligman 2004: 1). Authors suggest that for the purpose of measuring of WB, positive and negative emotions, commitment, purpose and meaning, optimism, trust, and a wide concept of a full life be used as variables. At the same time they point out that for the measuring of WB researches are important, which refer to social conditions, income, physical health, and mental disorders, we add their interests, economic, personal, and consciousness development. James (2007) warns about the border between WB and the end of motivation because of the affluence combined with complacency: the border is not objective, but subjective. "In recent years, a form of WB in addition to subjective WB has emerged from theorists such as Ryan and Deci (e. g. 2000, 2001) and Ryff (1989) based on the idea of universal human needs and effective functioning. These approaches are labeled "psychological WB" and are based in part on humanistic theories of positive functioning." (Diener et al. 2009: 251).

It could be added that on this basis one should monitor the subjective WB, which supports people's creative work and cooperation, which can then lead to an increased objective and personal WB. Hornung (2006; summarized after Prosenak and Mulej, 2007: 6) also provides an interesting common denominator: happiness counts as a humans' constant goal and also as a comprehensive synergetic indicator of one's requisitely holistic WB, good performance, physical, psychological, and social health. Hornung (2006: 334–337; summarized after Prosenak, Mulej and Snoj 2008: 6) states that for the good WB the following needs should be met: material needs, informational and, at the level of individuals, psychological needs, security needs, needs for freedom and action, needs for adaptability, needs for efficiency, and needs for responsibility.

5. Some conclusions

SR leads the way out of current 2008- crisis blind alley. SR even might bring capitalism back to its roots aimed at rather holistic replacement of the feudal one-sidedness. Nickels/Burk Wood (1997: 92–93) argue that the SR concept has expanded to all organizational areas; companies shouldn't care for their profits only, but contribute to prosperity in society [WB]. SR helps them. SR behavior reaches beyond matching law and avoiding unethical deeds; SR organizations help solving societal [and other] problems. By Johnson/Scholes (1997: 211-212) CSR includes organizations' internal (care for employees, work-conditions', work-place's and work-order's adequacy) and external

actions (care for environment, safety of products and services, market and suppliers choice, employment, and local societal activities).

After surveying the relevant literature, Prosenak/Mulej (2008: 10) defined SR as humans' care for social and environmental problems to be included in activities matching humans' goals. They see SR's three dimensions: (i) social, (ii) environmental, and (iii) economic. EU's definition (2001: 5; sum. after: Mulej/Hrast, 2008: 43) also matters here: »...SR of companies is a concept, with which companies voluntarily implement social and environmental care into their business activities and into their interactions with stakeholders«. We add the importance of enterprise stakeholders' consciousness about all inhabitants' of the world and nature's long-term interests and appropriate developmental orientation. All of these should be incorporated into the enterprise policy that leads toward enterprise responsibility and stakeholders WB discussed in the presented paper. Because companies are people's tools; therefore SR should be considered an ethical guide of active and decision-making humans. SR can thus be a business strategy (Esposito, 2009) or in our words: requisite holism/wholeness policy, incorporated into the enterprise policy, which supports requisite holism of behavior.

All subjects are inter-connected and therefore interdependent. Hence we should strive at as-holistic-as-possible quality of life (requisitely holistic objective and subjective WB) and at human solidarity as a part of equality and brotherhood along with freedom. WB results from acknowledging the meaning, and strengthening, of ethics of interdependence and respect for ecological sensibility and natural limitations. SR hence demands reconciliation of narrower, broader, short-term and long-term perspectives with ecological and other nature-respecting views as necessary elements of VCEN of people, expressed as SR (Prosenak/Mulej, 2008: 13). It should be captured into the enterprise policy. SR-WB of many rather a few only should result instead for the current civilization's survival.

6. References

- Allport, G. W. (1961). *Pattern and growth in personality*, Holt, Rinehart & Winston, New York.
- Aurobindo, S. (1991). *Slapovi luči*, Mohorjeva družba.
- Barney, J. B., Hesterly, W. S. (2011). *Gaining and Sustaining Competitive Advantage*. Fourth, International Edition. Pearson Education, Inc., publishing as Prentice Hall, One Lake Street, Upper Saddle River, NJ
- Belak, J. (2002). *Politika podjetja in strateški management*. Založba MER v Mariboru.
- Belak, J. (2010). *Integralni management: MER model*. Založba MER v Mariboru, MER Evrocenter, zbirka Aktualnosti managementa in razvoja.
- Belak, Je., Duh, M., Mulej, M., Štrukelj, T. (2010). Requisitely holistic ethics planning as pre-condition for enterprise ethical behaviour. *Kybernetes*. Vol. 39, No. 1.
- Bell, S. in S. Morse. (2005). Holism and Understanding Sustainability, *Sistemic Practice and Action Research*, 18 (4): 409-426.
- Bleicher, K. (1995). *Das Konzept Integriertes Management*. Das St. Galler Management-Konzept. Campus Verlag GmbH, Frankfurt am Main/New York.
- Bleicher, K. (2004). *Das Konzept Integriertes Managements*. Visionen – Missionen – Programme. (St. Galler Management-Konzept). Campus Verlag GmbH, Frankfurt/Main.
- Buhler, C. (1935). The curve of life as studies in biographies. *Journal of Applied Psychology*, 43, 653-673.
- Capra, F. (1991). *The Tao of Physics: an Exploration of the Parallels Between Modern Physics and Eastern Mysticism* - 3rd Ed., Flamingo, London.

- Coulter, M. (2005). *Strategic Management in Action*. Third, international edition. Pearson, Prentice Hall, Pearson Education International. Pearson Education, Inc., Upper Saddle River, New Jersey.
- Criado, A. R., Galván-Sánchez I., and Suárez-Ortega S. M. (2010). A configuration-holistic approach to born-global firms' strategy formation process. In: *European Management Journal* (2010) 28, 108–123.
- David, F. R. (2011). *Strategic Management: Concepts and Cases*. Thirteenth, Global Edition. Pearson Education, Inc., publ. as Prentice Hall, One Lake Street, Upper Saddle River, NJ.
- de Mello, A. (1989). *Žabja molitev - Meditativne zgodbe*, Župnijski urad Ljubljana-Dravljje.
- Diener E, Seligman EPM. (2004). Beyond Money; Toward an Economy of Well Being. *Psychological Science in the Public Interest* 5(1): 1–31.
- Diener, E., Witz, D., Biswas-Diener, R., Tov, W., Dim-Prieto, C., Choi, D.-w., & S. Oishi, (2009). New measures of Well-Being. In: Diener, E., Lucas, R., Schimmack, U. and Helliwell, J. F. (eds.). *Oxford (UK) (eds.): Well-being for public policy*, Oxford University, New York, 247-267.
- Duh, M., Štrukelj, T. (2011). Integration and Requisite Holism of Enterprises' Governance and Management as Precondition for Coping with Global Environmental Changes. In: *Acta Polytechnica Hungarica, Journal of Applied Sciences. Special Issue on Management, Enterprise and Benchmarking*. Guest Editor: György Kadocsá. Volume 8, Issue Number 1, pp. 41–60.
- Erikson, E. (1959). Identity and the life cycle. *Psychological Issues*, 1, 18-164.
- Esposito M. (2009). *Put your corporate responsibility, act together!* Tate Publishing and Enterprises: Mustang, Oklahoma.
- Frankl, V. E. (1962). *Man's search for meaning: An introduction to logotherapy*. Beacon Press: Boston.
- Grant, J. H. (2007). Advances and Challenges in Strategic Management. In: *International Journal of Business*, 12(1), 2007, pp. 11-31.
- Hinterhuber, H., H. (2004). *Strategische Unternehmensführung. 7. grundlegend neu bearbeitete Auflage, Band I und Band II*, Berlin – New York.
- Hornung, B.R. (2006). Happiness and the pursuit of happiness. A socio-cybernetic approach. *Kybernetes* 35(3/4): 323-346.
- Jahoda, M. (1958). *Current concepts of positive mental health*, Basic Books, New York.
- James, O. (2007). *Affluenza – a contagious middle class virus causing depression, anxiety, addiction and ennui*, Random House UK Ltd etc., London, Vermillion, an imprint of Ebury Publishing.
- Jogananda, P. (2003). *Avtobiografija Jogija, Gnostica*, Ljubljana.
- Johnson G, Scholes K. (1997). *Exploring Corporate Strategy*. Prentice Hall Europe: Hertfordshire.
- Kajzer, Š., Duh, M., Belak, J. (2008). Integral Management: Concept and Basic Features of the MER Model, *Zeitschrift für KMU & Entrepreneurship, Sonderheft 7*, pp. 159-172.
- Khisty, C. J. (2006). Meditations on System Thinking, Spiritual Systems and Deep Ecology, *System Practice and Action Research*, 19: 295-307.
- Kononenko, I.. (2002). Znanost preverja duhovnost. Dostopno na: <http://lkm.fri.uni-lj.si/xaigor/slo/Znanost%20preverja%20duhovnost.doc>. [17.2.2009]
- Kononenko, I.. (2005). Objektivna znanost in subjektivna duhovnost sta komplementarni. Dostopno na: <http://lkm.fri.uni-lj.si/xaigor/slo/IgorKomplementarnost.doc>. [17.2.2009]
- Kononenko, I.. (2006). Učitelji modrosti vseh kultur sporočajo isto. dostopno na: <http://lkm.fri.uni-lj.si/xaigor/slo/modrosti/ucitelji/ucitelji-modrosti60.doc>. [17.2.2009]
- Krishnamurti, J., Watts, A., Trungpa, R., Maharshi, Dalaj Lama; in Steiner. R. (1993). *Knjiga duhovnih zakladov*, Julija Pergar, Ljubljana.
- Maslow, A. H. (1968). *Toward a psychology of being* (2nd ed.), Van Nostrand, New York.
- Matthews, J. R. (2005). *Strategic Planning and Management for Library Managers*. Westport, Conn.: Libraries Unlimited, xiv.

- McAllister, F., Wellbeing Concepts and Challenges. Discussion Paper Prepared by Fiona McAllister for the Sustainable Development Research Network (SDRN), 2005, at http://www.sd-research.org.uk/wellbeing/documents/SDRNwellbeingpaper-Final_000.pdf.
- McTaggart, L. (2004). *Polje – po sledih nevidnih sil v vesolju*, Ara, Ljubljana:
- Meera, Mo. (2002). *Odgovori matere Meere*, 1.del, Samozaložba, Tolmin.
- Milčinski, M. (ur. in prev.). (1992). *Klasiki daoizma: Dao de jing, Zhuang Zi, Lie Z.*, Slovenska matica, Ljubljana.
- Mulej, M., Hrast, A. (2008). Družbena odgovornost podjetij. In *Skupaj smo močnejši*, Zbornik 2. konference nevladnih organizacij Podravja. Regionalno stičišče Podravja: Maribor; 41-52.
- Mulej, M., Ženko, Z., Potočan, V., Štrukelj, T. (2009a). Kriza 2008 – posledica neoliberalnega zanemarjanja primerno celovitega obnašanja do inoviranja (Crisis of 2008 – a consequence of the neoliberal neglecting of the requisitely holistic behaviour concerning innovation). In Mulej, M. editor: *Globalna finančna kriza ter trajnostni razvoj. Conference at 50th anniversary of University of Maribor, Faculty of Economics and Business Maribor*. Edition: Faculty of Economics and Business Maribor and Union of Economists Slovenia.
- Mulej, M., Belak, Je., Hrast, A., Prosenak, D., Potočan, V., Štrukelj, T., Ženko, Z., Žižek Šarotar, S. (2009b). Kriza – povod za inoviranje planiranja in vodenja v smeri k družbeni odgovornosti (podjetij) ter zadostni in potrebni celovitosti obnašanja ljudi (Crisis – a reason for innovation of planning and management toward (corporate) SR and requisite holism of human behavior). In: 34. posvetovanje Planiranje in vodenje organizacij v kriznih razmerah, s poudarkom na aktualno temo: Kriza – priložnost za pozitivne spremembe s primeri dobre prakse različnih organizacij. Union of Economists Slovenia, Association of Economists Maribor.
- Mulej, M., Ženko, Z., Potočan, V., Štrukelj, T., Božičnik, S., Hrast, A. (2009c). Nujnost in zapletenost ustvarjalnega sodelovanja za inoviranje kot pot iz krize 2008- (Necessity and complexity of creative cooperation aimed at innovation as a way out from the 2008- crisis). In: *Work – a bridge to cooperation: Relations with co-workers and different age generations. 4th international conference SR and current challenges 2009*. On CD. Available at www.irdo.si. IRDO Institute for development of SR, Maribor (IRDO – Inštitut za razvoj družbene odgovornosti, Maribor).
- Mulej, M., Potočan, V., Ženko, Z., Štrukelj, T., Hrast, A. (2009d). Introduction of innovating to enterprises in crisis times of 2008-. Integracija Rossii v mirovju ekonomičeskuju kul'turu v postkrizisnyî period. Čast' = Part 2 / [redakcionnaja kolegija = editors: L. E. Strovskiî ... [et al.]. - Ekaterinburg ; = Yekaterinburg : UGTU-UI Ural'skiî gosudarstvennyî tehničkiî universitet - UPI : = USTU-UI - Ural State Technical University, 228-243.
- Musek J. (2005). Generalne dimenzije osebnosti in subjektivno emocionalno blagostanje. *Anthropos* 1(4): 319-338.
- Nickels WG, Burk Wood M. (1997). *Marketing: Relationships, Quality, Value*. Worth Publishers Inc.: New York.
- Osho. (1998). *Zvok ploskanja ene roke*; Satja, Ljubljana.
- Pilgrim, P. (1999). *Romarka za mir - O svojem življenju in delu*, Prijatelji Romarke za mir, Satja, Ljubljana.
- Po, Huang. (1977). *Učenje o prenosu duha*, Horizonti, Beograd.
- Potočan, V., Mulej, M. (2007). *Transition into an Innovative Enterprise*. University of Maribor, Faculty of Economics and Business, Maribor.
- Prosenak, D. & Mulej, M. (2008). O celovitosti in uporabnosti obstoječega koncepta družbene odgovornosti poslovanja = About holism and applicability of the existing concept of corporate social responsibility (CSR), *Naše gospodarstvo*, 54 (3/4): 10-21.
- Prosenak, D., & Mulej, M. (2007). How can marketing contribute to increase of well-being in transitional (and other) societies?. In: Snoj, B., Milfelner, B. 1st International Scientific Marketing Theory Challenges in Transitional Societies Conference, EPF, Maribor, 127-133.
- Prosenak, D., Mulej, M. & Snoj, B. (2008). A requisitely holistic approach to marketing in terms of social well-being. *Kybernetes*, 37(9/10).
- Rogers, C.D. (1961). *On becoming a person*, Houghton Mifflin, Boston.
- Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57, 1069-1081.

- Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, 69, 719-727.
- Schumacher, E. F. (1989). *Small is Beautiful – Reprint*, New York, Harper & Row Publishers, Inc.
- Senge, P., Scharmer, C. O., Jaworski, J. in Flowers, B. S. (2004). *Presence – Exploring Profound Change in People, Organizations, and Society*, Doubleday, New York..
- Shah, I. (2000). *Put Sufija*, Gnosis, Ljubljana.
- Shankar, S. S. R. (2000). In *Intimate note to the Sincere Seeker*; Volumes 1-7, Art of Living Foundation; 1997-2003. Idries Shah: *Put Sufija*; Gnosis, Ljubljana.
- Stegmann, J. P. (2007). An Integrated View of Strategic Management. In: *The journal of Interdisciplinary Economics*, 2007, Vol.18, pp. 275-302.
- Štrukelj T., Mulej, M. (2008). Business policy and strategic management for the sustainable future. In: Božičnik, S., Ećimović, T., Mulej, M. with co-authors (2008): *Sustainable future, requisite holism, and SR (Against the current abuse of free market society)*. ANSTED University, British Virgin Islands, and ANSTED Service Centre, Penang, Malaysia; School of Environmental Sciences In Cooperation with SEM Institute for Climate Change, Korte, Slovenia And IRDO Institute for development of SR, Maribor, Slovenia.
- Štrukelj, T., Mulej, M. (2009). Enterprise management, innovativeness, market competitiveness and the case of global (transitional) economy. In: *Marketing theory challenges in transitional societies*. 3rd International Scientific Conference, Maribor, Slovenia, September 24th-25th, 2009. – Maribor: Faculty of Economics and Business, Institute of Marketing.
- Štrukelj, T., Duh, M., Belak, Je., Mulej, M. (2010). Entrepreneurial rationality for enterprise's long-term survival and development. In: Hrast, Anita, Mulej, Matjaž, editors: *SR and current challenges 2010. Nature and humans*. Proceedings of the 5th international conference on SR. On CD. Available at www.irdo.si. IRDO Institute for development of SR, Maribor.
- Štrukelj, T., Mulej, M. (2010). Vision as an instrument for becoming a socially responsible enterprise (including nature), in Hrast, A., Mulej, M. (ed.): *SR and current challenges 2010. Nature and humans*, Proceedings of the 5th international conference on SR. On CD. Available at www.irdo.si. IRDO Institute for development of SR, Maribor.
- Targ, R. & Hurtak, J. J. (2006). *The End of Suffering. Fearless Living in Troubled Times ...or, How to Get Out of Hell Free*, Hampton Roads Publishing Company, Inc, Charlottesville (VA).
- Tolle, E. (2002). *The Power of Now*, Ganeš.
- Wheelen, T. L., Hunger, D., J (2006). *Strategic Management and Business Policy*. Tenth edition. Pearson Education International, Pearson Education, Inc., Upper Saddle River, New Jersey.
- Wheelen, T. L., Hunger, J. D. (2010): *Strategic Management and Business Policy: Achieving Sustainability*. 12th Edition. International edition. Pearson Education, Inc., Upper Saddle River, New Jersey.
- Zimmerer, T. W., Scarborough, N. M. (2005). *Essentials of Entrepreneurship and Small Business Management*. Fourth Edition. Pearson Education International, Pearson Education, Inc., Upper Saddle River, New Jersey.
- Zohar, D. (2006). *Duhovni kapital*, TOZD, Ljubljana.

WELLBEING AND SOCIAL SCIENCE

Tomáš Sigmund

University of Economics in Prague
Faculty of Informatics and Statistics
Department of System Analysis
sigmund@vse.cz

Abstract

The concept of wellbeing is getting a lot of attention, and in many recent researches its subjective aspects have been stressed. The prevalent efforts try to quantify its content. However, I think wellbeing belongs into social sciences and the attempts to measure it are examples of objectifying knowledge which can be traced back for centuries.

In social sciences a movement can be found related to the successes and developments of natural sciences – the ideal of social sciences was to imitate the natural sciences' mathematical methods. But since Durkheim, Dilthey, Weber, Gadamer and others, the social sciences have been based on a fundament different from natural sciences and even superior to them. In my article I'd like to show the relevance of wellbeing for economics, point to the objective and subjective approaches to wellbeing, the efforts to quantify it and criticize these attempts from the "verstehen" (understanding) point of view. The critique will be supplemented with a positive outlook at wellbeing as an event. I would like to elaborate the hermeneutic perspective on wellbeing which is the perspective of social sciences.

Keywords

Wellbeing, Social Science, Hermeneutics, Happiness, Information

1. Introduction

Good living has always been important to man. The sign of it has been happiness. With the increase of individuality and human independence happiness and wellbeing are attracting even more attention.

The interest in wellbeing is also apparent in the attempts to change the criteria measuring the economic development of societies. The historical irony wanted that it came true what the founder of GDP Simon Kuznetz warned against: GDP is the aim in itself measuring wellbeing of societies. (Simon Kuznets, the Nobel Prize winning economist, recognized the GDP flaws when warning the US Congress in 1934: "The welfare of a nation can scarcely be inferred from a measurement of the national income." (Kuznets, 1934, p. 7))

Recently the report by the Commission on Measurement of Economic Performance and Social Progress, led by Professors Stiglitz, Sen and Fitousi stated that GDP is not the ideal measure of wellbeing. The report contains the recommendation that institutions should shift emphasis from measuring economic production to measuring people's well-being and identifies 9 domains to

measure quality of life: material living standards, health, education, personal activities including work, political voice and governance, social connections and relationships, environmental conditions, insecurity, overall life satisfaction. J. Thomas and J. Evans who analyzed in their article (2010) this report found out there is a lot of existing information measuring societal wellbeing. What is missing is a sense of coherence and how various parts might be aggregated to a complete measure.

Happiness and wellbeing motivates a lot of human behaviors and can be used as an explanation of it. That is why it can be found in the basis of many sciences including economics. Many sciences try to explain it, find its independent content, formulate rules governing it, measure it and control it.

2. Wellbeing and economics

In economics wellbeing plays a fundamental role as it is believed it determines the human behaviour. This idea is based on the presupposition that happiness is the ultimate objective of human life (Bentham). In economics wellbeing took the form of utility as a flow of pleasure or pain. First it was believed that utility can be measured either directly or indirectly (Edgeworth, Fisher), later the acceptance of Pareto's ideas, which implied economic laws independent on psychology, lead to the conclusion that utility is not objectively measurable. Only ordinal utility can be inferred from observed choices and so economists used just cues, considered to be closely related to wellbeing, such as income.

However, psychologists never abandoned the idea that utility or wellbeing can be measured. In the 1970s researches appeared (Easterlin, 1974), (Kahneman and Tversky, 1979) which challenged the classical economic theories with two findings: 1) on the macroeconomic level it was found out that in spite of the economic growth the happiness in the USA didn't increase; 2) on the microeconomic level nonrational decision making was confirmed. The result of this criticism led to increased interest in psychology in economic sciences. (Kristoffersen, 2010)

To be precise it is necessary to mention that Bentham's utility referred to pleasure and pain, the utilitarians aimed at experienced utility, happiness and wellbeing in general. Later economists used decision utility by observing people's economic choices. Theories based on different concepts of course accordingly differ.

3. Wellbeing theories

Ranson (2010) includes wellbeing into ethics because wellbeing means what is good for a person. From this perspective wellbeing would belong into the category of normative ethics. (In my article I'd like to doubt this claim a little.) There are many categories of wellbeing theories. The substantive theories state the constituents of well-being (such as pleasure), while the formal theories state what makes these things good for people (pleasantness, for example). Another categorization would be according to different schools of thought in normative ethics. Thus we can differentiate four approaches:

Hedonist theories claim that people try to reach maximum pleasure over pain. The problem is with different pleasures and their comparability; there are higher and lower pleasures. And pleasure only needn't be related to real external world activities. Our life takes place in real world and we take responsibility for it.

Desire theories claim that people try to satisfy their desires and preferences. This leads to ranking preferences and utility functions and measurement of utility sometimes expressed in money. But present desire satisfaction cannot explain our behaviour as we take into account the whole life. The desire theory needs to be comprehensive then. However, comprehensiveness alone is not satisfactory as the desires about the shape of one's life as a whole should be given some priority (global comprehensive theory); the person should also be informed about the facts (informed desire). But the whole idea of desire-satisfaction is strange. As Aristotle says (*Metaphysics* 1072a), "desire is consequent on opinion rather than opinion on desire". In other words, we desire things, such as helping somebody, because we think those things are independently good; we do not think they are good because they will satisfy our desire for them (Crisp, 2008).

Objective list theories state that certain objective conditions like knowledge or friendship define personal wellbeing and not just utility. This theory needn't be authoritative. In principle the objective list may include happiness or preference satisfaction, but wellbeing may not be reduced just to this. Informed and reflective living of one's own life may be also on the list. Objection to this theory may be that it is elitist and it is not very clear what the list should include.

The recent fourth complex approach was formed by A. Sen (2008). It is based on freedom, capabilities and Aristotle's concept of *eudaimonia* (human flourishing, perfect wellbeing) from *Nicomachean Ethics*. Sen also takes into account achievement and fulfillment of one's potential. His approach tries to incorporate both objective list features and the subjective feelings and supplement them with human capabilities and their satisfaction. His theory is quite complex. However, wellbeing defined according to it is not measurable and the objective aspects may be in conflict with the subjective ones.

4. Subjective and objective wellbeing

Some authors distinguish between subjective and objective well-being, but their definitions are not unanimous. For some (e.g. Gasper, 2005) the subjective wellbeing consists in feelings, the objective one in valued functionings, characteristics or objects. Subjective wellbeing is then closer to hedonist and desire theories, objective wellbeing is more related to objective list theories. It is difficult to decide what is more important and how to combine these two aspects. The emotional and cognitive aspects cannot be separated and their relation to happiness is quite complicated. One can be happy even though one doesn't feel the highest pleasure possible and one may even be happy in spite of the rational arguments. Happiness and wellbeing belong in the same category as love or religious faith. They are events which occur to people and only the respective person can say if he was happy or not. This recognition is always a step behind the event. We cannot force happiness to occur; we can just prepare for it and wait. First happiness comes, and then we realize we were happy. It is similar to the birth. One cannot be completely contemporary with one's birth; one always comes a little bit late. Because of the difficult tractability and intangibility of wellbeing some researchers define subjective wellbeing as the person's evaluation of her situation including both emotional and cognitive aspects (as e.g. Diener et al, 1998). This definition seems to me more intuitive and more reflecting the essence of wellbeing. I will use this definition of wellbeing in my article.

A lot of current researchers stress the subjective (in the sense of the person's evaluation of her situation containing both the emotional and cognitive parts) aspect of wellbeing (explicitly e.g. Diener et al, 1998). I think their intuition is correct. It is important how the person evaluates her situation and if she feels well. Objective wellbeing refers to the objectively discoverable characteristics, which are with some probability from past experience related to wellbeing, like

health state, purchasing power, income, or property. The advantage of these objective characteristics is that they are quite easily ascertainable. Their problem is their relation to the real wellbeing, which is the topic of interest.

Economic indicators of wellbeing like income and other resources, which are used for goods and commodities acquirement, form a special category of objective well-being. It has been proven (Segal, 1998a) that increase in income or purchase power is not followed by increase of total objective wellbeing or by increase of subjective wellbeing. The reasons may lie in needs for further expenditures for travelling to work, to take care of the children, to cope with stress. The increased efforts, demands and the new demanding lifestyle may decrease the satisfaction. Not even subjective wellbeing is related to income. Subjective wellbeing may rise and fall and the different states of wellbeing are sometimes hardly comparable; but economic measures of wellbeing may rise almost without limits.

The reason why income is not in correspondence with wellbeing may lie in the fact that people are not solely oriented to their own benefits. It is the result of Sen's analysis, too (Gasper, 2005). It seems the fundamental reason for pursuing economic growth is not that it improves human lives. In any case we may conclude that wellbeing is wellbeing, not high income or good health state or pleasant feeling.

The relation between the non-economic objective and subjective wellbeing is also not unambiguous. Sen (1985) reports the case of Indian women who in spite of their worse objective health compared to men reported higher subjective satisfaction. It won't help much to measure unhappiness or unpleasant states of mind (the so called U-index (Kahneman and Krueger, 2006)).

The difficulty to find the subjective wellbeing of people was reported in some researches. Kahneman and Kruger (2006, p. 6) claim that life satisfaction is neither a direct, verifiable experience nor a known personal fact like one's address or age. It is a global retrospective judgment, which in most cases is constructed only when asked and is determined in part by the respondent's current mood and memory, and by the immediate context. There are some factors which are correlated with high life satisfaction like self-reported health or sociability and extraversion, but they are valid generally only. Another problem lies in the fact that respondents may interpret and use the response categories differently. It seems silly to ask somebody if he is happy and offer him three or four answers. It is similar to asking if he believes in God. This shows the necessity of dialogue.

The objective characteristics of wellbeing do not correspond to the wellbeing because of its subtlety and subjectivity. Another implication is that wellbeing is not comparable. We can work with generalizations and approximations only. The only way how to learn if the person is happy is to talk to her and try to understand and interpret the discussion with her. (Here I advocate the Gadamer's hermeneutic position. This conception has nevertheless its flaws as e.g. the Gadamer's discussion with J. Derrida has shown.)

Heller (2007) defines subjective wellbeing as "how people evaluate their lives". The problem is that their evaluation changes over time. Momentary feelings and enduring tendencies differ. And there are also intra-individual fluctuations in life satisfaction. This shows subtlety of the concept and difficult quantification.

Kristoffersen (2010) claims that there is no one universally agreed upon metrics that captures the meaning of wellbeing. Economics appears to accept the wellbeing as relevant in economic analysis. However the problems remain with its interpersonal, international and intertemporal comparison, cardinality of the measurement scale, and the related questions of its additivity. The world is too

complex - the complexity of current social systems and the related complexity and turbulent nature of the systems' environment has been proved in the article of Exnarova et al (2011).

In history of sciences there were attempts to use the paradigm of natural sciences on all areas of scientific research. However movements against these attempts appeared as well. Especially the social sciences showed such movements. Because I think wellbeing belongs into the domain of understanding perspective and thus into social sciences – where economy also partly belongs – I'd like to trace the methodology of social sciences and show how it has dealt with the subjective notions.

5. Social sciences and Natural sciences

The German philosopher W. Dilthey reacted to attempts to use methodology of natural sciences on social sciences (also called human sciences); he differentiated the first-person participatory perspective that agents have on their individual experience as well as their situation, culture, history, and society (he proposed to use this perspective in social sciences) and contrasted it with the external objectification by third-person's explaining perspective in which subjectivity and its products are analyzed as effects of impersonal natural forces (this perspective should be used in the natural sciences). The first-person approach has been further developed and introduced into sociology by Max Weber. This perspective found one of its peaks in the hermeneutical work of H. G. Gadamer. We could also subsume this line of thought into the wider genealogical perspective stemming in Nietzsche and continuing through Husserl into its many branches in the 20th century.

The distinction between human and natural sciences may lie either in their object or in the method of investigation. Either they investigate different things (material difference) or they proceed in different manners when investigating the same thing (formal difference). There were attempts to found the material dichotomy between the two objects on the difference nature-mind, but they have failed as also sciences dealing with human world like psychology can find laws and generally proceed in the manner of natural sciences. The neokantian movement (Rickert, Windelband) introduced the distinction between repeatable and unrepeatable (unique). Unique events don't call for finding similar events of the same kind and finding laws, but for understanding in their individuality. J. Čapek (2008) doesn't consider this a material, but a formal distinction. It is the feature of our point of view, not of the things. The same event or phenomenon can be approached in both ways. I think we can agree to that. The natural sciences provide us with explanation by subsuming the individual under a general rule; the human sciences provide us with understanding by giving us context, reasons, individual decisions, relation to other facts. They use the hermeneutical circle. But to look at individual facts through generalized point of view means some violence and loss of meaning. In some cases, like happiness, all the meaning can be lost.

The problem with the individual is that to understand it in its individuality is very difficult. Concepts, the building stones of sciences, relate individual to the general and in consequence abolish its individuality. (To be precise it should be noted that in the 20th century there were attempts to establish the science of the individual. Barthes' *mathesis universalis* or the ideas of later Derrida are of this kind.)

So to understand the individual we have to use a special composition of general rules, special concepts like free will, works of art, affects or methods like the affective incidence, hermeneutical circle going from the individual to the general and back repeatedly etc.

The fact that I usually travel by train can be either explained as a sociological fact which have many people of my status in common or understood as my individual decision stemming from my freedom and my individual situation, history etc.

6. H. G. Gadamer

Gadamer says in the Introduction to his *Truth and Method* (2004) that the phenomenon of understanding is connected to all human relations to the world. It resists every attempt to explicate it as a scientific method. Human sciences overlap the area controlled by scientific methodology. The truth revealed this way cannot be verified by scientific means. Human sciences do not try to understand the laws and regularities. They are not inductive. Single facts are not used to verify the validity of the law in order to forecast. Their ideal lies in understanding the event in its singularity and historical concreteness. They try to understand how this individual, this nation, this state became what it is. How it happened.

Scientific research is guided by thing discovered by scientific procedures. Social sciences don't go deeper into the nature, their approach is motivated by the presence and its interests. This motivation constitutes the theme and object of research. Their research is in contrast to natural sciences governed by the historical movement and doesn't have any independent object. (An interesting question would be what historical situation motivates current research in wellbeing. We will leave it for another paper. We can say in advance that the basic hermeneutical rule that the whole must be understood through the parts and parts through the whole will have to be used. This circular procedure from part to the whole and back must be repeated in order to achieve understanding.)

As Taylor (2002) shows there are differences between knowing (explaining) an object and understanding a man. The first does not react on me, for the second I have to deal with his view of me. The goal of knowledge is total understanding excluding all future surprises. Understanding has no finality. Understanding is always individual; reaching understanding with one person won't help when dealing with others. And even the present partners may change.

The aim of knowledge is control of the object. The aim of understanding is not manipulation, but ability to function with the partner which may include change of original goals. Wellbeing belongs into the category of understanding.

Understanding has three features: it is bilateral, party dependent and involves revising goals. All of them conflict with the scientific principles.

Today we have robbed truth from all non-mathematical sciences. Mathematical sciences reduce objects to what is measurable and invariable in them. The social sciences cannot always use such methods and that's why their validity is dubious for the natural scientists. H.G. Gadamer (2004) reminds us of an almost forgotten model used in text interpretation different from investigation of abstract objects. Social sciences are based on interpretation and understanding. It is difficult to see the reality through the investigated subject's eyes; however we must interpret the clues left by him. The interpretation is not arbitrary similarly to the artist's interpretation of a score or a theatre play. The interpretation is something others can hear, read or understand.

Every interpretation is based on tradition. Without tradition, authority and prejudices no interpretation is possible. But interpreting within a tradition also means changing it. Gadamer compares it to the judge who must be able to explain whether his decisions are or are not in compliance with a general rule and to give reasons for that. He must also take into account how others may understand his decision and how it will influence them. The elements of interpretation consist of historical context or tradition, prejudice, and application, and show that full human

understanding is unavoidably temporal. Natural sciences try to remove historicity from consideration. The tradition and historical context are abstracted away. Natural sciences are not fundamental, they are abstract only. They are also based on tradition which they try to forget. The natural science is universal in our world as the result of certain practices and norms which were adopted by all societies in our time. Its language is universal because it was separated from the human understanding which produced it. The human meanings were removed from words.

J. Čapek (2008) reminds us that the struggle for the autonomy of human sciences also has an ethical dimension²⁴. Human sciences consider man a free agent and their autonomy means respect for the freedom. If everything is subsumed under the explanation of natural sciences, there is no room for freedom and no ethics is possible.

7. Conclusion

Measuring wellbeing means reducing its individuality to general concepts and losing its content. The former Czech president, Václav Havel, warns in his speech on the Forum 2000 against the naivety that we can completely grasp, explain, forecast and manage the world. We are subject to these temptation because our civilization is based on globalization (everything which appears can be quickly and easily expanded on the whole world), atheism (we have no relation to eternity and infinity and short-term profit prevails over long term one), and above all pride leading to disrespect for our ancestors and nature and allowing to see profit only). (Havel, 2010). To understand wellbeing means not to reduce it to some general or probable principles, but to understand the individual person and his situation. That is why I think wellbeing is neither additive nor cardinal. In the attempt to understand the person's state both parties will change and gain something new. This understanding is also only provisional. The natural sciences may try to look for some rules governing wellbeing. However, the individual character of wellbeing becomes in this procedure lost and I think what remains is not wellbeing or happiness, but it's distorted generalized picture uninteresting for the individuals as they can't recognize their happiness in it.

For businesses which are goal-governed understanding happiness is not an important issue if it doesn't contribute to the goal fulfillment. And it usually doesn't. Current businesses don't want to understand their employees and change with this understanding, nor do they want to understand their customers; explaining and managing their behaviour is enough. Maybe with the growth and development of civil society and with the technical and technological progress which falls short of some expectations and opens new perspectives (e.g. photograph, film) we may expect a change.

Acknowledgement

This article was prepared with support from the project of the University of Economics in Prague „VŠE IP400040“.

8. References

- Aristotle. (2009). *Metaphysics*, NuVision Publications, ISBN-10: 1595475710
- Crisp, R., Zalta, E., N. (ed.). (Winter 2008 Edition). *Well-Being*, The Stanford Encyclopedia of Philosophy., Retrieved from <http://plato.stanford.edu/archives/win2008/entries/well-being/>

²⁴ This idea was also addressed by von Helmholtz and Droysen.

- Čapek, J. (2008). Explanation and Understanding: Action as „Historical Structure“, *Philosophia*, Springer Netherlands, Issn: 0048-3893, p. 453 – 463, Volume: 36, Issue: 4
- Diener, E., Sapyta, J. J., and Suh, E. (1998). Subjective Well-Being Is Essential to Well-Being, *Psychological Inquiry*, Vol. 9, No. 1, pp. 33-37, Taylor & Francis, Ltd.
- Easterlin, R.A. (1974). Does Economic Growth Improve the Human Lot? Some empirical evidence, in David, P.A. and Reder, M.W. (eds), *Natiional and Houselholds in Economic Growths: Essaysin Honor of Moses Abramovitz*, Academic Press, New York and London, 89-125,
- Exnarova, A., Dalihod, M., Mildeova, S. (2011). Measuring Systems Thinking Ability. Prague 09.06.2011 – 10.06.2011. In: *Efficiency and Responsibility in Education*. Praha: Czech University of Life Sciences in Prague, 2011, p. 66–74. ISBN 978-80-213-2183-0.
- Gadamer, H.G. (2004), *Truth and Method*, Continuum, 2nd Revised edition, , ISBN-10: 9780826476975
- Gasper, D. (June 2005). Subjective and objective Well-Being in relation to economic Inputs: Puzzles and Responses, in *Review of social economy*, vol. LXIII, No. 2,
- Havel, V. (2010). Projev na konferenci Forum 2000, Retrieved from http://data.idnes.cz/soubory/domaci/45A101011_CEM_HAVEL-FORUM2000-ZAHJEN.PDF,
- Heller, D. (2007). Employee well-being: A multilevel model linking work kand nonwork domains, *European Journal of work and organizational psychology*, 16 (3), 326-341
- Kahneman, D. and Tversky, A. (1979). Prospect Theory: An analysis of Decision under Risk, *Econometrica*, 47, 263-92
- Kahneman, D., Krueger, B. (Winter 2006). Developments in the Measurement of Subjective Well-Being, *Journal of Economic Perspectives*, Volume 20, Number 1, p. 3-24
- Kristoffersen, I. (March 2010). The metrics of Subjective Wellbeing: Cardinality, Neutrality and Additivity, *The Economic Record*, vol. 86, No 272, , 98-123
- Kuznets, S. (1934). "National Income, 1929-1932". 73rd US Congress, 2d session, Senate document no. 124, page 7. <http://library.bea.gov/u/?SOD,888>
- Ranson, B. (Autumn 2010). Sen and Aristotle on Wellbeing, *Australian Journal of Social Issues*, vol. 45, No. 1
- Segal, J. (1998). Consumer Expenditures and the growth of need-required income, in D. Crocker and T. Linden (eds) *Ethics of consumption*, Lanham, MD, Rowman and Littlefield, p. 176-197
- Sen, A. (2008). Capability and wellbeing, in D.M. Hausman (ed.), *The Philosophy of Economics: An anthology*, Cambridge, Cambridge University Press
- Taylor, Ch. (2002). Gadamer on Human Sciences, in Robert J. Dostal (ed), *The Cambridge Companion to Gadamer* (Cambridge Companions to Philosophy), Cambridge University Press; 1st edition, , ISBN-10: 9780521000413
- Thomas, J., Evans, J. (September 2010). There's more to life than GDP but how can we measure it?, *Economic&Labour Market Review*, vol. 4, No 9

Social Computing for Cooperation

-

SOCIAL COMPUTING FOR COOPERATION

Konrad Klöckner

Fraunhofer Institute for Applied Information Technology FIT

Sankt Augustin, Germany

konrad.kloeckner@euromicro.org

Abstract

Social computing tries out the intersection of social behaviour and computational systems. It has to do with supporting any sort of social behaviour in or through computational systems. Thus, blogs, email, instant messaging, social network services, wikis, social bookmarking and other instances of what is often called social software illustrate ideas from social computing, but also other kinds of software applications where people interact socially. In this respect it is today's CSCW (Computer Supported Cooperative Work) environment. Social software encompasses a range of software systems that allow users to interact and share data. This computer-supported communication has become very popular with social sites like Facebook and Twitter, media sites like Flickr and YouTube as well as a range of Blogs and Wikis. Many of these applications share characteristics like open APIs, service-oriented design and the ability to upload data and media. The terms Web 2.0 and (for large-business applications) Enterprise 2.0 are also used to describe this style of software.

Keywords

Blogs, Instant Messaging, Social Network Services, Wikis, Social Bookmarking, CSCW, Web 2.0

1. Cooperation Support in a Social Environment

Social computing has become more widely known because of its relationship to a number of recent trends. These include the growing popularity of social software and Web 2.0, increased academic interest in social networks, the rise of open source. In the early 90ies the motivation for Tim Berners-Lee was to improve communications, mainly among researchers – a social Web (Berners-Lee, 2005). On his website, he writes, "I found it frustrating that in those days, there was different information on different computers, but you had to log on to different computers to get at it. ... Finding out how things worked was really difficult. Often it was just easier to go and ask people when they were having coffee" (Berners-Lee, 2005). As the Web became popular with people other than scientists, it was often used for "personal Web pages" - a very social use of the Internet. But something peculiar happened when the Web was commercialized. Because the people who built the first Web businesses were mainly the venture capitalists, consultants, and entrepreneurs of Silicon Valley, the first dot-coms were largely concerned with using the Web to improve the efficiency of existing markets for products and services like books, groceries, stocks, and software. After the Internet bubble burst in 2000, all but the most profitable of these experimental ventures vanished. Since then, Web 2.0, with its emphasis on collaboration and communication, has become overwhelmingly social - a nice return to the Web's foundations. An entire generation of young people has come of age using the Internet as its dominant medium for socializing. But although tens

of millions around the world use social networks like Facebook and MySpace, the future of the Web is obscure.

2. Social Computing

The term Web 2.0 is associated with web applications that facilitate participatory information sharing, interoperability, user-centered design, and collaboration on the World Wide Web. A Web 2.0 site allows users to interact and collaborate with each other in a social media dialogue as creators of user-generated content in a virtual community, in contrast to websites where users are limited to the passive viewing of content that was created for them. Examples of Web 2.0 include social networking sites, blogs, wikis, video sharing sites, hosted services, web applications, mashups and folksonomies (Wikipedia, 2011).

Web 2.0 websites allow users to do more than just retrieve information. By increasing what was already possible in "Web 1.0", they provide the user with more user-interface, software and storage facilities, all through their browser. This has been called "Network as platform" computing (Graham, 2005). Users can provide the data that is on a Web 2.0 site and exercise some control over that data (Hinchcliffe, 2006). These sites may have an "Architecture of participation" that encourages users to add value to the application as they use it.

Web 2.0 is the term given to describe a second generation of the World Wide Web that is focused on the ability for people to collaborate and share information online (ZDNet, 2006). Web 2.0 basically refers to the transition from static HTML Web pages to a more dynamic Web that is more organized and is based on serving Web applications to users. Other improved functionality of Web 2.0 includes open communication with an emphasis on Web-based communities of users, and more open sharing of information. Over time Web 2.0 has been used more as a marketing term than a computer-science-based term. Blogs, wikis, and Web services are all seen as components of Web 2.0. The new systems introduce powerful features for enriching the internet use:

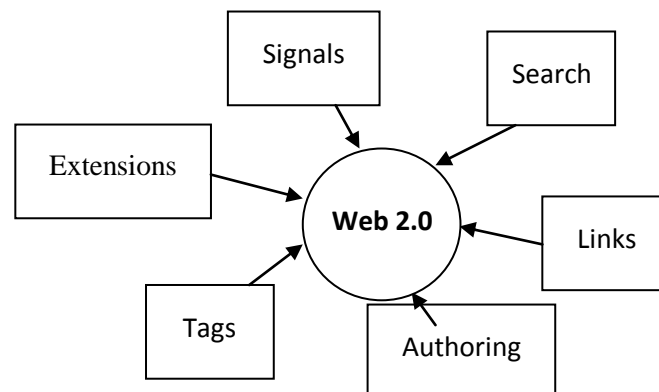


Figure 1: Web 2.0 features and techniques

An important part of Web 2.0 is the social Web, which is a fundamental shift in the way people communicate. The social web consists of a number of online tools and platforms where people share their perspectives, opinions, thoughts and experiences. Web 2.0 applications tend to interact much more with the end user. As such, the end user is not only a user of the application but also a participant by:

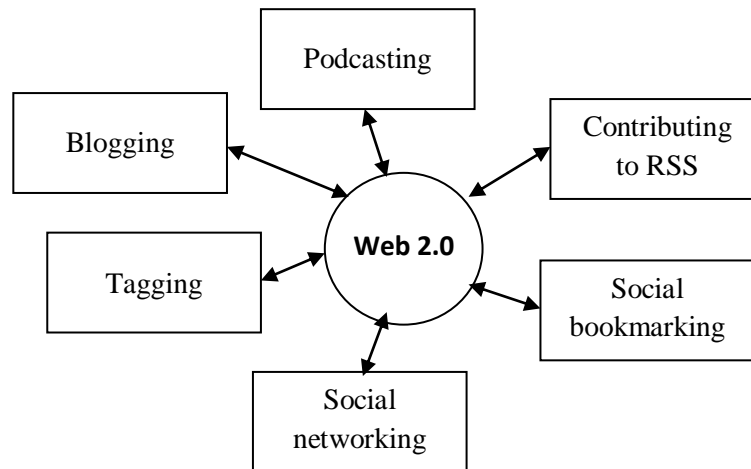


Figure 2: Web 2.0 applications

The meaning of web 2.0 is role dependent. For example, some use Web 2.0 to establish and maintain relationships through social networks, while some marketing managers use this promising technology to make companies communicate with their customers.

There is a debate over the use of Web 2.0 technologies in mainstream education. Issues under consideration include the understanding of students' different learning modes; the conflicts between ideas entrenched in informal on-line communities and educational establishments' views on the production and authentication of 'formal' knowledge; and questions about privacy, plagiarism, shared authorship and the ownership of knowledge and information produced and/or published on line (Anderson, 2007).

2.1. Business Partners and Consumers

For marketing people, Web 2.0 offers an opportunity to engage consumers. A growing number of marketers are using Web 2.0 tools to collaborate with consumers on product development, service enhancement and promotion (O'Reilly, 2005). Companies can use Web 2.0 tools to improve collaboration with both its business partners and consumers. Among other things, company employees have created wikis -web sites that allow users to add, delete and edit content - to list answers to frequently asked questions about each product, and consumers have added significant contributions (Parise, 2008). Small businesses have become more competitive by using Web 2.0 marketing strategies to compete with larger companies. As new businesses grow and develop, new technology is used to decrease the gap between businesses and customers. Social networks have become more intuitive and user friendly to provide information that is easily reached by the end user. For example, companies use Twitter to offer customers coupons and discounts for products and services.

2.2. Better Education with Web 2.0?

Web 2.0 technologies provide teachers with new ways to engage students in a meaningful way. However, Web 2.0 shows students that education is a constantly evolving entity. Whether it is participating in a class discussion, or participating in a forum discussion, the technologies available to students in a Web 2.0 classroom do increase the amount they participate (Jahnke, Koch, 2009).

Globalisation and increasing competition force enterprises to decentralize the development of products by participating international suppliers in the engineering processes. This trend is especially due to the quantity of components used up in a product and its variety.

3. New Functionality in Web 2.0

3.1. Internet Forums

Originally modelled after the real-world paradigm of electronic bulletin boards of the world before internet was born, internet forums allow users to post a "topic" for others to review. Other users can view the topic and post their own comments in a linear fashion, one after the other. Most forums are public, allowing anybody to sign up at any time.

Current successful services have combined new tools with the older newsgroup and mailing list paradigm to produce hybrids like Yahoo! Groups and Google Groups. Also as a service catches on, it tends to adopt characteristics and tools of other services that compete. Over time, for example, wiki user pages have become social portals for individual users and may be used in place of other portal applications.

3.2. Blogs

Blogs, short for web logs, are like online journals for a particular person. The owner will post a message periodically, allowing others to comment. Topics often include the owner's daily life, views on politics or a particular subject important to them. Blogs mean many things to different people, ranging from "online journal" to "easily updated personal website. Beyond being a simple homepage or an online diary, some blogs allow comments on the entries, thereby creating a discussion forum. They also have blogrolls (i.e. links to other blogs which the owner reads or admires) and indicate their social relationship to those other bloggers. Blogs engage readers and can build a virtual community around a particular person or interest (Hookway, 2008). Blogging has also become fashionable in business settings by companies who use software such as IBM Lotus Connections.

3.3. Wikis

A wiki is a web page whose content can be edited by its visitors. Examples include Wikipedia and Wiktionary. A collaborative Web site comprises the perpetual collective work of many authors. Similar to a blog in structure and logic, a wiki allows anyone to edit, delete or modify content that has been placed on the Web site using a browser interface, including the work of previous authors. In contrast, a blog, typically authored by an individual, does not allow visitors to change the original posted material, only to add comments to the original content.

3.4. Instant Messaging

An instant messaging application or client allows one to communicate with another person over a network in real time, in relative privacy. Popular, consumer-oriented clients include AOL Instant Messenger, MSN Messenger, Skype and Yahoo! Messenger. One can add friends to a contact or "buddy" list by entering the person's email address or messenger ID. If the person is online, their name will typically be listed as available for chat. Clicking on their name will activate a chat window with space to write to the other person, as well as read their reply.

Internet Relay Chat (IRC) and other online chat technologies allow users to join chat rooms and communicate with many people at once, publicly. Users may join a pre-existing chat room or create a new one about any topic. Once inside, you may type messages that everyone else in the room can read, as well as respond to messages from others. Often there is a steady stream of people entering and leaving. Whether you are in another person's chat room or one you've created yourself, you are

generally free to invite others online to join you in that room. Instant messaging facilitates both one-to-one and many-to-many interaction.

3.5. Social Network Services

Social network services allow people to come together online around shared interests, hobbies or causes. For example, some sites provide meeting organization facilities for people who practice the same sports. Other services enable business networking like XING, Facebook and LinkedIn. Some large wikis have effectively become social network services by encouraging user pages and portals.

3.6. Social Bookmarking

In a social bookmarking system, users save links to web pages that they want to remember and share. These bookmarks are usually public, and can be saved privately, shared only with specified people or groups, shared only inside certain networks, or another combination of public and private domains. The allowed people can usually view these bookmarks chronologically, by category or tags, or via a search engine.

Most social bookmark services encourage users to organize their bookmarks with informal tags instead of the traditional browser-based system of folders, although some services feature categories/folders or a combination of folders and tags. They also enable viewing bookmarks associated with a chosen tag, and include information about the number of users who have bookmarked them.

Many social bookmarking services provide web feeds for their lists of bookmarks, including lists organized by tags. This allows subscribers to become aware of new bookmarks as they are saved, shared, and tagged by other users. As these services have matured and grown more popular, they have added extra features such as ratings and comments on bookmarks, the ability to import and export bookmarks from browsers, emailing of bookmarks, web annotation, and groups or other social network features.

3.7. Some critical Remarks

Critics of the term claim that "Web 2.0" does not represent a new version of the World Wide Web at all, but merely continues to use so-called "Web 1.0" technologies and concepts. First, techniques such as AJAX do not replace underlying protocols like HTTP, but add an additional layer of abstraction on top of them. Second, many of the ideas of Web 2.0 had already been featured in implementations on networked systems well before the term "Web 2.0" emerged (Best, 2006). Previous developments also came from research in computer-supported collaborative learning and computer supported cooperative work (CSCW) and from established products like Lotus Notes and Lotus Domino that preceded Web 2.0.

4. Web 3.0

Definitions of Web 3.0 vary greatly. Some (Agarwal, 2009) believe its most important features are the Semantic Web and personalization. Focusing on the computer elements, Web 3.0 is where "the computer is generating new information", rather than humans. Web 3.0 is the return of experts and authorities to the Web. Web 3.0 is emerging from new and innovative Web 2.0 services with a profitable business model (Hempel, 2009). Web 3.0's early geo-social (Foursquare, etc.) and

augmented reality webs are an extension of Web 2.0's participatory technologies and social networks (Facebook, etc.) into 3D space.

According to some Internet experts Web 3.0 will allow the user to sit back and let the Internet do all of the work for them. Rather than having search engines gear towards your keywords, the search engines will gear towards the user. Keywords will be searched based on your culture, region, and jargon. For example, when going on a vacation you have to do separate searches for your airline ticket, your hotel reservations, and your car rental. With Web 3.0 you will be able to do all of this in one simple search. The search engine will present the results in a comparative and easily navigated way to the user.

Today with Web 2.0, especially with social networking sites like Facebook, MySpace, Twitter, Flickr, Blogs, Wikipedia, the face of web has changed completely. It has evolved to its current form in around a decade's time. It has become more collaborative. Sharing content, movies, pictures has become so easy that any common man who is not aware of underlying technology can share his views, broadcast the message to all his friends in one go, upload and share pictures/videos very easily. Internet is now accessible through cell phone too, which keeps people connected all the time.

In the very early days internet was just linking of machines (PCs). It has rapidly changed to linking of pages and making the same information accessible from mobile phones and other such devices. Same information is now available in different formats like text as well as audio and conversion happens on the go, as per the need.

5. Conclusions

The concept of Web-as-participation-platform captures many characteristics. Web 2.0 is the "participatory Web" and regards the Web-as-information-source as Web 1.0. The Web 2.0 offers all users the same freedom to contribute. While this opens the possibility for rational debate and collaboration, it also opens the possibility for "spamming" by less rational users. The impossibility of excluding group members who don't contribute to the provision of goods from sharing profits gives rise to the possibility that rational members will prefer to withhold their contribution of effort and free ride on the contribution of others. This requires what is sometimes called radical trust by the management of the website. The characteristics of Web 2.0 are: rich user experience, user participation, dynamic content, metadata, web standards and scalability. Further characteristics, such as openness, freedom and collective intelligence by way of user participation, can also be viewed as essential attributes of Web 2.0.

As such, Web 2.0 draws together the capabilities of client- and server-side software, content syndication and the use of network protocols. Standards-oriented web browsers may use plug-ins and software extensions to handle the content and the user interactions. Web 2.0 sites provide users with information storage, creation, and dissemination capabilities that were not possible in the environment now known as "Web 1.0".

The future of the Web is very fascinating but also scary. Technically it would mean linking of data in the page and not just the page. This is what is called as semantic web. Any word that appears the Web will know what it means. And it would be linking things related to that particular word together.

6. References

- Agarwal, Amit (2009). Web 3.0 concepts explained in plain English. Labnol.org
- Anderson, Paul (2007). What is Web 2.0? Ideas, technologies and implications for education. JISC Technology and Standards Watch.
- Berners-Lee, Tim (2005). Berners-Lee on the read/write web. BBC News. 2005-08-09, retrieved 2011-07-02.
- Berners-Lee, Tim (2007). DeveloperWorks Interviews: Tim Berners-Lee. DeveloperWorks 2006-07-22, retrieved 2007-07-02.
- Best, D. (2006). Web 2.0 Next Big Thing or Next Big Internet Bubble? Lecture Web Information Systems. Technische Universiteit Eindhoven.
- Graham, Paul (2005). Web 2.0". paulgraham.com , retrieved 2011-07-02.
- Hempel, Jessi (2009). Web 2.0 is so over. Welcome to Web 3.0. CNN Money. CNN.com .
- Hinchcliffe, Dion (2006). The State of Web 2.0. Web Services Journal , retrieved 2011-07-01.
- Hookway, N. (2008). Entering the blogosphere – some strategies for using blogs in social research. In Qualitative Research, Bd. 8, Heft 1, pp. 91-114.
- Jahnke, I. & Koch, M. (2009). Web 2.0 goes Academia: Does Web 2.0 make a difference? Int. Journal of Web based Communities, Volume 5, Number 4, pp. 484 – 500.
- O'Reilly, T. (2005). What is Web 2.0. Design Patterns and Business Models for the Next Generation of Software, 30, p.2005.
- Parise, Salvatore (2008). The Secrets of Marketing in a Web 2.0 World. The Wall Street Journal.
- Rusak, Sergey (2009). Web 2.0 Becoming An Outdated Term. Boston, Massachusetts, U.S.A.: Progressive Advertiser.
- Wikipedia (2011). Social Computing, retrieved 2011-07-05.
- ZDNet (2006). Web 2.0 definition updated and Enterprise 2.0 emerges. ZDNet.

MANAGEMENT BY OBJECTIVES-BASED GROUPWARE: REQUIREMENTS FOR EFFICIENT AND EFFECTIVE ACHIEVEMENT OF OBJECTIVES

Sam Tschernitz

Robert Bosch Group
sam.tschernitz@at.bosch.com

Tom Gross

Human-Computer Interaction Group
University of Bamberg, Germany
tom.gross@uni-bamberg.de

Abstract

This paper is concerned with the challenges arising from the development of a groupware requirement specification for effective and efficient achievement of operative and strategic objectives in mass production industry. To analyze the process by which objectives are achieved, a systematical investigation using document analysis, participant observation, interviews and context scenario analysis was undertaken at a large manufacturing location with over 6 000 coworkers of a multinational automobile supplying company. The results of this in-depth analysis of objective achievement were utilized to develop a detailed requirement specification for a management by objectives groupware for use in mass production industry.

Keywords

Cooperation, CSCW, Management by Objectives

1. Introduction

Leading with targets, better known as “Management by Objectives” (Drucker, 1954), is the top approach used in decentralized commercial enterprises to systematically control the individual organizations (Malik, 2009, p. 174). Multiple empirical studies have already proven that the setting of goals positively affects work performance (Locke, Shaw, Saari, Latham, 1981). Nevertheless, practical experience shows that the setting of objectives itself does not necessarily lead to the achievement of the desired objectives and as a consequence the desired business results. This disparity may be due to the reasons that the achievement of objectives is a time-, work-, and resource-intensive process for all responsible persons (Malik 2009, p. 174ff). Two circumstances are regularly associated with the achievement of objectives. Firstly, a status report analyzing the current state of goal achievement through performance indicators that compare the as-is status with the to-be status (desired result) and secondly, the entire process to reach a defined goal. This process starts after an objective is determined and can be divided into 4 simplified phases (1.) definition of measures, including due date and the person responsible, (2.) implementation of

measures, (3.) performance measurement of the measures and (4.) determination of the effectiveness and achievement of objectives. Effective achievement of objectives thereby requires the definition of measures that are favorable for the achievement of objectives, while the efficient achievement of objectives entails that these measures are implemented with minimum input of time and money.

Communication and information technology in general and Computer Supported Cooperative Work (CSCW) in particular have already shown its ability to increase effectiveness and efficiency of work processes. CSCW is thereby concerned with the technical support of group work (Gross and Traunmueller, 1996). The goal is to develop better technical support for group work by the analysis of working conditions and job requirements. Unlike traditional software (which is seen as being truly functional as soon as it runs technically error-free), a CSCW application (further addressed as GROUPWARE) is only truly functional if it also is compatible with the working conditions of the group of users (Beaudouin-Lafon, 1999, p. xii). This is an important difference compared to the development of software, as the development of groupware has to be adapted to what is technically feasible as well as to the context of the group of users and its use context. The strength of CSCW stems from an interdisciplinary research approach that allows the visualization of different strategic, organizational and technical components of a process as a holistic, computer-supported group task. By this it combines findings from computer science, sociology, psychology and economic science in order to develop new, more effective and more efficient tools and methods for the accomplishment of group tasks.

The following chapters will present the collection and analysis (including user participation) of use contexts and their context scenarios (operative processes) as well as the requirement specifications for the developers of groupware to improve the achievement of group objectives.

2. Methods

The focus of this study was to acquire deeper knowledge of social structures and processes in mass production industry in context of the implementation of strategic and operative objectives. This was reached by the qualitative research methods observation, questioning/interview as well as by the analysis of documents and process-generated data.

As study object a large manufacturing site (6 000 coworkers) in Jihlava (Czech Republic) of a multinational company (Bosch, 300 000 coworkers) was available. A manufacturing site is particularly well suitable for the present analysis as it has to fulfill the whole policy deployment process (from enterprise vision to operational manufacturing processes and individual tasks) in the context of the achievement of objectives. Due to the high degree of standardization within the organization and of its processes as well as the standardized software packages implemented in the mass production industry the findings are transferable also to other locations. This was examined by later interviews with employees from other locations and confirmed by prototypic location-spreading implementation of the groupware. The researcher accomplished the observations, interviews, document and data analyses during his activity as an assistant of the plant management of the examined site during a three-year period. To assess the current state, 54 standardized interviews were conducted with responsible persons from all hierarchical levels (4x top management, 10x enabler group, 40x implementation group). Additional 5 standardized interviews were conducted for the analysis of the context scenarios. Furthermore the researcher had in the context of the document analysis entrance to all internal documents and databases as well as process-generated data from the IT-department.

3. Analysis of the Use Context

According to Rosson and Carroll (2002, p. 16ff) the use context of a product is determined by the users, their tasks of work, the relevant media as well as the physical, organizational and socio-technological environment. To objectively specify the use context, individual user groups were identified and the present state assessed according to Jokela (2002, p. 28). The data obtained were used to first define and then evaluate appropriate use context scenarios. These results formed the basis for the development of the requirements specification from the user's viewpoint (DATE, 2009, p. 20).

3.1. User Groups and their Characteristics

At the time of identification of user groups the selected production site had over 6 000 employees. Of these, 2 743 employees had access to a computer and were hence selected as potential users of the groupware in accordance with the plant management. For further characterization, users were classified into three groups according to their work organization class (cf. Table 1):

Group	Work organization class	Users per group
Steering group	Plant and operations managers	12
Enabler group	Department heads	50
Implementation group	Masters, group and team leaders, employees	2 681

Table 1: Work Organization Classification

3.1.1. Work Objectives and Work Equipment and Current User-Software

Work objectives to be completed and labor resources available for the achievement of objectives were determined for each users group by analyzing work profiles and standardized equipment lists and by conducting interviews (cf. Table 2). The following table gives a summary of work tasks for each user group:

Group	Work Objectives
Steering group	Defining main objectives, establishing an operation framework for the achievement of objectives at the aggregate level and supporting work through the setting and control of key performance indicators.
Enabler group	Deriving from main objectives sub-objectives and measures for operational implementation. Delegating and controlling the implementation and sub-goal. Supporting and tracking achievement of objectives at implementation level. Communicating goal achievement.
Implementation group	Implementation of objectives and measures - alone or in a team, documentation and communication of achievements to the enablers and steering group.

Table 2: Work Objectives of User Groups

Due to standardization the following equipment was available to all user groups: office workplace (desk, chair and office cubicle), a computer with standard software (Microsoft Windows and MS Office) and access to inter- and intranet, printers and scanners. Projectors and white boards (with from board printer function) were available in the office or shared meeting rooms.

SAP and Hyperion are introduced group-wide. This allows monitoring, documentation and visualization of the most important top-level business figures from the group's perspective. For

operational processes of goal achievement regularly no standard software and no template (e.g. for Excel) is defined. Exceptions are made for pre-defined work processes where all steps of goal achievement could be precisely defined in advance (e.g., customer complaint process with an Excel checklist). Details of the goal achievement are communicated by e-mail, orally (e.g. meetings) and through department notice boards by current printouts. Key figures for the analysis of goal achievement are primarily indicators for measuring the results. These are found depending on the objectives to local Excel, Word, Access files, Oracle, SAP and other IT solutions and manually kept in paper lists. Access to this information is frequently not possible for all members of the target groups. Visualisation, in order to recognise the goal achievement faster is not implemented by default and must be implemented afterwards by additional work. A following up of measures to achieve these goals is found in locally maintained OPL's (Open points list), to-do lists, Mile Stone plans, project solution sheets and other free-form MS Office documents. For asynchronous communication, the e-mail program Microsoft Outlook is used. Shared network drives offer the ability to view and edit documents together (asynchronous). Furthermore some users use NetMeeting and Interwise in telephone conferences as groupware for synchronous shared use of screen surfaces.

3.1.2. Physical and Work Organizational Environment

In order to evaluate how much time users have available to work at their computer, data on office time and computer working time were collected using on-site observation and interviews (cf. Table 3).

Group	Physical and work organizational environment
Steering group	Office time is very limited (30-50% of working time). People are on business trips (domestic and foreign) and at meetings in other departments and production areas on a regular basis.
Enabler group	Office time is limited (40-80% of working time). People are on business trips (domestic and foreign) and at meetings on a regular basis.
Implementation group	Office working hours for white collar employees and team leaders comprise 75-100%, for group leaders 40-80% and foremen 30-40% of total working time.

Table 3: Physical and Work Organizational Environment

3.1.3. Technical Competence of the Users

Information on this aspect was collected on spot by interviewing the prospective user. Goal was to determine what technical components could be used in the collaboration system so that users may work with the features of the groupware applicable to them quickly and intuitively and without further training (cf. Table IV).

Users work reliable (edit, create, format and save documents) with standard software (Microsoft Excel, Word, PowerPoint, Internet Explorer, documents and folder management). Deep knowledge of Excel (use of complex formulas, pivot and conditional formatting, hyperlinks) is not routinely available in the steering group is available to a limited extent (10% of users) in the enabler group and implementation group (20% of users). Working with databases and special software is only possible on a very limited basis and only to fulfill special predefined tasks (e.g. e-Works purchase orders, approval processes).

3.2. As-is Work Support for the Achievement of Objectives

Objective of this as-is analysis was to obtain an overview of both the software and its current use as well as from the as-is execution of currently running projects and work processes. The instruments applied were document analysis, interviews with representatives of the user organization and analysis of the current software used. The results of the as-is analysis formed the basis for establishing context scenarios and developing use concepts for a groupware from the perspective of the user.

3.2.1. Process Flow and Quality Criteria for the Achievement of Objectives

As the quality management system (ISO certification) and process standardization provided valid and documented instructions, document analysis was carried out to determine the to-be process flow and determine quality criteria for the achievement of objectives. Materials available included flyers, leaflets, illustrations, multi-page brochures, management manuals, internal research reports, online information platforms, internal company documents from online collaboration rooms, and corporate intranet sites. As an example the English translation of a passage taken from the brochure “Zielentfaltung bei Bosch” (in English: Policy Deployment at Bosch”) is given below:

"The main task in target implementation is to plan and organize activities. Thereby is to decide in which way and by which means the achievement of objectives is sought. Consistent action is imperative for the successful achievement of objectives. Thereby is important that the employees get transferred both the responsibility for the achieving the objectives as well as the necessary decision freedoms (Keywords: delegation, empowerment)".

Based on this document analysis a theoretical to-be flow of the goal achievement process was mapped from the company's perspective. Goal achievement is seen as part of an 11-step policy deployment process. As soon as the process of goal determination for the principal objectives is completed, the process of achieving the objectives begins. The goal achievement process itself is thereby divided into the sub-processes objective processing, target tracking, visualization and management review. A generally valid and standardized process flow for the systematic implementation of operational objectives, objective processing, target tracking, visualization and management review was not specified. Furthermore, as part of the document analysis, quality criteria for evaluating the quality of objective processing, target tracking, visualization and management review were established.

- (1.) (Sub-) goals are ambitious.
- (2.) The goal is formulated understandable, influenced, accessible, and provide motivation for the employees.
- (3.) Objectives are measurable and relevant referred on the overall objectives.
- (4.) Objective achievement and monitoring is done consistently, by systematically comparing as-is status and to-be status of achievement of objective and by taking appropriate measures to achieve the desired to-be value.
- (5.) Relevant information and data for communication and performance monitoring of the organizational unit are displayed in well accessible location within the organizational unit visually appealing and timely.
- (6.) Managers regularly seek information on the status and progress of goal achievement.
- (7.) If agreed targets due to serious changes are not objectively achievable, goal adjustments are made.

3.2.2. Current user requirements

To accommodate the needs of different users for an objective achievement groupware, based on a standardized interview guide conversations were held. There were a total of 54 interviews conducted (4x from steering group, enabler group 10x, 40x implementation group). Hereinafter the user requirements for a groupware are summarized for each group.

Steering group: (1.) Clear presentation of goal achievement, visualization at a glance, (2.) standardized and up-to-date representation of goal achievement of the main objectives, (3.) drill down option: Ability to access sub-goals, measures and responsibilities, (4.) easy access to the goal achievement information (5.) regulated access to confidential information, (6.) "Nothing new" in terms of software, hardware, methods and (7.) no additional costs for hardware and software.

Enabler group: (1.) Uniform standard systematic for deduction of sub-goals from main goals, distribution of responsibilities, objectives and goal achievement, documentation of responsibilities, objectives and achievement of objectives, (2.) communication of responsibilities, objectives and achievement of objectives and (3.) reduction of reporting effort.

Implementation group: (1.) Reduce the administrative burdens for documentation, communications and preparation of reports and (2.) usage of already known software.

3.3. Survey and Analysis of Context Scenarios of Achievement of Objectives

The analysis of context scenarios for the achievement of objectives helps to understand needs in the use context of these group tasks and by this to derive requirements for the groupware. In order to meet the different facets of achievement of objectives, these five, in terms of tasks, activities and context entirely different context scenarios were selected:

- (1.) Achievement of day to day business objectives by the example of quality control and quality improvement of suppliers
- (2.) Achievement of globally distributed objectives by the example a rationalization project in the international production network
- (3.) Achievement of objectives for implementation projects by the example of the EFQM implementation
- (4.) Achievement of headquarter objectives by the example of employee qualification project

Achievement of strategic objectives by the example of the policy deployment process.

- (5.) After the context scenarios were recorded and analyzed, the requirements specification to create a groupware was made. This is described in the next chapter.

4. Requirement Specification

The requirement specification identifies objectives, usage, operating conditions, features, data, and performance and quality criteria of a given groupware.

4.1. Groupware Objective

In both the as-is analysis and the context scenario interviews potential users reported that communication and coordination required a high amount of work, especially with relevance to understanding, discussing, working out the details of, and accurately setting goals, sub-goals and

expected results (cause-effect chains). Equally high amounts of work were also required for the reporting of achievement of objectives. From the standpoint of the process participants, groupware should therefore aim at reducing the amount of work required for communication, coordination and reporting, or, preferably, to automate and simplify some of these activities.

4.2. Groupware Usage

In order to implement one standardized process for communication, coordination and reporting of achievement of objectives within an organization, the groupware developed should be applicable to both commercial and engineering objectives as well as sub-objectives. This will ultimately reduce the workload required for report customization, performance indicator conversation and discussions and coordination within the group.

Groupware scope: Depending on the objectives the groupware shall be able to support persons, teams, departments and sites on a local level, as well as whole production networks, distributing sites and teams on a global level in their achievement of objectives. The external use (e.g. objectives to be pursued together with a customer or supplier) is not intended may be developed if required.

Groupware target group: The groupware target group comprises all people within the organization involved in the process of objective achievement with access to a computer and the local area network (NT user ID).

4.3. Groupware Features

The different product features required of a groupware were derived from the analysis of context scenarios and hence can be used as a basis to develop mandatory technical specifications.

Functionality for standard user

The standard user can use the groupware as soon as he obtains the appropriate user rights from the groupware administrator (see administrator functions).

The standard function consists of:

- F10 Documentation of plan, measures, as-is status and responsible individuals to accomplish a specific objective or sub-objective
- F20 Automatic graphical presentation of performance indicators for achievement of objectives (includes historical values, benchmarks, plans and forecasts in relation to as-is status)
- F30 Automatic transfer and calculation of objectives achievement level from other data sources
- F40 Creation of links to other data sources
- F50 Standardized input function for nonstop documentation of achievement of objectives (see general input functions)

Input functions for the achievement of objectives are:

(* indicates support of automated input through other data sources)

- EF010 entering the objective (name)
- EF020 input of person in charge for main objective (name and department)

- EF030 input of document owner (name and department)
- EF040 input of objective description
- EF050 entering the date of the last update of the document
- EF060 input of last year's degree of objectives achievement
- EF070 input of plan value (BP) for this year's degree of objective achievement (BP= business plan)
- EF080 input of the as-is status for objective achievement (YTD = Year to Date) *
- EF090 input of current forecast for objective achievement (CF = Current Forecast) *
- EF100 inputs of traffic light coding for the objective achievement (green, yellow, red)
- EF110 input of sub-goals of operative measures to achieve objectives
- EF120 input of responsible for measures or sub-goals to achieve objectives (acronym)
- EF130 input of measuring unit for achievement of objectives (number)
- EF140 input of planned values for the achievement of sub-objectives (BP)
- EF150 input of as-is sub-goal-achievement degree (YTD)
- EF160 input of forecasted degree of sub-goal achievement (CF) *
- EF170 input of degree of achievement of objectives of past four years
- EF180 input of plan values of past four years
- EF190 input of benchmarking values of past four years
- EF200 input of cycles (e.g. monthly) for the intermediate measure of achievement of objectives degree
- EF210 input of planned intermediate achievement of objectives degree
- EF220 input of actual intermediate achievement of objectives degree
- EF230 input of forecasted intermediate achievement of objectives degree
- EF240 input symbols for the planned start of measures (white triangle with the top up)
- EF250 input symbols for executed start of measures (black triangle with the top up)
- EF260 input symbols for planned end of measures (white triangle with the top down)
- EF270 input symbols for executed end of measures (black triangle with the top down)
- EF280 input symbols for planned milestone (white star)
- EF290 input symbols for reached milestone (black star)
- EF300 input of the due date calendar day for measures and sub-goals to be performed
- EF310 input of traffic light coding for objective achievement degree of measures and sub-goals (green, yellow, red) *

Functionality for administrator

System Administration:

- AF10 Network administration for the intranet and network drives
- AF20 Ensure backup function for the data on the network drive
- Groupware Administration:
- AF30 Securing access for work environment through pre-defined allocation of access rights for specific user groups or through individual allocation of access rights to specific users
- AF40 Management of folders and document structure
- AF50 Metadata definition and input
 - EF320 K-Nr. (only Administrator)
 - EF330 Strategic ordinal number (only Administrator)
 - EF330 Hierarchical ordinal number (only Administrator)
 - EF340 Top and bottom-line Input (only Administrator)
- AF60 User contact person for technical and textual questions about groupware usage

4.4. Groupware Data

Persistent groupware data:

- Objective (name)
- Responsible for overall objective (name and department)
- Document responsible (name and department)
- Objective description
- Manually inputted date for the last update of document
- Last year's degree of objectives achievement
- Plan value for the degree of this year's objectives achievement (BP = Business Plan)
- Actual degree of achievement of objectives (YTD = Year to Date)
- Forecasted achievement of objectives degree (CF = Current Forecast)
- Traffic light coding for the objective achievement degree (green, yellow, red)
- Measures or sub-goals to achieve objectives
- In charge for measures or sub-goals to achieve objectives (department acronym)
- Measurement units for achievement of objectives (code, e.g. Euro)
- Plan value for sub-goals achievement of objectives (BP)
- Actual degree of achievement of objectives (YTD)
- Forecast of achievement of objectives degree (CF)
- Degree of achievement of objectives of past four years
- Planed values of last four years

- Benchmarking values of the past four years
- Cycles for the intermediate outcome measures of degree of objectives achievement
- Planned intermediate values of objectives achievement
- Actual interim results of objectives achievement
- Intermediate results of forecasted degree of achievement of objectives
- Position of the symbols for planned start in the time frame
- Position of the symbols for executed start in the time frame
- Position of the symbols in the time frame for planned end
- Position of the symbols in the time frame for the executed end
- Position of the symbols in the time frame for the planned milestone
- Position of the symbols in the time frame for the reached milestone
- Due day calendar date of measures and sub-goals in the time frame
- Traffic light coding for objective achievement of measures and sub-goals (green, yellow, red)

Groupware metadata:

- K-Nr.
- Strategic ordinal number
- Hierarchical ordinal number
- Top- and bottom-line data
- Last Saved By: (User ID)
- Last saved on: (date)

4.5. Groupware operating conditions

The groupware shall be designed to run using the standard computer and network configurations, without requiring additional software, hardware, databases, administration, licenses and special training for groupware users. To fulfill these conditions the groupware was designed to run within the following framework:

Software: Operating system Windows 2000 and above, Microsoft Excel spreadsheet program, SAP Business Warehouse Client (optional)

Hardware: Computer hardware that can handle the defined software requirements and that can be attached to a network

Orgware: Network with network hard drives, backup software for documents on the network hard drive, SAP Business Warehouse

4.6. Groupware Performance

The product features should implicitly support the following demands:

- (1.) Support employees in thinking and acting in feedback loops.
- (2.) Support employees' understanding of cause-effect chains and relationships between objectives.
- (3.) Support employees' understanding of process interdependencies across departments.
- (4.) Support employees in implementing a new objective achievement process quickly, fast and flexibly but in a systematical fashion.
- (5.) Support employees in ensuring the transparency of individual responsibilities within a measurement package with many responsibilities.
- (6.) Support employees in presenting the visualization of planned/achieved milestones, start and end times.
- (7.) Support employees in easily presenting a monthly graph of the performance changes in quantitative measurement of the achievement of objectives.
- (8.) Support employees in integrating data from external data sources (in particular regularly manually updated spreadsheets with figures) in their reporting and avoiding duplication of efforts.
- (9.) Support employees in automated updating of data in the reporting system.
- (10.) Support employees in presenting and visualizing the reporting for senior management in a transparent and clear form (performance monitoring).
- (11.) Support employees in creating a link to directly related objectives and to systematically track the objective achievement process throughout the cause-effect chain on the computer.
- (12.) Support employees with a drill down function from the main objective to sub-objectives and to the operational activities (measures), including the relevant data for each main and sub-goal.

4.7. Implementation

The groupware was technically realized to run on the standard computer configuration and in coordination with the IT department of the organization. In addition to the development of a prototype, the main goal of this research was to determine whether and how a standardized achievement of objectives process with standardized rules and procedures would make the achievement of objectives more efficient and more effective.

5. Conclusion

The keys to success in the context of the achievement of objectives are determined by the human input. A groupware that supports groups to make documentation of required data easier, less time consuming and fail-safe, and, at the same time, functions as an information platform for the whole organization is helpful. In this capacity it provides necessary data such as measures, responsibilities, time tables and performance indicators in a transparent, standardized and understandable form and so reduces the reporting effort. Furthermore, a groupware has to fulfill its functions without being too technically and operationally demanding. The requirements of a groupware determined within this study may therefore form the basis for the development of a groupware, specifically tailored to the needs of an achievement by objectives-run organization in mass production industry.

6. References

- Beaudouin-Lafon, M. (Ed.) (1999): Computer Supported Cooperative Work, John Wiley & Sons, Université Paris-Sud 1999
- DATEch - Deutsche Akkreditierungsstelle Technik in der TGA GmbH (Hrsg.) (2009). Leitfaden Usability, Version 1.2, Frankfurt/Main, <http://www.datech.de/share/files/Leitfaden-Usability.pdf>, Abgerufen: 2009-05-10
- Druker, P. F. (1954). The Practice of Management, Harper & Row, New York 1954
- Gross, T. and Traunmueller, R. (1996) Methodological Considerations on the Design of Computer-Supported Cooperative Work. *Cybernetics and Systems: An International Journal* 27, 3 (May/June 1996). pp. 279-303.
- Jokela, T. (2002). Assessment of User-Centred Design Processes – Lessons Learnt and Conclusions. In: Proc. Intl. Conf. PROFES – Product Focused Software Process Improvement, Springer, Rovaniemi 2002
- Locke E. A., Shaw K. N., Saari L. M., Latham G. P. (1981). Goal setting and task performance: 1969-1980. *Psychological Bulletin*, Vol. 90, No. 1. (1981), pp. 125-152.
- Malik, F. (2009). Managing Performing Living: Effective Management for a New Era. Campus Verlag, St. Gallen 2009
- Rosson, M. B.; Carroll, J. M. (2002): Usability Engineering: Scenario-Based Development of Human-Computer Interaction. San Francisco: Morgan Kaufmann, 1-55860-712-9.

SHARING DATA AND INFORMATION THROUGH DIGITAL PORTFOLIO

Martin Pochyla

Department of Applied Informatics

Faculty of Economics

VŠB-TU Ostrava

martin.pochyla@vsb.cz

Abstract

Creating portfolio has been a natural activity for years. Digital world due to its scope and services brings a new dimension to creating and sharing portfolios. In this paper the function, composition and rules for creating digital portfolio are described. Further we introduce basic trends of Web 2.0, which has the major impact on existence of multimedia portfolio on the internet and its rapid development. We also mention VŠB-TU Ostrava development projects that are focused on building digital portfolios and users training for their individual creation and administration.

Keywords

Web 2.0, Digital Personal Portfolio, Tag, Hyperlink, Team Work, Wiki, Blog, Interactive Content, Social Networks, Collaborative Environment, Business

1. Introduction

It has always been a natural human need to gather achieved experience, knowledge and memories. Everybody has its own portfolio which he builds and expands either knowingly or not. Likely we will not call it a portfolio. It might be e.g. photo album, collection of postcards, diary, memorial or a shoebox with a collection of interesting artefacts from travels. Nowadays the term portfolio is associated usually with portfolio of a company or a field of competence of a particular company. We may come across a corporate portfolio, a portfolio of services, a school portfolio etc., which usually tell us what services a particular company offers, what services we can order, or what educational programs there are for students.

In this paper we understand a digital portfolio as a summary of all available information about a person, project or activity. In contrast with standard static portfolio we consider digital portfolio a functional unit offering additional services, such as ability to provide an adequate protection of our data and possibility of sharing or setting user's rights. Further on in this paper we will use a shorter term – digifolio.

This new form and dimension of digital portfolio is possible mainly due to the development of internet technologies known as Web 2.0. Crucial revolution from the perspective of digifolio was represented by year 2004 when a term Web 2.0 was used by Tim O'Reilly. The principal of this revolutionary change of web is particularly the interactivity. A general user does not have to know any programming languages or communication protocols and still he can fully use all applications and services on the Internet (Ambrož, 2010).

From the beginning Web 2.0 is characterized as advancement from centralized service treatment towards decentralization. For instance we can name “Akamai” and “Bit torrent”, “encyclopaedia Britannica” and “Wikipedia”, personal sites and blogs or other peer to peer systems.

Another definition says that WEB 2.0 is a transformation from a document web to a data web, into the platform of data sharing, where the user screens data from different sources (Bednář, 2010). As we can see on Figure 1 below, the basic principle of WEB 2.0 is a mutual sharing and creation of multimedia contents on the Internet by the users themselves. We can see combination of today's conventional technology together with rapid development of online applications. I believe that in the near future will focus on Software as a Service and Personal Learning Environment.

Web 2.0 is guided by the fundamental design patterns that define the basic business rules and emerging services and applications. Among these design patterns especially:

- many small sources (long tail),
- users add value,
- ownership of data, or unique content is the key to success,
- aggregation of data about users behaviours,
- release of rights to documents (Creative Commons),
- constantly evolving web services,
- cooperation instead of centralized management,
- software for many different end devices or platforms.

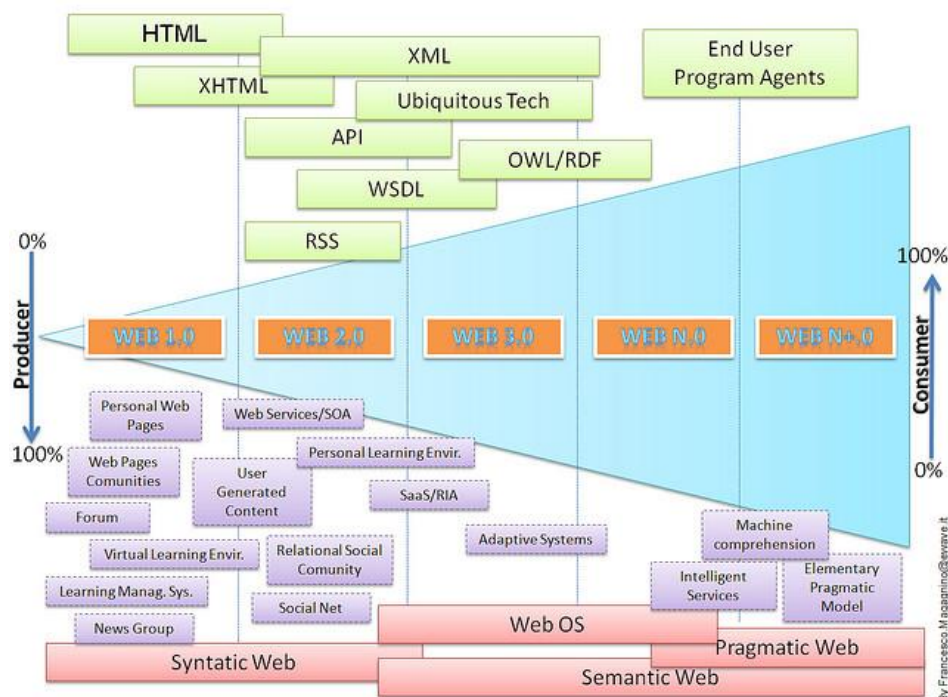


Figure 1:- From Web 1.0 to Web N - Source: (Magagnino, 2010)

Web 2.0 technologies include a range of Internet-based tools. Web 2.0 technologies allow businesses and users to create, customize and organize content on the web, rather than just consuming the existing content. As (Koeppel, 2011) describes some of these technologies are

among others blogs, podcasting, tags, social networking, RSS, instant messaging, wikis, AJAX and online and interactive video. Let me briefly describe the most important technologies and approaches.

Tags and Tagging – A tag allows you to easily find information from different places on the Internet, whenever you need it. Tagging enables web users to organize online information from many sources, such as websites, links, images, etc.

RSS or Twitter – also known as content syndication. RSS (Really Simple Syndication) feeds allow organization to send news and information to their customers. It also allows users to get updated information related to their needs and field of interest.

Podcasting and Webcasting – A podcast, to put it simply, is no different than a webcast, a show that is broadcast over the web and is broken up into parts or episodes. Most podcasts are similar to news radio programs and deliver information on a regular basis.

Blogs and Wikis – The user is a contributor and creator of a content. Wikis are websites that can be easily edited and updated by the users. They provide a great forum for people within and outside one organization to collaborate in. This can also create problems for users, since competitors, customers or anyone on the Internet can abuse or alter information on wikis.

Online and Interactive Video – Many users may not have the resources to run an advertising campaign on television. However, it will not cost them anything to post their video clip on website. If they want to share a clever or intriguing commercial or video, they also might consider posting it for free on YouTube or Google Video, which are sites that are visited by millions of people every day.

2. Digital portfolio rules

A well created digital portfolio should make our work less demanding. Naturally there is some input at the beginning, but in long term we consider it a useful tool, not a difficulty. Being so, it is necessary for us to feel confident and safe with it. Portfolio, in which we are afraid to create or save something, is just waste of time. The most common doubts arise from language barrier, fear from doing something wrong without possibility to change it and from fear from safety of our private details and information.

Therefore we should observe these several basic rules when establishing digital portfolio:

1. Portfolio should speak the user language – this rule may sound quite funny but four years ago it caused serious problems. Most applications which nowadays use the Czech language were only in English (Google Apps, Facebook...) or didn't exist at all.
2. Portfolio is free - the user should not be worried of losing his portfolio in case of financial problems in future. The amount of free tools is huge. Nevertheless it is necessary to have sufficient information and knowledge about their quality and usability.
3. Portfolio is independent – independent of company for which the user works and independent of financial options of the user. If portfolio was somehow under the administration of the company we are working for, we could be never sure that the data belong just to us. The problem inevitably arises with the termination of employment. All our work would be lost and we would have to start from the beginning.
4. Portfolio is under the user control – many applications involved in portfolio have some preset structure and defines the conditions for editing and accustoming. To feel free when

creating a portfolio there has to be the possibility for adjusting it as we want regardless other side's conditions. Of course according to the valid laws.

With the current approach to digital portfolios, the digital archive and the presentation tools are most often combined in a single system. However, learning is lifelong and life wide. There is a need to separate the needs of the individual users and the institution as you can see on Figure 2.

The digital portfolio belongs to the learner, and should be under the control of the users throughout their life. Each artifact should have a unique identifier, so that a learner can access their work for use in a variety of contexts. This digital archive should have the capacity for meta-tags, searching by keywords, date created, date changed, etc. (Barrett, 2009)

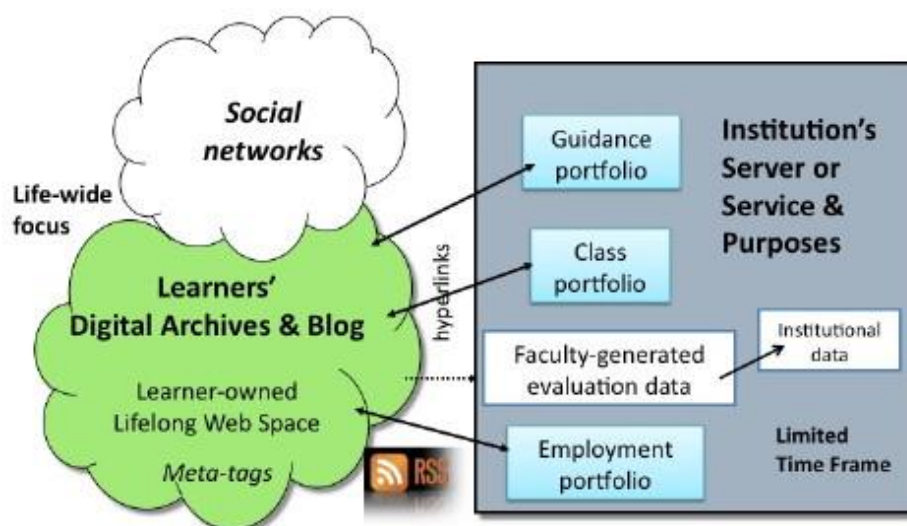


Figure 2: Learners' Digital Archive Source: (Barrett, 2009)

3. Digital portfolio functions and features

The beauty of digital portfolio consists in that it is always an original. Every user prefers a different structure, colours etc. Besides this they have something in common – i.e. functions of digital portfolio. The features are not definite but some of them are inherent. Basic functions and features are as follows (Fellner, 2010):

Archive – results from the main principal of portfolio which is to gather and store information. At the times before computers we used to store information in files, boxes, shelves – wherever possible. With the arrival of computers it is possible to digitalize the data and store them in electronic format which dramatically saves storage space and enables easy editing and multiplication.

Information – logical use of portfolio. First we gather information and then share it with other people. The exceptional value of digital portfolio lies in the possibility to select access permissions to the users. Not only we can define which information will be public or personal but we may also choose specific persons to use it and to define what extent they may manipulate with it.

Aggregation – nowadays it is common to use several services of internet applications, e. g. Email, ICQ or Skype, social network (Facebook, Twitter), information portals (ihned.cz, cnn.com. etc.),

electronic data storage, blogs. Each of these applications has its own web address, login or specific program to use. Digital portfolio should free the user from bothering with visiting different websites and using many logins but ideally it should enable him to administer everything with one login at one site.

Collaborative – all above mentioned functions would – in a particular case – be possible to run without other users. It would be much limited but functional portfolio used just by a single user. The most added value of digital portfolio is a collaborative function in particular. Through information function we can share our knowledge, ideas or materials, but due its collaborative function we can adjust, edit and improve them.

Educational and Reflective – these two functions extend the collaborative function and it is up to the user to use them fully. There is a possibility to compare oneself with the other users; we can use the feedback for our evaluation in time.

Entertaining – though it may seem very unscientific and superficially, it is a very important function. Most people started to use some social application because they enjoyed it. They could relax and contact their friends at once. As a part of digital portfolio we can have a photo album, family tree, video game etc.

4. Practical application of digital portfolio

The main project currently being run at VŠB-TU Ostrava within the operational programme „Education for competitiveness“, it is project CZ.1.07/2.3.00/09.194 – Digital portfolio as a principal of networking and team work in research and development. The project shall contribute to the development of work teams in science and research, joining individuals as well as teams into the international networks or projects and to support interdisciplinary mobility of science and research workers. Nowadays it is typical that the scientists are locally remote and therefore rational usage of ICT can simplify communication, searching, organizing and sharing information and know-how. More information and details about ICT human capital are described in (Doucek, 2009).

Basic aims of this project are as follows:

- To familiarize the university labour with possibilities of ICT for communication, presentation and sharing of information within working and research teams, professional associations and networks of science and research workers.
- To familiarize the university labour with available information sources and rules and principles of working with them.
- To create and use the tools of digital portfolio by university labour.

To meet the targets of the digital portfolio project at VŠB-TU Ostrava we decided to use Google applications together with other additional applications and services. Since 2008 the most of the important applications are available in the Czech language and all needed applications are for free. It is sufficient just to register at Google to be able to use them, and the user interface is adjustable according to the user's needs. Furthermore, most applications are open source, which leads to the consistent improvement of existing functions. These facts also correspond to the requirements of personal or professional digital portfolio.

At present, there is a team of tutors that developing a structure of initial form of digital portfolios which will consist of study materials for academic and administrative university workers. These study materials are made in online environment of Google applications but because of less comfort

in this environment, the study materials are also created in Microsoft applications. For completion of courses, their operation, and creating digital portfolios the Mahara system has been chosen. See the <http://rccv.vsb.cz/mahara/>.

As (Mudrák, 2010) describes, Mahara is a system for the design and administration of e-portfolios, weblogs and online curriculums. Mahara has been designed as a web application with a plug-in architecture. This means it is possible to scale the application up by separating hardware for search, database, file storage and web servers. Mahara is an open source e-portfolio that can be also integrated into LMS Moodle. It means that in accordance to Web 2.0 principals, the users can create social networks with learning communities.

Mahara provides students and teachers with tools for documentation of their lifelong studies, knowledge and competence requirements. Mahara enables sorting out the portfolio and offer its specific parts to a selected group of recipients – e. g. future employers, schools, friends etc.

In our project mentioned above, there are 12 basic learning views which represent main piers of knowledge and applications, which may be used for creating and using the digital portfolio. During year 2011 there are trainings being organized which introduce the above mentioned views to the university labour. At present we assume the biggest interest in online applications, creation of multimedia matters and searching information on the Internet.

5. Conclusion

The idea of a portfolio is not in principle new. Everybody has a natural need to gather and store information and pass them on. The fundamental shift in perception of digital portfolio is brought by Web 2.0 technologies. To be able to understand and create a digital portfolio it is important to understand its basic functions and rules-making. All authors must understand its timeless concept and need to be independent of particular technology, organization or provider. To create a multimedia digital portfolio it is necessary to have some theoretic knowledge of online applications operation and it is necessary to understand the rules of content security when sharing it with other Internet users. In accordance with above mentioned needs. ICT knowledge is very crucial and important for all types of online activities as described in (Maryška, 2010).

In future there may be a big problem with rapid development of online applications and services. During ESF project realization mentioned above, we faced the fundamental change of online environment several times. New online applications still improve their functions and that can be quite confusing for some users. It is important to prepare users for some volatility and modularity during the training of applications offered as a service (Tvrdíková, 2010). In principle it is necessary to state that applications for creating digital applications are still in the early development and all Web 2.0 area awaits long development and rapid growth.

Despite this it is possible to make these days a very high quality digital portfolio of knowledge, study materials or experience which we can share with our colleagues, co-workers or friends.

The rapidly growing popularity of social networks and penetration of Internet applications into our everyday lives amplifies this trend even more. The very possibility to be online almost whenever and wherever is the driving force of all online applications benefiting from development of Web 2.0 and associated digital portfolios.

The research is due to the support provided by the project SGS VŠB-TUO SP2011/152.

6. References

- Ambrož, J. (2010) Web 2.0: bublina, nebo nový směr webu? [Online] [cit. 5.5.2011]. URL <http://www.lupa.cz/clanky/web-2-0-bublina-nebo-novy-smer-webu/>
- Barrett, H. (2009) Online Personal Learning Environments: Structuring Electronic Portfolios for Lifelong and Life Wide Learning. [Online] [cit. 20.4.2011]. URL https://docs.google.com/Doc?id=dd76m5s2_39fsmjdk
- Bednář, V. (2010) Po webu je tu Web 2 [Online] [cit. 1.5.2011]. URL <http://www.lupa.cz/clanky/po-webu-je-tu-web-2/>
- Doucek, P. (2009) ICT Human Capital – Research and Development Work in ICT. Jindřichův Hradec 9.9.2009-11.9.2009. In IDIMT-2009 System and Humans – A Complex Relationship. Linz: Universitat Linz, 2009, p. 83-94. ISBN 978-3-85499-624-8
- Fellner, D. (2010) Modul 1 – Digitální Portfolio, Ostrava: VŠB-TU Ostrava, 2010, 50s. [Online] [cit. 5.5.2011]. URL <http://rccv.vsb.cz/mahara>
- Koeppel, P. (2011) How Web 2.0 Technologies Can Help Small Businesses Connect with Customers, [Online] [cit. 15.4.2011]. URL <http://www.maxawesafaris.com/business/how-web-2-0-technologies-can-help-small-businesses-connect-with-customers>
- Magagnino, F. (2010) From Web 1.0 to Web N, [Online] [cit. 10.6.2011]. URL http://www.flickr.com/photos/franz_photo_gallery/1194939773/sizes/z/in/photostream/
- Maryška, M., Novotný, O., Doucek, P. (2010) ICT Knowledge Analysis of University Graduates. Jindřichův Hradec 8.9.2010-10.9.2010. In IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz: Universitat Linz, 2010, p. 125-136. ISBN 978-3-85499-760-3
- Mudrák, D. (2010) E-portfolio jako součást online vzdělávacího prostředí [Online] [cit. 10.1.2011]. URL http://handicap.vsb.cz/wiki/images/e/ed/David_Mudrak_SMM.pdf
- Tvrdíková, M. (2010) Implementation of Business Intelligence as the SaaS – the opportunity for small and medium sized companies. Jindřichův Hradec 8.9.2010-10.9.2010. In IDIMT-2010 Information Technology – Human Values, Innovation and Economy. Linz: Universitat Linz, 2010, p. 377-386. ISBN 978-3-85499-760-3

USER PRIVACY PROTECTION FROM TRAJECTORY PERSPECTIVE IN LOCATION-BASED APPLICATIONS

Trong Nhan Phan, Tran Khanh Dang

Faculty of Computer Science & Engineering

HCMUT

Ho Chi Minh City, Vietnam

nhanpt@cse.hcmut.edu.vn, khanh@cse.hcmut.edu.vn

Josef Küng

FAW Institut

Johannes Kepler University Linz, Austria

josef.kueng@faw.jku.at

Abstract

Under the help of information and communication technologies, our lives are becoming better than ever in such a way we have been spending. One of popular and worthy supports comes from mobile devices. Integrated with modern positioning-aware technologies like Assisted Global Positioning System (A-GPS), mobile devices nowadays can locate users' position with acceptable accuracy. However, privacy issues have been emerging as a real challenge to industry as well as researchers world-wide. We cannot deny the advantages of LBS, but one's privacy can be violated while he enjoys such services. Dealing with this properly aims at protecting users' personal information while the quality of services (QoS) needs to be assured. This essential balance makes it possible to users' acceptance and reinforces interests to mobile market. Being a part of that progress, this paper gives an overall perspective about not only trajectory preservation but also its concerns in location-based applications. Moreover, its domains and relevant privacy-preserving techniques are also discussed as a key to the door of future research directions.

Keywords

Information and Communication, Location-based Services (LBS), Trajectory, Privacy-Preserving.

1. Introduction

The more modern our society is, the more advanced equipments are developed to support human life. State-of-the-art technologies today make them possible to gradually improve what they are lack of or limited. Besides, the ability of how to detect user location is also integrated into such mobile devices, which opens and paves the way for the development of what is so-called location-based services (LBS for short). However, there exists one important issue known as user privacy causing the most influence during LBS value chain in (Kupper, 2005) as well as making end-users feel afraid of using these services. That LBS supply customers with the demands of utilities is not

good enough to persuade them to freely use. The reason is that users are bound to sacrifice their position in order to get added-values in return. When enjoying these services, one is uncomfortable about whether his position and other personal information are revealed or misused. For instance, knowing the position or trajectory of a user gives an attacker a chance to re-identify the person to whom the position or trajectory belongs. Then, his personal information will be disclosed one after another. One is unhappy if his personal information he tries to keep by himself is revealed to others. Furthermore, malicious attackers can take advantage of his information to go against him. These matters really make sense in LBS. That is why there is a crucial need to keep user sensitive information safe or inviolate.

How vitally important user privacy is has spread a powerful wave of doing more research in this field of study, for its progress contributes to the final success of LBS. The studies have been documented and reported on privacy techniques suitable for both research and business. Among objects needing to be protected, trajectory is the vulnerable one in terms of spatiotemporal relationship. Protecting only positions at specific time just leads to snapshot-based and space-based protection. In fact, users are interested in services involved in both space and time. Therefore, how to identify threats and find out corresponding privacy defense based on trajectory become more essential than ever. To the best of our knowledge, we classify these into three application domains: (1) Application level; (2) Publication level; and (3) Database level. In addition, privacy objects are considered overall, and challenges when dealing with trajectory problems are also studied. From what we have had up to now, the idea of a new access method towards database level in an effort of unifying moving object data and privacy preservation will be mentioned afterwards.

The rest of the paper is organized as follows. Section 2 presents related work in which trajectory scope is classified into three main levels: application, publication, and database level. Next, trajectory problems in terms of privacy are discussed in section 3. Finally, we introduce our work and clarify our future direction in section 4 before making our conclusion in section 5.

2. Related Work

Application level: It makes itself possible to be a fertility land in that privacy techniques are integrated to protect users' sensitive information. They follow mostly three kinds of architectures including centralized party, non-cooperation, and peer-to-peer (Mokbel, 2007). The authors in (Truong et al., 2010) propose a memorizing algorithm, using trusted middleware that organizes space in an adaptive grid where it cloaks the user's location information in an anonymization area. In (Hao et al., 2007), the authors propose a dummies-based technique. The basic idea of this approach is to generate trajectory dummies in order for adversaries not to identify the true one and link it to the corresponding user. Mix zone, a concept proposed by the authors in (Beresford & Stajano, 2003), raises an idea of hiding users' activities in a spatial region where users do not register their applications and let their position be revealed. A similar method known as dynamic mix zone is mentioned by the authors in (Yi et al., 2008). The zone is created dynamically whenever moving objects are close enough. The authors in (Dan et al., 2009) have presented the way called transformation. It aims at making adversaries confused by transforming data from the current space into another space. User requests, after sent to LBS service providers, will be processed in the transformed space, and corresponding results are returned to the users at present. Besides, some obfuscation techniques employ k-anonymity concept to do their jobs. The authors in (Toby et al., 2008) employ user historical positions instead of current neighbor positions. The basic idea is that we can cloak a node's position based on its nearby footprints left by other people.

Publication level: Hardly can we deny the importance of data mining nowadays. Some researchers have also studied privacy-preserving methods in data mining. These techniques can be applied to processes before mining, during mining, or after mining so that they can achieve their goals. For example, reaching to k -anonymity and some privacy annotations like l -diversity, m -invariance, α -diversity, and t -closeness makes trajectory data be generalized or suppressed in order to get extended k -awareness, which can reduce the probability of attacks and is shown in (Pierangela & Latanya, 1998; Gyöző et al., 2008; Fung et al., 2010; Rinku et al., 2010). The authors in (Mehmet et al., 2008) also exploit k -anonymity to make close trajectories be in a group and then to find a representative trajectory through a process called generalization. Another one is to make attackers so confused because of path perturbation as illustrated in (Ghinita, 2009). That means whenever two users meet, or their distance is less than a pre-defined threshold, their paths in such areas will be forced to cross with each other. This measure drives adversaries to their desperation when they try to monitor or track the trajectory of a user.

Database level: There is little closer work (e.g., towards database level) considering privacy as a significant factor in LBS. The authors in (Divanis & Verykios, 2008) present a privacy-aware trajectory tracking query engine that controls what should be shown to corresponding parties. Having the same approach, the authors in (Chow et al., 2009) propose a privacy-aware query processor embedded inside a location-based database server. It deals with how to process snapshot as well as continuous queries with cloaked regions instead of exact positions from the component known as location anonymizer. Another recent approach comes from the authors in (Vijayalakshmi et al., 2008), who propose a unified index called S^{PPF} -tree. By having authorizations embedded into the tree, it is capable of supporting privileges based on locating and tracking. Actually when striking upon an idea of index structures towards user privacy, the authors in (Dang & To, 2010; To et al., 2011; Dang et al., 2011) have presented a database-centric approach and become pioneers in generating such indices. They have considered temporal and geographical factors other than spatial dimension. One is OST-tree, contributing to make spatiotemporal data obfuscated, and the other is B^{ob} -tree, recognizing geographical features inside cloaked regions. The indices open a new access method to spatial-temporal and geographic-aware obfuscation.

3. Trajectory-based Privacy Preservation

3.1. Trajectory Problem

Among location-based services, some refer to trajectory privacy. Here, we have online and offline processing applications. The former points out the direct interaction between a user and the service he is using. If a user is put in a positive place (i.e., he sends or updates his consecutive positions to use his service), we have applications based on continuous queries. Otherwise, we have tracking systems in that they take their initiative in monitoring target locations. The latter is concerned with data mining or data post processing where some data sets are retrieved and processed to publish necessary information expressing their semantics. Some examples for each kind of them are listed below but are not limited:

- Consecutive queries such as “continuously let me know where the nearest gas station is”.
- Tracking systems involved in fleet, asset, or workforce management.
- Publication including traffic planning, trend detection, or behavior discovery.

The population of such services becomes popular to users nowadays. In a general view, each of them leaves trails of user movements called paths or trajectories. According to them, some attackers

can obtain personal information they desire to know or discover items of interests where trajectories cross over or pass by. In particular, each has its own specific characteristics, in terms of privacy, which should be taken into account as well.

3.2. Objectives

When a privacy technique is proposed, it is directed toward what it is used for. So objectives need to be considered with other aspects that are significant in requirements in LBS. Here, we take into account criteria as followings: (1) Preventing the combination of a trajectory and an identity with or without the support of background or external knowledge; (2) Preserving the utility of data; (3) Protecting user privacy against untrustworthy parties (LBS server for example); (4) Protecting user privacy when acquiring services; (5) Protecting sensitive location samples (e.g., political buildings, private places, items of interest, etc.); (6) Providing high quality of service; (7) Being applicable to the real-life scenarios as much as possible. They can be found themselves in opposition to each other (e.g., the utility of data versus user privacy, the QoS versus user privacy). However, there should be a trade-off between what is offered and which level of privacy is required.

3.3. Approaches

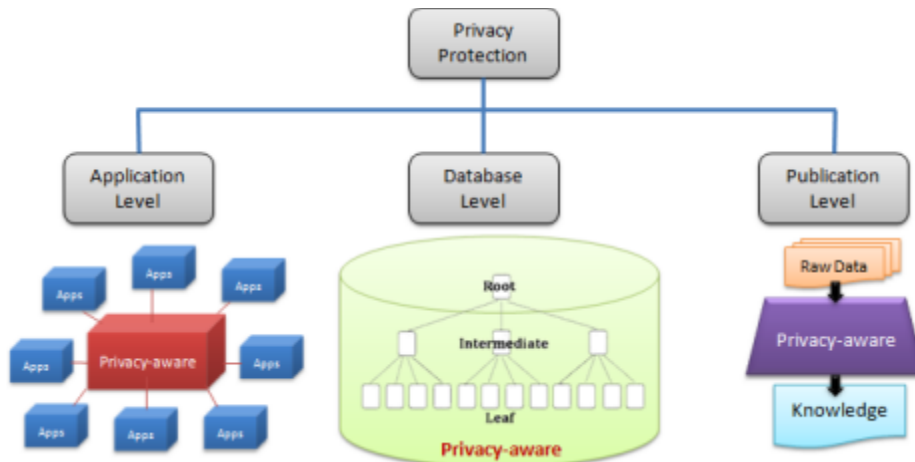


Figure 1: Trajectory-based privacy preserving approaches

During a LBS supply chain, privacy techniques in general and trajectory-based privacy techniques in particular can be applied to many approaches. In this paper, we classify them into three main levels whose further details are discussed in related work:

- Application level: privacy mechanism is implemented at the application level. That means privacy techniques are put outside the storage database.
- Database level: privacy mechanism is embedded into the database. Every privacy technique is done before a user request and its relevant data are sent to service providers.
- Publication level: privacy mechanism is taken into account at either mining applications or the database. Additionally, where it is applied relies on phases of data mining techniques such as before, during, or after mining.

3.4. Important Factors

Through a circle of life for LBS, a request from a service can be affected directly or indirectly by many factors in (Nayot & Indrakshi, 2009). Depending on what we want to meet our needs, we

should be aware of risks from them. Factors listed below more or less reflect their influences on privacy preservation in general and trajectory preservation in particular: (1) *Identity*: identifies the requester who is requesting the location information or services; (2) *Object*: indicates the targets of the service including public or private objects (3) *Query*: specifies the purpose of a user request; (4) *Time*: denotes the time of a request; (5) *Period*: defines a time interval $[T_s, T_E]$; (6) *Location*: shows the position of the requested object or the requester's; (7) *Velocity*: presents the speed of a moving object; (8) *Acceleration*: cares about the rate of change of velocity over time; (9) *Orientation*: introduces the direction of a moving object, and the angle of the moving is a derived attribute; (10) *Density*: involves the quantitative of objects in a specific area; (11) *Object profile*: gives more extra information of an object like its interests; (12) *Background knowledge*: supplies external information obtained for inference attacks.

3.5. Privacy Objects

3.5.1. Identity Privacy

Identity refers to attributes explicitly identifying a user like user identification or social security number (SSN). Thus, *identity privacy* is to protect users' identities directly from disclosure to attackers. The main goal is to protect users' identities that could be directly or indirectly inferred from other information including background or external knowledge.

3.5.2. Query Privacy

Query privacy is related to the disclosure of sensitive information in the query itself and its association to a user. In other words, a query should be protected from being linked to a specific user. Knowing the content of a query, for example, can indicate user preferences which, for some reason, had better to be kept in private.

3.5.3. Position/Location Privacy

Users' locations belong to sensitive contents that have to be kept away from malicious attackers. They include those which from the past, current, or even predicted positions. How to protect sensitive locations from being linked to a specific user defines *position/location privacy*. Besides, private or sensitive places are also prevented from adversaries. Many of them such as home, office, hospital, political buildings, items of interest, etc. could be feasible background information leading to re-identifying individuals.

3.5.4. Path/Trajectory Privacy

Relying on location privacy, *path/trajectory privacy* is defined as the ability to prevent other unauthorized parties from learning users' motions in a close relationship between positions and time. Moreover, sensitive routes can be formed from paths through private or sensitive places. Getting them is usually useful for adversaries to meet their needs, so they have to be preserved, too.

3.5.5. Quasi-Identifier Privacy

Quasi-identifier is a set of attributes that can potentially lead to identity breaches. An adversary exploits them, together with some external information, to re-identify a user. For example, the attribute values consisting of birth date, zip code, and the gender can uniquely determine an individual. So *quasi-identifier privacy* recommends that the values from quasi-identifiers should be kept in private but still assured the utility of the data set in which they are.

3.5.6. Privacy of Sensitive Attributes

In some location-based applications, especially in trajectory data publication, all individual attributes of a user (e.g., salary, disease, disability status, marriage status), not joining quasi-identifier, should be maintained in secret. These should be guaranteed due to the fact that everyone has the right to keep his own personal information, which is shown in (Westin, 1967).

3.6. Challenges

Preserving data privacy is always one of the most emerging issues in database systems, especially in modern information systems. For those who want to achieve their goals have to overcome these challenges: (1) How to make privacy be in close co-operation with both security and policy lays a firm principle on the prosperous development of LBS; (2) There are lots of criteria to classify LBS applications while each also has its own privacy problems and protection mechanisms; (3) Bear in mind that protecting identity including removing the true one or simply using a pseudonym is not sufficient; (4) Private places or items of interest should be also considered; (5) The quality of services should be guaranteed, along with user policy, trade-offs, personalization, efficient query processing, and system performance. Especially due to mobility and some measurement error, the query answer has to be assured; (6) It is a good way to care about both spatial and temporal dimensions and location privacy and query privacy when we deal with user privacy to minimize attacks from adversaries; (7) The more efficiently the variety of queries are supported, the more widely the location-based applications are used; (8) Privacy techniques should be context-aware in order to gain more effectively; (9) Each privacy technique may be attached to some assumptions or constraints. That means it also deals with some attack models. The closer it is to the real world, the most applicable it is to LBS, or at least these assumptions are reasonable; (10) Dealing with exceptions should not be ignored (GPS signal loss because of mobile devices' power limitation, device failure, or breakdowns of all kinds for example); (11) It is necessary to have a measure (i.e., privacy metric) for user privacy of all kinds as a criterion to judge whether proposed solutions are good enough or not.

Depending on what kinds of trajectory-based applications, we should pay attention to either of issues listed below or their combination: (1) *Trajectory preservation*: assures that we can preserve the utility of data as much similarity as possible like what they are in the real world and then helps us answer trajectory-based queries efficiently; (2) *The outbreak of data*: indicates that when time goes by, trajectory data grow quickly. There should be a way to control or deal with this phenomenon; (3) *Privacy preservation*: especially needed when mining, publishing, or learning some useful information hidden in trajectory data. User privacy should be kept personally and not be violated; (4) *Movement constraints*: care about what kind of trajectories there are, for one can use lots of different transportations for his moves. If cared properly, they contribute to the quality of services; (5) *Data stream management*: deals with continuous location updates or queries while given accuracy remains unchanged. Especially in real-time applications, there are numerous data collected from positioning-aware mobile devices or sensors. Therefore, it requires essentially a flexible mechanism to collect and process consecutive data efficiently in an effort of increasing QoS and its performance.

A lot of challenges have been recognized during user privacy analysis. We can possibly take them off the table, but not all of them are resolved in order to have a good privacy method or solution. Among such challenges, some are mutual, but others can be incompatible. One solution is supposed to be fit once it's suited to its application and objectives.

4. Our Future Work

Although one's location privacy is assured when location privacy techniques are applied, it may still be exposed once his trajectory is identified. As a consequence, his sensitive data will be leaked. Motivated by this, our research is focused on trajectory-based privacy-preserving problems whereas there is little work in this field.

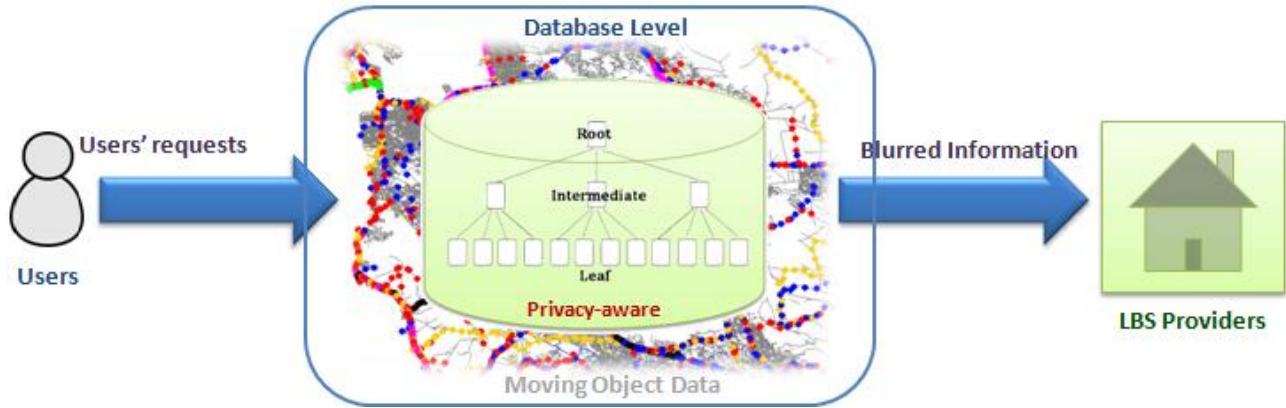


Figure 2: A trajectory-based database-centric approach

To cope with these concerns, we can put our investigation in application, publication, or database level, which depends much more on location-based applications, strategies, and what we are going to protect. However, database-centric approach seems to be the most potential above all others. Our approach is how to find out an efficient privacy-preserving access method for moving objects. In other words, an index structure integrated with user privacy will be studied at the database level while previous related work just only cares about how to have an efficient index for moving objects. This approach is chosen in comparison with earlier introduced approaches because of its advantages such as flexibility, efficiency, and performance. Furthermore, it easily spreads to other levels once there is a need (e.g., indexing for data mining or application management).

Alternatively, our goal aims at indexing for the predictability of trajectories supporting user privacy. Such an interesting and significant research direction becomes much more exciting for the next generation of mobile services, for it promotes location-based applications pointing at management, knowledge-based decision making, service optimization, forecast, and intelligence as well. These kinds of LBS inspire more research and industry, promise a strong growth, widen application domains, strengthen users' expectation, and benefit from what makes them possible.

5. Conclusion

In this paper, a general view and related components about trajectory-based privacy-preserving protection are given. There are lots of criteria, characteristics, and challenges needing to be satisfied and explored deeply in an attempt on maintaining the balance between user privacy and QoS. At the same time, this work also introduces lots of relevant research directions leading to open problems that should be investigated more in the future.

In addition, we address our approach towards database level in dealing with trajectory privacy and its related issues, which can give a potential support in resolving trajectory-based privacy-preserving location-based applications.

6. References

- Beresford A.R., & Stajano F. (2003). Location Privacy in Pervasive Computing. IEEE Pervasive Computing, IEEE CS and IEEE Communications Society, 2(1), 46-55.
- Chow C.Y., Mokbel M.F., & Aref W.G. (2009). Casper*: Query Processing for Location Services without Compromising Privacy. TODS'09, 34(4), 1-48.
- Dan L., Elisa B., Reynold C., & Sunil P. (2009). Location Privacy in Moving-Object Environments. TDP'09, 2(1), 21-46.
- Dang T.K., & To Q.C. (2010). An Extensible and Pragmatic Hybrid Indexing Scheme for MAC-based LBS Privacy-Preserving in Commercial DBMSs. ACOMP'10, Ho Chi Minh City, Vietnam, March 3-5, 2010, pp. 58-67.
- Dang T.K., Thoai N., To Q.C., & Phan T.N. (2011). A Database-Centric Approach to Privacy Protection in Location-Based Applications. RCICT'11, Vientiane, Lao PDR, March 10-11, 2011, pp. 65-71.
- Divanis A.G., & Verykios V.S. (2008). A Privacy-aware Trajectory Tracking Query Engine. SIGKDD Explorations Newsletter, 10(1), 40-49.
- Fung B.C.M., Chen K.W.R., & Yu P.S. (2010). Privacy-Preserving Data Publishing: A Survey of Recent Developments. ACM Computing Surveys (CSUR), 42(4), 1-53.
- Ghinita G. (2009). Private Queries and Trajectory Anonymization: A Dual Perspective on Location Privacy. TDP'09, 2(1), 3-19.
- Gyöző G., Xuegang H., & Torben B. P. (2008). Privacy-Preserving Trajectory Collection. ACM-GIS'08, Irvine, California, November 05-07, 2008, pp. 387-390.
- Hao Y.T., Chih P.W., & Chien L.W. (2007). Protecting Moving Trajectories with Dummies. MDM'07, pp. 278-282.
- Kupper A. (2005). Location-based Services - Fundamentals and Operation. John Wiley & Sons.
- Mehmet E.N., Maurizio A., & Yucel S. (2008). Towards Trajectory Anonymization: A Generalization-based Approach. SPRINGL'10, CA, USA.
- Mokbel M.F. (2007). Privacy in Location-based Services: State-of-the-Art and Research Directions. MDM'07, Mannheim, Germany, May 2007.
- Nayot P., & Indrakshi R. (2009). Towards Achieving Personalized Privacy for Location-Based Services. TDP'09, 2(1), 77-99.
- Pierangela S., & Latanya S. (1998). Protecting Privacy when Disclosing Information: K-anonymity and its Enforcement through Generalization and Suppression. SSP'98, Oakland, CA, May 1998.
- To Q.C., Dang T.K., & Küng J. (2011). Bob-Tree: An Efficient B+-Tree Based Index Structure for Geographic-aware Obfuscation. ACIIDS'11, Daegu, Korea, pp. 109-118.
- Rinku D., Indrakshi R., Indrajit R., & Darrell W. (2010). Query m-Invariance: Preventing Query Disclosures in Continuous Location-Based Services. MDM'10, Kansas City, Missouri, USA, May 2010.
- Toby X., & Ying C. (2008). Exploring Historical Location Data for Anonymity Preservation in Location-Based Services. INFOCOM'08, pp. 547-555.
- Truong Q.C., Truong T.A., & Dang T.K. (2010). The Memorizing Algorithm: Protecting User Privacy in Location-Based Services using Historical Services Information. IJMCMC, IGI-Global, 2(4), 65-86.
- Vijayalakshmi A., Heechang S., & Jaideep V. (2008). Efficient Security Policy Enforcement for the Mobile Environment. DBSEC'08, 16(4), 439-475.
- Westin A.R. (1967). Privacy and Freedom. New York: Atheneum.
- Yi O., Yurong X., Zhengyi L., Guanling C., & Fillia M. (2008). Providing Location Privacy in Assisted Living Environments. PETRA'08, Athens, Greece, July 16-18, 2008.

CURRENT ISSUES OF SOCIAL NETWORKING SITE FACEBOOK FROM THE PERSPECTIVE OF ACTIVE USERS

Petr Kašpar, Roman Kozel, David Nespěšný

Department of Applied Informatics

Faculty of Economics

VŠB – Technical University of Ostrava

petr.kaspar@vsb.cz

Abstract

The issue of social network is nowadays a big phenomenon. With the use of the social networks are associated many negative aspects, which have a major impact on their users. The main aim of this paper is to present research results, which deal with major issues, related to users use of social networking sites and was conducted with using focus group method. Data obtained from this survey were used as input data for the controlled experiment conducted on the social networking site Facebook as a virtual social game.

Keywords

Social Media, Social Network, Facebook, Focus Groups, Controlled Experiment

1. The Research Project SP2011/162

The research project is focused on mapping of possibilities and limitations of using original marketing methods in new market and technological conditions. Current trends and near future market environment, that is market saturation, competition and the importance of segmentation show us growing importance of customer's role not only as an individual and user of values, but also as an important element of contemporary social phenomenon, social networks.

1.1. Social Media

At present, there is on the one hand decreasing effectiveness of traditional media and on the other hand development of social media (Evans, 2008). In social media field, users themselves are involved in the content making process. For social media, evaluation, voting, writing comments and other activities are typical. People can communicate there about anything, including various products and services of companies.

In terms of marketing, social media can be divided into several categories (Janouch, 2010, p. 216):

- social networks (Facebook, Myspace, LinkedIn),
- blogs, videoblogs, mikrologs (Twitter),
- discussion forums, Q&A portals (Yahoo! Answers),

- wikis (Wikipedia, Google Knol),
- social bookmarking systems (Digg, Delicious, Jagg),
- shared multimedia (Youtube, Flickr),
- virtual worlds (Second Life, The Sims).

In the past two years, the social networking became a phenomenon. The idea of these networks is nothing unknown. Although this phenomenon, it brings various number of problems, not only in technology, but mainly in the social and ethical area. The term "social network" does not come from information technology, but from sociology. The social networking website aims to bring together various users, enabling them to communicate and share information between themselves. The nature of shared information can vary: from pictures and photos, via text information, style units, literary works, audio and video recordings.

Origins of these association efforts of users and their communication extend to the distant past, when the Internet boomed. Perhaps someone still remembers the services such as: Usenet, Listserv, Tripod or Geocities. A major service of the Internet gray zone was IRC net - Internet Relay Chat (Lytras, 2009). Some authors even claim that the boom of the social networks comes between years 2002 and 2004, when networks such as MySpace, Friendster or Bepo were developing.

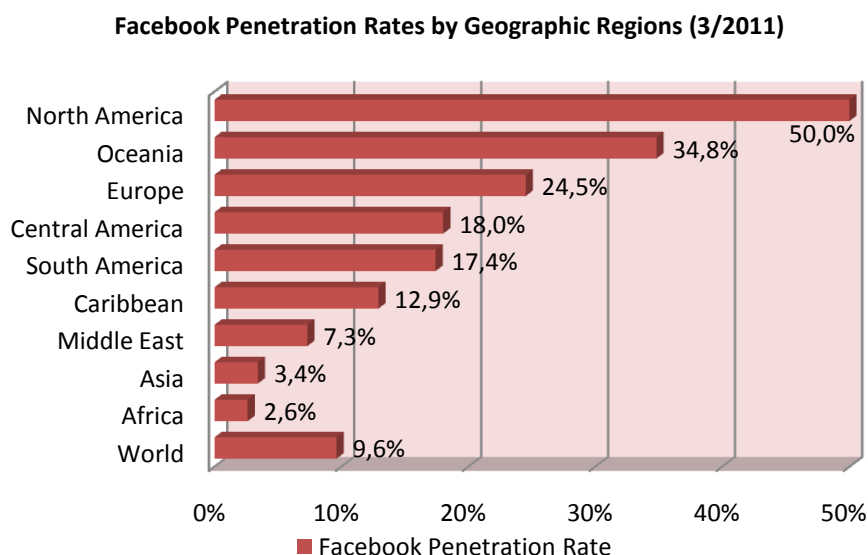


Figure 1: Facebook Penetration Rates by Geographic Regions - 3/2011; (Authors, Internet World Stats, 2011)

Currently, there are tens of active social networks. The social network Facebook is considered as the leader in this area (Wagner, 2008). Available statistics from March 2011 (see Figure 1) shows, that speed of Facebook spreading among users is very high and the perception (number of Facebook users /number of internet users) in selected regions even exceeds 50 % (for example Canada, Hong Kong, Norway, Singapore). The largest number of registered users is located in Europe, where there are more than 200 million people connected to Facebook (worldwide more than 664 million users). In the period from 9/2010 to 3/2011 only, the number of Facebook users increased about 40 million in Europe and worldwide about nearly 150 million.

However, it should be mentioned that social networks can vary by its focus, or purpose for which they were incurred. A good example may be the Badoo network, which is intended primarily to searching for a partner. Facebook was initially designed to communicate and share information.

The popularity among the mostly young users gradually changed the network and because of it have been expanded capabilities of the network. For completeness, it is necessary to mention that the group of social networks, despite limited capabilities, also includes popular communication tools such as ICQ and Skype.

One of the aims of the research team was to identify how young people currently perceive threats or opportunities of social networking site Facebook, which authors considered as a current leader among social networks. The research team of student project grant competition from Faculty of Economics VSB-TUO addressed several groups of students of VSB-TUO aged 19-24 and realized pilot group discussions (Focus Groups), which deals with social networking.

These interviews clearly showed that the majority of users do not know, or deliberately does not accept the risk of using these networks. Majority of surveyed users did not know that there are in addition to Facebook other social networks. Current users clearly prefer communications capabilities before the acquisition of knowledge and awareness of potential risks arising from the use of these types of networks.

In the real, therefore, brings the red zone of these social networks, targeted exploitation by malware attacks, abuse of private data and information, overloading of advertising or committing crimes, where source or the common denominator may be one of the social networks (Awl, 2011).

1.2. The Methodology of the Research

The main aim of the project is to verify the possibility of using classical segmentation techniques on users of social networks, defining barriers of using these methods and suggest a new methodology for segmentation (i.e. targeted division of the whole to internally homogeneous segments or segments outwardly differently looking). The target group is young people, especially students of secondary schools and universities.

The project is being realized with the use of methods of combined research, which consists of quantitative and qualitative parts.

Quantitative procedures (secondary research – especially statistics of web pages and social networks; primary research - especially electronic questioning methods and observation) are conducted to collect identification and descriptive characteristics, and the views of target groups.

Qualitative procedures (primary research - especially focus group and electronic observation) are conducted to find differences of potential target groups and segments.

In addition to numerous secondary investigations, mainly these primary research methods of gathering information have been used:

- focus group - for pilot testing of input assumptions of the research team,
- controlled experiment - for obtaining qualitative views of the target group and to observe user's behaviour in the natural environment of the social network Facebook,
- electronic questioning - for obtaining quantitative views of the target group.

The project duration is planned for the whole year 2011. The first three months were devoted to the orientation in social networking problem. Also, we needed to determine current situation and certificate input assumptions. The controlled experiment began in the environment of social network Facebook since April. The last 3-4 months of the year, after obtaining a sufficient amount of quality information, will be devoted to data analysis, interpretation of results and definition of the relevant suggestions.

2. Focus Group

The main advantage of using a group interview is a relatively quick acquisition of information from more people than by individual interviews. Unlike traditional types of questioning, there is a free space for communicating ideas, opinions and attitudes, which improves the information value of the data. Usually there is a combination of qualitative and quantitative methods. The collected results are often used as pilot data for good orientation in the issue.

Positivity of the group discussions lies in the activation of all interviewed participants, who are gradually drawn into the debate by the moderator, or they are bearers of the main ideas of the ongoing conversation. According to Vysekalová (2007), we can divide the participants of group interviews into 5 groups:

- active participant,
- introverted individual,
- "he knows everything and understand everything",
- "unstoppable speaker",
- grumbler.

Improper combination of participants could be a serious problem if a moderator is not sufficiently experienced psychologist. Therefore, in case of the research project SP2011/162 presenters were teachers and participants were students of Faculty of Economics VSB - TUO.

2.1. The Methodology of the Focus Group Research

Our model consists of a few specific questions that address the current needs of young users, aged 19-24 years. The total number of users involved in our focus group was thirty. The authors were not ambitious to consider this group as the relevant representative sample. This sample should help us get at least the general overview of user's behaviour on social networks.

Group interviews run in the first quarter of 2011 in areas of Faculty of Economics VSB-TUO. Total number of discussants was thirty. They were divided into three groups of approximately ten participants. The scenario of interviews was always the same:

- explanation of the problem by the moderator,
- knowledge of issues and preferences of participants,
- views on the possible dangers and pitfalls of social networks,
- completing of a short questionnaire with requirement for quantitative answers,
- final discussion.

2.2. The Results from Focus Group Research

Information obtained from focus group confirmed the correctness of the chosen methodology, because students, who participated in these talks, help by their significant ideas in planning of next steps of the project. Especially in planning and creating a test environment in the social network site Facebook.

2.2.1. Decision-making Model

The first area of our focus was related to the question, which communication tool users generally preferred. Basic answer options were ICQ, Skype, Badoo (or another social network) and Facebook. An unequivocal response was just Facebook. As justification for their positions, users reported completion of the necessary information in one place, sharing options, synchronous communication (chat), the set of users with whom they want to meet more frequently on the network (the so-called friends), functionality known as the "wall" or information about the behaviour of other users.

Another area of the discussion concerned the defining differences between the communication tool of Skype and Facebook. These two very different networks have been deliberately chosen in order to obtain accurate information and enable users to suggest clearly that the networks are very different. Majority of users agreed that Skype is used mainly for personal communication (people close to the family), while Facebook they considered as an impersonal instrument. One of the drawbacks of Skype has placed the need for users to communicate in real time (synchronous communication), whereas in case of Facebook "It does not matter."

We also wonder why users prefer Facebook over other social networks. Users have reported that Facebook allows them cheap, active and clear communication, where they can choose only those users that they want. Facebook has good functionality for sharing data and information (photos, texts, videos, sounds) and it also enables publishing users' opinions and views, promoting the publication of different events, etc.

These three questions provided to authors elementary overview of the problem why the reference group prefers Facebook, i.e. what advantages see users of socials networks in Facebook and major differences from other social networks that make it currently most preferred social network? An important aspect seems to be a combination of synchronous and asynchronous communication and the possibility of pooling the necessary information in one user profile, data sharing and information and an overview of the preferred group of users.

2.2.2. Negative Aspects of the Facebook Community

Subject of further investigation was survey of the real and subjectively negative aspects of users of social networking site Facebook. The question was clear: Are there real negatives on Facebook? In the group emerged different views and opinions on safety and its subjective perception. The most commonly expressed negative aspects are summarized in the following paragraphs:

1. Overloading with advertising, spam, too much information on the activities of friends on the "wall" application,
2. Loss of privacy, abuse of information – this negative aspect is more pronounced at case of younger Facebook user, we have to say that the loss of private information is often caused by minimal awareness of information privacy. The Facebook provides security features, but people do not know how to protect their profile,
3. Targeted modification of user identity – users on the network acting as another person, a better, smarter, better, more empathetic, understanding, protecting. The authors consider the fact as a targeted manipulation with the target object, i.e. with who is deliberately fed or fed continuously misled,
4. Running between the real and virtual world - there is a risk that the user is forced to choose between these two "worlds". If user choose the virtual, then he or she is exposed to the risk

of addiction, deepening self-deception, user stop to perceive the real world as the naturally dominant and then exposes to the real danger of getting mental disorder or illness,

5. Electronic track, difficult process of removing profile from Facebook – many users are not aware about the problem that personal data shared on the network can be used as a subject of blackmail. That information can be stolen without the owner's knowing. Many employers now check whether the employees do not own profiles on Facebook. To delete a profile is quite problematic, electronic track remains and in combination with carelessly shared information may be the reason of future not only professional problems, but also private,
6. Age control – This is an ethical question. The official boundaries that accepts Facebook is thirteen years of age. How to ensure that your network is not used by younger children? Children are generally often exposed to crimes committing, they are exposed to attacks from deviant adult offenders. They have access to profiles with explicit themes or they are committed to handling abuse (elicitation of personal data, called for a meeting with a stranger, etc.),
7. Modern internet threats, malware – it means technological threats, often purposefully created for attacks on social networks, programs responsible for the theft of personal contacts and other information.

These results of focus group identified some problematic areas of real social networking site Facebook. At the same time it is fair to say that the focus group participants named a number of positive impacts of social networks for their personal, working or student life. I.e. they mentioned, that they are using Facebook site, when they just want to chat with a friend, who could be physically very far, or want to be more passive than as Skype, or even in case when they want to increase the productivity of studies by sharing ideas with each other, links or whole study materials.

However, the research team in the early stages wanted to look just for the negatives aspects, that is why was created a controlled experiment that after initial focus group continues during the period April to October 2011 in an environment of social networking site Facebook.

3. Controlled Experiment

During the controlled experiment, which is called “Ideal University”, fans of this site (same target group 19-24) participate in the development and management of this entity through discussions and create virtually their ideal school. The research team will observe and guide their actions and obtain the relevant information from target groups. The advantage of a controlled experiment in a natural environment is high external validity, which lies in the applicability of the results; it means the possibility of generalization of results and translating them into real situations (Kozel, 2006).

3.1. Methodology of Controlled Experiment

Students of selected university were sent an official e-mail with request for participation in the project "Building of the Ideal University", with following tasks:

- find Facebook profile of Ideal university (IU),
- become a fan of the IU,
- become a friend of user “Dean IU” (in our experiment, Dean is the head of the Ideal university),

- actively discuss in announced discussions,
- regularly vote on issues which Scientific Board of IU need to solve.

Each member of the research team is simulating one position or role in the virtual Scientific Board of IU. Through these fictionally created profiles (avatars), we can influence the direction of discussions.

Every week (usually Monday), imaginary Scientific Board of IU has a meeting, then spokesman of IU informs fans about outcomes of this meeting on the Facebook profile. Around noon, Dean of IU makes a statement in a specific issue (this problem was mostly the subject of previous discussions) and publishes it at the profile. Shortly after, the topic for next week discussion is announced.

After that, discussions and voting take place whole week. Research team uses this space to observe the behaviour of participants in the project.

In June, we sent a letter to directors of selected secondary schools with a request to promote the project to their students. The driver for students to join the project was information that they can win attractive prizes for active discussing and for some other tasks. Before selecting the winner, electronic questioning will take place on Facebook page.

The last step of the research project will be to make an appropriate interpretation and suggest recommendations for finding potential tools for effective communication with target groups and segments according to obtained results as in general context and also in the application use for Faculty of Economics VSB – TUO.

3.2. Outputs of Controlled Experiment

The first positive finding was the speed how the site received its first 100 IU fans. The first mention of the project came to students on April 1st at twelve o'clock. The IU had one hundred fans in 6 hours (see Figure 2).

The speed with which project participants clicked on the appropriate icons and lines, however, imply a number of negative findings, respectively confirmation of information that were described above in the analysis of focus group outcomes. For example it is about targeted change of user identity, loss of privacy and misuse of information.

Facebook users were not only becoming the fans of IU, but at the same time without further restrictions of protecting their privacy, they willingly became friends of the user "Dean IU". Through the Dean's profile it is possible without any problem to have a full view of user's profile with all personal data. It means that in these cases we have very good access to personal data and good position for monitoring other activities of users throughout the experiment.

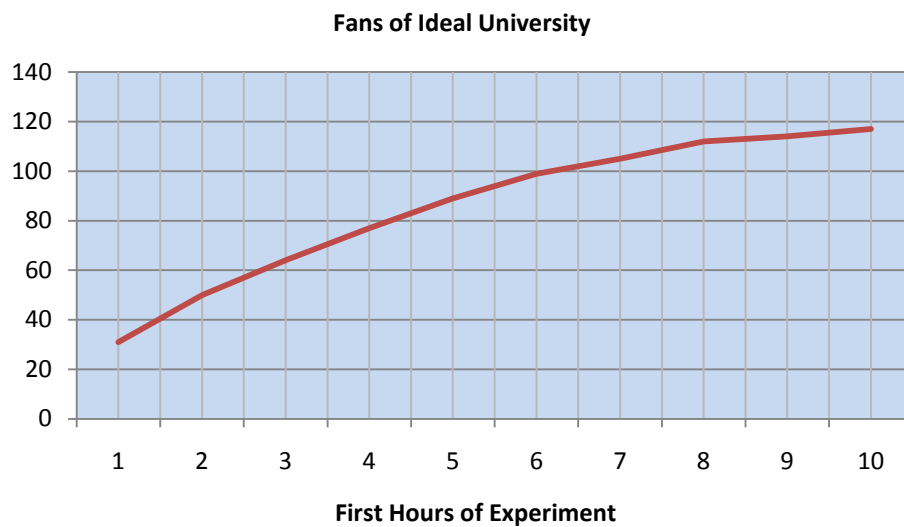


Figure 2: Fans of Ideal University from 1st to 10th hour of Experiment (1. 4. 2011)

Also striking was that without knowing the true identity of the user Dean IU, they were willing to reveal their own privacy so easily. These lacks of interest in protecting of their own privacy allowed to our team confirm some earlier findings. Younger students are less alert to the surroundings. Older users allowed access to their profile, but they let us see only basic information about them.

At the same time, the research team has verified that the topic which has been chosen for collective communication with members of Controlled experiment – common construction of educational university institution – was right, because it's close to young people and thus, in the first several weeks, members were successful in assertion of:

- IU residence – in the city centre at Komenského sady,
- logo IU, in which dominates green colour,
- outlook of IU – modern campus type with green main building,
- IU establish a student dormitory, which equip costly and in modern style,
- IU will have six faculties: economic faculty, medical faculty, legal faculty, faculty of natural science and one "non-traditional" faculty,
- IU introduce practical trainings into curricula of compulsory,
- IU will offer students various forms of scholarship.

While members solve above-mentioned fields of their concern, research team gathers information about members by observing. The information is consequently analysed and compared with opinions, which members themselves express in a questionnaire at the end of the summer competition.

4. Conclusion

The authors agree that in future there may be two varieties of the future evolution of social networks. The first option suggests that questions about safety are not addressed, all of these

"problems" will be underpinned with the relevant legislation and the rest remain unresolved. The second variety is the smooth transitions between new networks.

As a result of up to now research, positive finding has been constantly increasing perception number of social network users in the whole world, candidness and willingness to cooperate on various forms of mutual communication with the aid of social medias, mainly concerning young people. For Faculty of Economics VSB-TUO leadership, which provided the origination of the research team, final conclusions of the project could be used in preparation and realization of marketing communication toward potential applicants for university education.

In order to do so, it is necessary to do the rest of the planned steps of the project as well, so that, in the end, every significant difference between the communication with target group using traditional media and using new media could be denominated. Therefore, new segmentation criteria can be defined for innovating procedures of future segmentation.

Acknowledgement

This article was created with the financial support of the Student Grant Competition EKF, Technical University of Ostrava in the project SP2011/162" Possibilities and limits of using traditional methods to segmenting users of social networks “.

5. References

- Awl, D. Facebook Me!: A Guide to Socializing, Sharing, and Promoting, Peachpit Press, Berkeley 2011, ISBN 978-0-321-74373-2
- Evans, D. Social Media Marketing, Wiley Publishing, Inc., Indianapolis, 2008, ISBN 978-0-470-34402-6
- Internet World Stats, (2011): Facebook Statistics. (cit. 2011-15-06). Dostupné z WWW:
<<http://www.internetworldstats.com/facebook.htm>>.
- Janouch, V. Internetový marketing - Prosad'te se na webu a sociálních sítích, Computer Press, Brno, 2010, ISBN 978-80-251-2795-7
- Kozel, R. a kol. Moderní marketingový výzkum, Grada Publishing, Praha, 2006, ISBN 80-247-0966-X
- Lytras, M.D. & de Pablos, P.O. Social Web Evolution, Information Science Reference, Hershey, New York, 2009, ISBN 978-1605662725
- Vysekalová a kolektiv. Psychologie reklamy, Grada Publishing, Praha, 2007, ISBN 978-80-247-2196-5
- Wagner, R. Building FaceBook Applications for Dummies, Wiley Publishing, Inc., Hoboken, 2008, ISBN 978-0-470-27795-9

ANALYSIS OF SENTIMENT IN UNSTRUCTURED TEXT

Jan Ministr

Department of Applied informatics
Faculty of Economics VŠB-Technical University Ostrava, CZ
jan.ministr@vsb.cz

Jaroslav Ráček

Department of Computer Systems and Communications
Faculty of Informatics Masaryk University, Brno, CZ
racek@fi.muni.cz

Abstract

This paper describes a software library for sentiment evaluation in unstructured text. The whole structure of the system is described here as well as learning and evaluating functions in greater detail. Furthermore, this paper shows outputs from the evaluation of a particular specialized discussion.

Keywords

Sentiment Analysis, Social Media Analysis, Unstructured Text, Evaluating Function Library, Marketing Data

1. Introduction

At the time of developed information society is common for more and more people to refer to the internet when deciding about the type of product or service they want to acquire for their money. Meanwhile, the percentage of people who do not make decisions based only on official company presentations or comparative tests but who seek information about offered products in specialized discussions, at technical forums or in advices of their acquaintances on social networks, increases (Klöckner, 2010).

There are a number of discussions that address this matter, so the determination of the type of sentiment within individual discussions is not an easy task. This information, however, is important for the majority of people offering their products and is also useful for potential buyers.

This paper describes the results of work of authors who are developing software tools that enable sentiment evaluation in texts automatically according to statistical methods. The development was run on publicly available text data downloaded from discussion forums oriented on banking and financial area. All texts were in the Czech language.

2. System structure

Currently, the software tool created for sentiment recognition, has the form of Java library which contains two basic types of functions:

- functions for creating and calibrating the knowledge base,
- functions for sentiment evaluation.

Both parts are independent of each other. They can run, and they usually do run, on various machines at different times. The task of the knowledge base creation functions is to teach the system to recognize a type of sentiment in given domain area. The function for the sentiment evaluation uses relevant part of the knowledge base and calculates the sentiment of unknown texts. This feature can be incorporated directly into the information systems of companies or it can be called as a web service (Kopeček, 2008). The main sections of the system and the data flows are illustrated below.

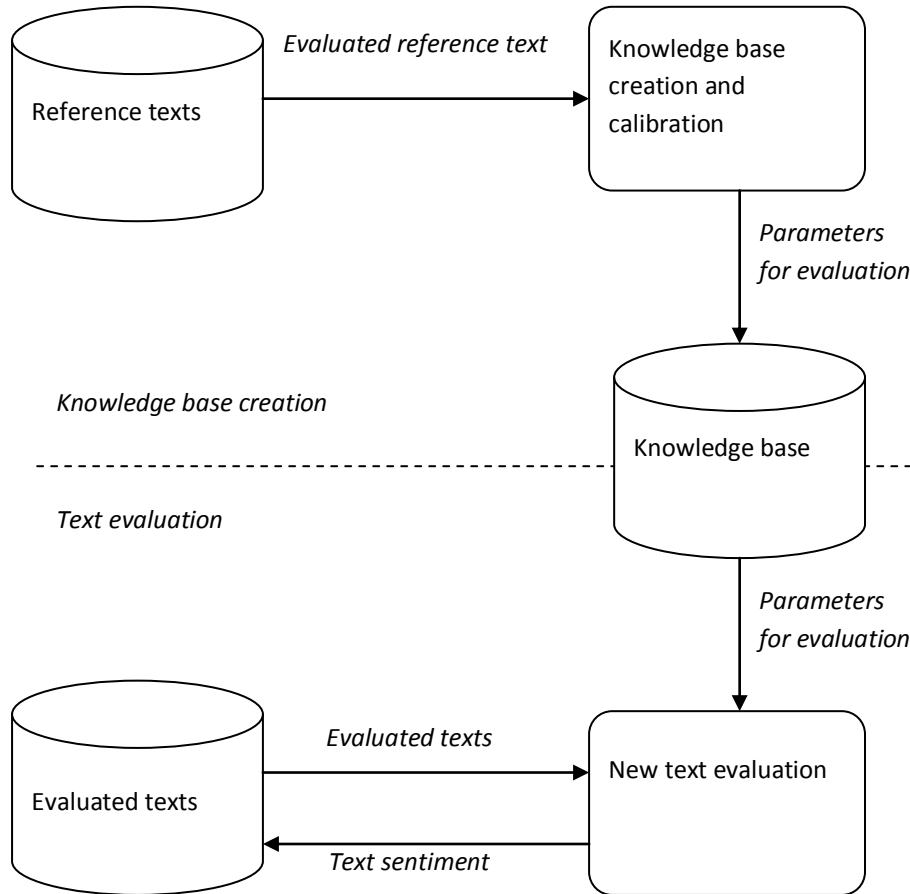


Figure 1: Basic parts of the system for identifying the sentiment in the text.

3. Knowledge base

The sentiment evaluation in the text is based on the knowledge base, which is actually a set of statistical data related to individual word combinations. To create a knowledge base, it is necessary to have large enough amount of correctly evaluated reference texts available. Each

text must include its sentiment, which serves as an entry value for system calibration. These texts are subsequently analyzed using statistical functions. For each word combination, mean values and sentiment variances that these words in the text indicate, are mainly derived.

Apart from functions that directly analyze reference texts and create the knowledge base, there are also other functions available in this system. In particular, these are statistical tools that track how the sentiment values of individual word combinations gradually stabilize, in order to recognize, whether the knowledge base is sufficiently taught or not. Another feature is the user interface for annotators who manually evaluate the reference texts. There are also functions for the evaluation system calibration, where it is necessary to set the limits of individual degrees of sentiment that have to be recognized by the system (Hančlová, 2008).

The knowledge base is created for each domain area anew. The same applies for setting the evaluating function limit values. Although this is a tedious labor and it takes days to weeks to train the system, the resulting specialized base produces much better results than a general base. This was experimentally verified by creating a specialized base for banking sector and a general base upon 25.000 contributions. 1.000 new contributions from financial discussions were subsequently evaluated by both bases and the banking base showed approximately 10% better success rate than the general base.

4. Evaluating function

The evaluation of unknown texts is carried out by gradually retrieving individual text passages, in which the system recognizes word combinations stored in the knowledge base. The sentiment of analyzed text is calculated after that.

The calculation can be parameterized in different ways. With the parameters of the evaluation function is possible to set the scale on which the sentiment should vary. The authors currently use five-step scale with discrete values of 1 to 5, where 1 represents the most positive sentiment and 5 represents the most negative sentiment. Alternatively, two-step scale can be used, which distinguishes only between positive and negative sentiment.

The following figure shows the sentiment evaluation results from March 2011, where 500 consecutive contributions were chosen from a discussion on www.finance.cz and www.mesec.cz about pension schemes. The evaluating function was set to distinguish only between positive and negative sentiment. Both groups of contributions are present in the picture. There are also several contributions among the clusters, for which the evaluating function was not able to determine, whether their sentiment is positive or negative. In addition, a linear trend line, which indicates that the mood in the discussion deteriorated over time, is represented in the graph.

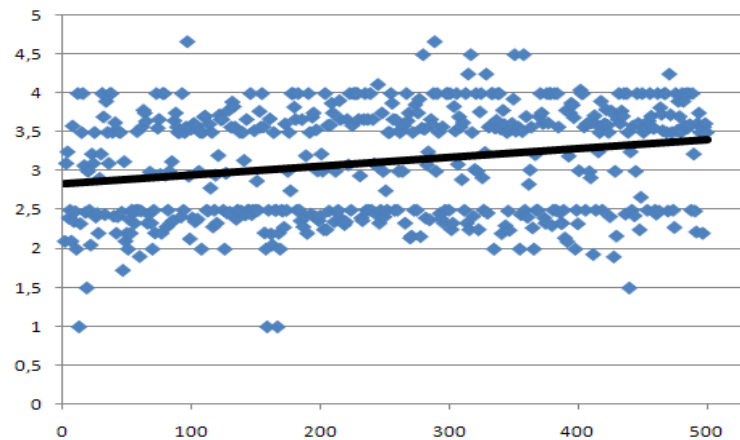


Figure 2: Example of the evaluating function initial output.

5. Portlets for social media analysis

The above described mechanism of the sentiment analysis will be incorporated into a set of portlets for social media analysis, which is being developed in collaboration with IBA CZ on a platform of the Liferay enterprise portal. These portlets combine three basic analytical views on the social networks and the discussion forums. They are:

- Cluster analysis,
- Network analysis,
- Time series analysis.

In the cluster analysis, the data (discussion posts) is grouped into clusters based on their attributes, such as topics, keywords, author, creation time or sentiment in the text, and then displayed as 2D or 3D maps, data cubes and projections of clusters on the plane. This view is primarily used in portlets for the determination and visualization of main discussion topics, the similarity (closeness) of topics and the amount of posts.

The aim of the network analysis is to show the participants of the discussion, what they are talking about and to what extent. The data can be viewed from different angles, such as the topic of discussion, author or the development in time. Individual graphical outputs usually combine multiple views. For example, a spectrograph can demonstrate branching of the discussion in time, the intensity of communication (line thickness) and the sentiment (color), or possibly some other monitored variable (author, topic).

The purpose of the time series analysis is to identify the trends in text data. In particular, this means to determine the subjects of the discussions and the public interest in a specific topic in order to predict future development. A stand-alone type of the time analysis is establishing sentiment in the discussions. The sentiment can be established for individual (sufficiently long) posts or entire threads where it is subsequent.

6. Conclusion

The above described tool evaluates the sentiment using statistical functions, while the outcome depends on how well the system is taught, i.e. how the knowledge base is created. Although the fact

that the base is created every time for each domain area and for the type of the sought sentiment increases the demands on the system, it also improves the evaluation success rates.

The system is currently in a testing mode and its recognition success rate ranges, depending on the quality and the size of the knowledge base used and on the complexity of evaluated texts, from 65% to 95%.

As for further steps, it is planned to create robust knowledge bases that will be exploitable for marketing purposes in sentiment evaluation in specialized discussions. Creation of knowledge bases for other European languages is also being considered. Given that the system is based on statistical methods and that it uses only minimal knowledge of the natural language analysis area, the transition to other languages should be manageable.

7. References

- Klöckner, K. (2010), Cooperation Support: A Multidisciplinary Challenge in a Difficult Word. Jindřichuv Hradec, SEP 08-10. In IDIMT-2010: Information Technology - Human Values, Innovation and Economy 18th Interdisciplinary Information Management Talks, Linz: UNIVERSITÄTSVERLAG RUDOLF TRAUNER, 2010, Book Series: Schriftenreihe Informatik Volume: 32, pages: 363-366. ISBN978-3-85499-760-3.
- Kopeček, I., Ošlejšek, R. (2008), Creating Pictures by Dialogue. In Computers Helping People with Special Needs: 10th International Conference, ICCHP 2006. Berlin: Springer-Verlag, 2006. p. 61-68, 8 pp. ISBN 3-540-36020-4.
- Hančlová, J. (2008), Comparative Properties of Structural Macroeconomic Modelling. High Tatras, Slovakia, SEP 05 - 07. In Proceedings of the International Conference Quantitative Methods in Economics (Multiple Criteria Decision Making XIV) 28th International Conference on Mathematical Methods in Economics, Bratislava: IURA Edition spol. s r.o., p. 70-75, 6 pp. ISBN: 978-80-8078-217-7

ANALYSIS OF EFFECTIVENESS OF SELECTED SOCIAL MEDIA

Peter Dorčák

Department of Marketing and International trade
Faculty of Management
University of Presov in Presov
dorcak@ezo.sk

František Pollák

Department of Marketing and International trade
Faculty of Management
University of Presov in Presov
Frank.Pollak@acuityeng.com

Abstract

The aim of the paper is to verify the effectiveness of selected modern means of communication on a selected online shop of a real brick and mortar company from the environment of small and middle-sized business in the Slovak market and, at the same time, compare results of the research carried out with the same research conducted in previous year. Selected marketing communication tools used in the research have focused on increasing traffic of the selected online shop. Analyzed relationships were then compared on a year on year basis.

Keywords

Internet Marketing, Social Media Marketing, Social Networks

1. Introduction

First, it is necessary to define the key concepts and relationships from the perspective of authors writing on the subject.

1.1. Social media marketing

Social media marketing is a relatively new trend in internet marketing and it is an enormous change, which all businesses have to accept. The change is in that internet advertising, which businesses were accustomed to, is not enough to promote products or brand. Marketing communication must involve social media, popularity of which is constantly growing among potential customers (socialmediamarketing.co.in).

Social media are thus becoming potent weapons of the current Internet. Their advantage is in that they provide an ample space for creativity and ideas, which are then spread among the users

themselves. The real power of social media is in creating community around a product or a brand and its active involvement. The reward can then be a substantial increase in the number of displays of the target website or in the growing number of links (Fedorko, 2010).

The current social media include:

- blogs
- microsites
- social networks
- wiki systems
- sharing videos and photos
- discussion forums
- podcasting and others (Škutková, 2010).

In the following section, social networks, which have an increasing impact on consumer behaviour, will be dealt with in more detail.

1.1.1. Social networks

Social networks - The Internet is becoming increasingly more personal. Thanks to its capabilities and functions it slowly pushes out traditional media and becomes a challenge for application of new trends in communication, but also in business. Its use brings many advantages, including the fact that we can search there for potential customers in a concentrated form – on online social networks. Their essence is the social relationship between individual participants in social networks and their mutual relationships. Social networks can thus be seen as a map of all possible, available dependencies between individual participants in social networks (Rajčáková, 2009).

Currently the popularity of social networking is huge in particular among young people, but the popularity is also growing among elderly population. Social networks can be regarded as a kind of new generation medium. They combine the advantages of blogs, chat, email, file sharing and other web applications, creating a strong foundation platform for online communication and collaboration of millions of users. They are also ideal for maintaining or making new contacts. It would be hard to find a better universal means for keeping personal connections with old friends, customers, suppliers and business partners. Social networks can also help to attract new customers or to get interesting opportunities (Delina, Tkáč, 2010). It turns out that social networks are also ideal for sharing useful information and promoting opinions, business activities, actions, projects (Vlach, 2009). Social networks have therefore attracted attention of businesses and other entities that seek to find new ways and means of communication. Companies create profiles for their products, follow discussions about their brands, organize informal marketing researches or acquire a database for promotional purposes on community portals (Delina, 2009).

2. Methods

2.1. The research object

The research object is the online shop of the company EZO.sk s.r.o. Using selected internet marketing tools we have tried to raise awareness among potential customers about the online shop and also increase its traffic and growth in number of orders.

2.2. The main purpose

The main purpose of this research is to verify the effectiveness of new low-budget promotional possibilities using modern means of communication such as email, blogs, social microsites and social networks. Also, the aim is to compare research results with the same research from March 2010 using secondary data.

2.3. Research Methods and Procedures

Research realization - The research task was conducted during the month of March 2011 in which 50 students of the Faculty of Management of Prešov University, Department of Marketing were involved. During that month, they were to comply with the same instructions set by the executor of the research, as in March 2010. Instructions were divided into 3 parts:

2.3.1. Word of mouth (WOM)

Students were to spread the good word about the online shop of EZO.sk s.r.o. The following were used for spreading the good word among friends and family members:

- email - email contained a personal recommendation with a link to the online shop,
- personal recommendations - concerned selected products of the company, but also the online shop itself, which were spread among friends, relatives, family, etc. (Fedorko, 2010).

2.3.2. Social network

Facebook, the most popular social network in Slovakia was chosen for this research task. Selected students were associated in a closed Facebook group called "Workgroup". Students were given specific tasks and instructions which were to be fulfilled within the working group. Tasks were divided as follows:

- for the purpose of this research students were to join an existing Facebook group called "We love hot and fragrant bath" and distribute invitations to their friends and acquaintances to join this group,
- repeatedly (at least once per 3 – 4 days) share a link on their personal Facebook profile page to:
 - any product from the online shop of EZO.sk s.r.o.
 - link to the Facebook group called "We love hot and fragrant bath".

2.3.3. Blog

This task consisted of creating a blog or a microsite, which name and description was associated with key words like esoterics, aromatherapy, sea salt or magnesium salt, natural thermoform, home spa, bath oil, books on esoterics and others. Students were to place these sites or blogs on selected websites such as Blogger.com or eStranky.sk.

The blog contained:

- a short article on effects of selected products available in the online shop. At the same time it was to draw their attention to the Facebook group "We love the hot and fragrant bath"

- place a link on the online shop in the section called Favourite pages (Fedorko, 2010). Students were to promote their blogs via email messages and their Facebook profiles (Fedorko, 2010).

3. Results and Discussion

Evaluation of research will gives us an overview of traffic analysis of the selected e-shop, in which we followed:

- total site traffic,
- traffic sources,

3.1. Traffic analysis - total attendance



Figure 1: Development of the total attendance, Source: Google Analytics

The first analyzed indicator of the realized research is total attendance. This is the most basic tool of measuring the effectiveness of website promotion. It gives us an idea of how many users visited the website during the studied period of time. Compared with last year's results there was a decrease in total traffic from 3,148 to 2,904 visits, which in percentage terms, means a decrease by 7.75%. Similarly, the number of average daily visits decreased from 101.55 to 93.68 visits per day. Decrease in traffic can be attributed to decreased activity of the research participants, as the research sample was not identical with the last year's sample. If we take a closer look at the total traffic curve development, we can see that unlike in the past period, there was no sharp increase in attendance. The trend curve is rather continuous without any significant fluctuations. The moderate increase occurred only in two cases: at the beginning of the studied period, which was due to increased activity of the research participants, and in the first two days since the launch of the competition.

3.2. Traffic analysis – traffic sources

Traffic sources are access channels, from which visitors come to the studied online shop site. The figure below provides an overview of shares of individual sources in total traffic. The highest mediated attendance came from the social network Facebook, which was also reflected in the annual percentage increase of mediated visits. While in 2010 the proportion of mediated visits was 51.4%, this year they accounted for 57%. Search engines follow with 27%. Last year their share was 19.5%. The smallest share in the total traffic has direct visits with 16% (last year the share of direct visits on the total traffic was 29.2%).

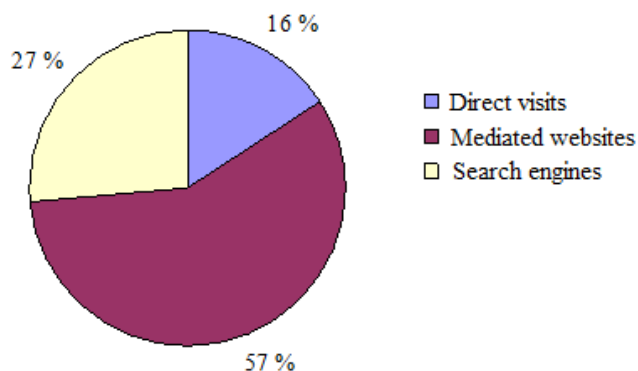


Figure 2: Share of individual traffic sources, Source: Google Analytics

The following figure provides an overview of how individual sources accounted for the total traffic.

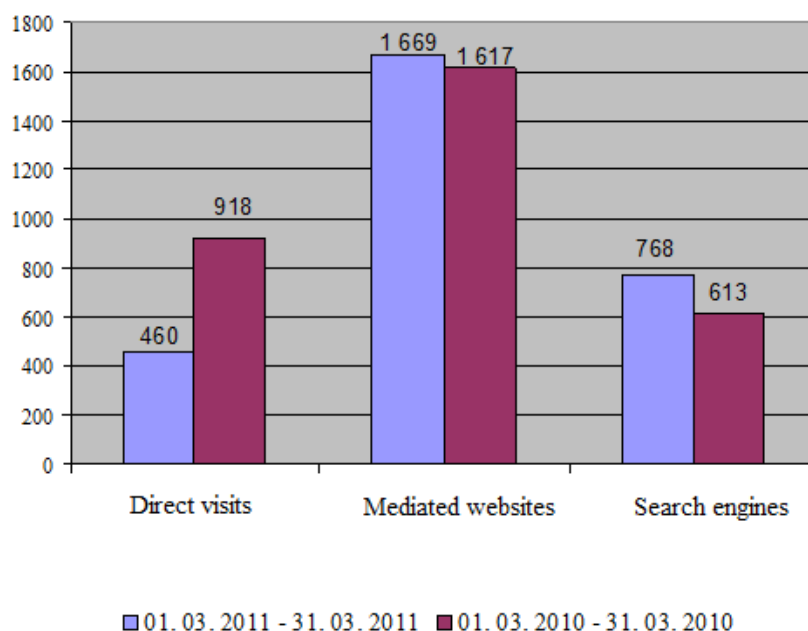


Figure 3: Overview of main traffic sources, Source: Google Analytics

Medium/source	Visits	Website/	visits	Average time spent on the site	New visits
Facebook					
1.3.2011 - 31.3.2011	1,510	3.25	0:02:08	62.85%	48.81%
1.3.2010 - 31.3.2010	1,362	2.84	0:01:57	65.57%	55.36%
Difference in %	+ 10.87%	+ 14.32%	+ 9.43%	- 4.14%	- 11.83%
Direct visits					
1.3.2011 - 31.3.2011	460	5,09	0:04:10	78.91%	34.57%
1.3.2010 - 31.3.2010	918	4.83	0:03:10	68.52%	45.42%
Difference in %	- 49.89%	+ 5.34%	+ 31.54%	+ 15.17%	- 23.91%
Google search engine					

1.3.2011 - 31.3.2011	610	4.81	0:02:00	78.69%	54.43%
1.3.2010 - 31.3.2010	599	4.28	0:01:43	86.14%	62.60%
Difference in %	+ 1.84%	+ 12.44%	+ 16.99%	- 8.61%	- 13.06%

Table 1: Overview of main traffic sources, Source: Google Analytics

It turned out that most visitors come from mediated websites which apart from Facebook include blogs or microsites that research participants were to create as part of the set tasks. As we can see on the figure 3, there was only a slight increase in comparison with the previous results. A slightly higher increase was recorded for search engines, which form a kind of access channel to the studied website. In spite of the fact that even in this case Google search engine became the most widely used search engine, it recorded the highest year on year decrease by almost 20% at the expense of another search engine Seznam.cz. We found that the proportion of visits from the search engine Seznam.cz rose to 158 visits. Table 1 provides a more detailed overview of individual sources where the social network Facebook was analyzed in more detail from among all of the mediated websites.

Based on this year's and last year's results we can see that all three traffic sources showed a positive trend in the average number of pages per 1 visit, with an average time on the website and at the leaving rate. It turned out that most visitors come from the social network Facebook, which was due to activity of research participants within that social network where they were to place their blogs and promote selected products from the online shop. Comparing to the previous period activities on Facebook also show other positive results. In addition to the higher number of visits coming from Facebook, other studied parameters also increased, with the exception of new visits which annually decreased by 4.14%. Direct visits are another analyzed traffic source. While in 2010 they represented the second most used source of visitors just after Facebook, in this case, direct visits qualified for third place. From among the three sources they recorded the highest year on year decrease by almost 50%. The reduction may be caused by the above mentioned activity on Facebook, which mediated the access of visitors to this website. The good thing is, however, that all other parameters of direct visits showed better results than in the previous year. The highest increase of almost 32% was in the average time spent on the site, which grew exactly by 1 minute. Similarly, the proportion of new visits showed an improvement of over 15% and from among other sources new visits had the highest percentage. Leaving rate also showed similar improvement when it decreased to 34.57%. At the same time it was also the lowest leaving rate for other sources of visits. Within the sources of visits we focused on the parameters of the most widely used search engine Google. In comparison with last year's 601 visits it recorded a slight increase by 1.84%.



Figure 4: Share of visits coming from Facebook in relation to all visits, Source: Google Analytics

Figure 4 reflects development of the total traffic and also the development of traffic coming from Facebook. The traffic from Facebook copied the development of the total traffic during the whole period. When the total traffic increased the traffic from the social network increased and vice versa. The power of Facebook did not only reflected in the fact that, once again, it had the highest

proportion of mediated visits over the given period, but it also became the largest source of total visits with the share of 52%, while in 2010 it's share on the total traffic was 43.27%.

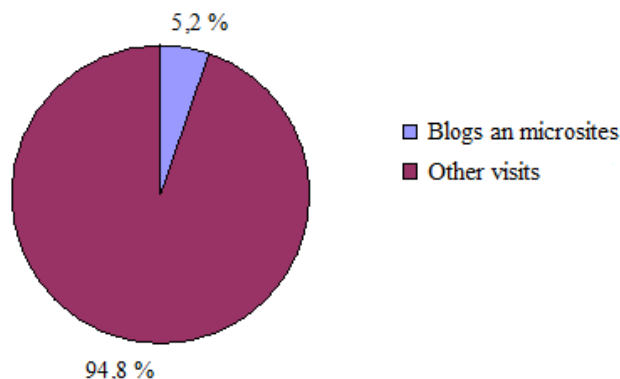


Figure 5: Share of microsites and blogs on the total traffic, Source: Google Analytics

Created and promoted blogs and microsites were another potential source of traffic. Using these tools the research participants were to spread the good word about the online shop and recommend the selected products in the form of short and eye-catching articles. Their task was to share blogs or microsites on their Facebook walls. Nevertheless, we observed decrease in the share of these tools on the total traffic. Compared with last year, when their share of total traffic accounted for about 7.9% this year, their share fell to 5.2%, which represents a year on year percentage decrease of around 30%. This may have been caused by smaller activity in sharing blogs and microsites by research participants, or insufficiently motivating character of statuses through which the research participants promoted their blogs and microsites.

4. Summary

The article discusses the issue of new trends in advertising with an emphasis on online and social media marketing. The aim was to test the effectiveness of selected modern means of communication - emails, blogs, microsites and the social network Facebook. At the same time, our goal was to compare the obtained research results with the results of the same research carried out in March 2010 using secondary data. Efficiency of selected means of communication was verified through the online shop of the company EZO.sk. Although we failed to increase the traffic of the monitored online shop compared with last year, we did record other significant and positive facts. For example, these may include lower leaving rate of the online shop's returning visitors, as well as higher number of pages viewed within the various sections of the online shop, from which we can conclude that visitors paid more attention to them. Besides the above positive results certain negative facts were recorded in some cases. Decrease in the overall website traffic and higher leaving rate of new visitors can be included among them. To conclude, we would like to state that in times of tough competition, it is not enough just to start offering a high-quality product on the market without its proper promotion. Conventional media of advertising messages such as flyers, billboards or posters, which attack us from behind every corner, can instead of the desired effect - drawing our attention, cause the opposite effect, even though companies invest considerable financial resources in them. This is also the reason why marketers have begun paying more attention to marketing communications in conjunction with the surge of Internet and social media in recent years, importance of which continues to grow today. In addition to providing companies with the opportunity to reach target segments, social media also fulfil requirements on a low-cost

promotion. The issue of using social media for marketing purposes also shows to be an interesting and promising area for further investigation.

5. References

- Delina, R. (2009). Reputation building for electronic marketplaces. In: *Ambient Intelligence Perspectives*, Vol. 1., 2009, p. 66-72. ISSN 1875-4163
- Delina, R.- Tkáč, M. (2010). Trust building mechanisms for electronic business networks and their relations to eSkills, In: *World Academy of Science, Engineering and Technology*, Vol. 6, no. 71, 2010, p. 380-390. ISSN 1307-6892
- Fedorko, R. (2010). Model marketingového mixu v aplikácii na vybraný sektor podnikania : diplomová práca. Prešov, PU FM, 2010. p. 92.
- Rajčáková, E. (2009). Podstata a význam „social networkingu“ pre marketing. In *Nové trendy v marketingovej komunikácii: zborník z medzinárodnej vedeckej konferencie*, Trnava, Fakulta masmediálnej komunikácie UCM, 2009. ISBN 978-80-8105-090-9, pp. 271 – 280.
- Social Media Marketing. [online]. [cit. 2011-01-07]. Available on the Internet: <<http://www.socialmediamarketing.co.in/>>.
- Soviar, J. – Krušínský, P. Marketing strategy of digital distribution in mobile communication - Case of: Sony-Ericsson's - PlayNowTM In *Journal of Information, control and management systems*. Volume 8, (2010), No. 4. Žilinská univerzita v Žiline – EDIS : Žilina, 2010. 415 – 420 s. ISSN 1336-1716
- Škutková, J. (2010). Marketing založený na sociálnych médiách. In *Stratégie* [online]. [cit. 2011-01-25]. Available on the Internet: <<http://www.strategie-marketingu.sk/2010/07/marketing-zalozeny-na-socialnych.html>>.
- Vlach, R. (2009). Sociální síť. [online]. [cit. 2011-01-27]. Available on the Internet: <<http://navolnenoze.cz/blog/socialni-site/>>.

Socio-economic Aspects of Digital Business Economics

TRUST BUILDING ELECTRONIC SERVICES AS A CRUCIAL SELF-REGULATION FEATURE OF DIGITAL BUSINESS ECOSYSTEMS

Radoslav Delina

Department of Banking and Investment

Faculty of Economics

Technical University of Kosice

radoslav.delina@tuke.sk

Abstract

In the field of digital business environment/ecosystem, the self-regulation feature plays crucial role. ICT support biological and sociological phenomena through efficient electronic services. One of the main roles is building and enhancing efficient relationships between actors within the ecosystem. Problem of interaction between commercial subjects depends on expected benefits/utility. These expectations are predictors of successful result from realized transaction with potential partner. And this predictor is based on trust and trustworthiness. The paper presents trust as crucial factor for cooperation and discusses specifics of trust building mechanisms in e-cooperation within digital business ecosystem. Together, it is discussed synergy effects between several trust building mechanisms.

Keywords

Trust, Trust Building, Inter-Organizational Trust, Strategy, Synergy

1. Digital business ecosystem

First research effort focusing on the Digital Ecosystems theme started around 2002 when the eEurope 2002 action plan established the term digital Ecosystems and a DBE research community. This was immediately supported by the first EU FP6 funded integrated research project – the Digital Business Ecosystems project. The DBE project involved 20 partners in 9 member states and received over €10M funding, making it the largest EC research investment ever in Free / Open Source Software in ICT for E-Business.

From 2004, the DBE concept was supported also by other EU FP6 funded project e.g. OPAALS, SEAMLESS, CONTRACT etc. Generally, projects within cluster Technologies for DEs were focused on developing an open-source, peer-to-peer information technology system that can facilitate effective and efficient exchange among businesses and communities of interest, such as SME networks or academic research communities.

A Digital Ecosystem (DE) as a European concept is a digital infrastructure established with the aim of creating a digital environment for networking. This environment based on the properties of self-organization, self-adaptability, scalability and sustainability, inspired by natural ecosystems should be capable of supporting co-operation, knowledge sharing, the development of open and adaptive

technologies and evolutionary business models (Nachira and Louarn 2007). Some of the basic features of digital ecosystems support collective learning development, efficient knowledge flow and innovation creation and implementation across SMEs and other actors within the ecosystem.

The digital ecosystem provides the advantage of ICTs in term of enhanced dynamic interaction (cooperation and competition) in network environment by networking of numerous and diverse actors (small & medium-sized and large enterprises; government and local administrations, training and learning institutes, innovation and research centers). Through natural ecosystem features it is able to produce comprehensive innovation and economic development.

Self-organizing feature is responsible for dynamic adaptation of the ecosystem to the environment with fluid, amorphous and transitory structures of collaboration and cooperation. As each ecosystem, also the success of DE development and sustainable growth depends on interactions between actors.

The Digital Ecosystem concept developed and promoted by the Digital Ecosystems Community distinguishes itself on the basis of its open source and peer-to-peer nature – a loosely coupled server system (Nachira and Louarn 2007). This makes it ideal for SMEs:

- It's open source philosophy makes it free
- It requires minimal ICT resources
- It requires minimal investments by the SMEs
- It is adaptable to SMEs' existing applications and business models.
- It provides a more secure digital environment for sharing and exchanging sensitive knowledge
- It involves no central control, no single point of failure, no dominant position, no pre-defined business model

One of the crucial systemic features of DE is self-regulation and self-adaptation. DE's feedback mechanisms maintain the components of the system in one or other of its equilibrium state. An equilibrium state demonstrates the stability of ecosystems. However, the components of ecosystems are still in dynamic exchanges. Ecosystems tend to cycle between states of change and stability and are looking for cycling stability. Together, different ecosystems of different parameters are in some way interconnected and determined each other what also impact the equilibrium state.

Self-regulated and self-adaptive systems work in a top-down manner. They examine their own global or local behavior and modify it. The signal for modification is indicated by the status, when it is not accomplishing what the system was intended to do, or when better functionality or performance is possible.

In the field of digital business environment/ecosystem, the self-regulation feature plays crucial role. ICT support biological and sociological phenomena through efficient electronic services. One of the main roles is building and enhancing efficient relationships between actors within the ecosystem. Problem of interaction between commercial subjects depends on expected benefits/utility. These expectations are predictors of successful result from realized transaction with potential partner. And this predictor is based on trust and trustworthiness. According to Fukuyama (1995), to increase and maintain high level of trust leads to sustainable growth and development.

2. Trust as the social component for economic development

Although some experts examine trust only from security aspect (Prins, J.E.J. et al., 2002; Salam, A.F. et al., 2005; Doucek, 2008), the trust has been often proclaimed as a valuable socio-economic asset. It plays a role as an important driving factor to an effective and efficient inter-organizational collaboration. In many studies, trust impacts on transaction costs reduction and allows greater flexibility to respond to changing market conditions (Barney, Hansen, 1995; Dore, 1983; Dyer, 1997). Together, it supports efficient information sharing standards improving coordination and joint efforts to minimize inefficiencies (Aoki, 1998; Clark, Fujimoto, 1991; Nishiguchi, 1994). It can also provide investments in transaction or relation-specific assets' which improve productivity (Asanuma, 1989; Lorenz, 1988; Dyer, 1996). Some other studies even claim that national economic efficiency is highly correlated with the existence of a high trust institutional environment (Fukuyama, 1995; North, 1990; Casson, 1991; Hill, 1995). For example, Fukuyama (1995) argues that the economic success of a nation depends on the level of trust inherent in the society.

Several other studies contend that e-commerce cannot fulfill its potential without trust (Jones, Wilikens, Morris, and M. Maser, 2000; Farhoomand, Lovelock, 2001; Raisch, 2001). Lee and Turban (2001) highlight lack of trust as the most commonly cited reason in market surveys why consumers do not shop online. The reason for this is that online sellers are not well known to the consumers, the consumer has no opportunity to physically examine the product before buying, and the consumer cannot protect any sensitive private or financial information that the seller receives. In research on e-commerce, trust is regarded as a mental short-cut to a buying decision, where the buyer is faced with the uncertainties of product quality and vendor reputation together with appropriate fund transfer (Lee, Turban, 2001).

Trust among partners is one of the most important factors that decide whether the cooperation of companies will occur and in case it occurs, if it will be successful. From several researches and reports conducted in recent years, the set of mechanisms needed for trust has been identified. This set needs to be analyzed with regard to the level of significance to trust building, especially for e-business networks.

One of the recent initiatives focused on cooperation improvement among companies was FP7 SME Research project eBEST. Its goal was to set up, experiment and promote the adoption new collaboration practices within business ecosystems and create ICT platform to facilitate this adoption. One of the most crucial functionalities areas is based on trust building, esp. reputation building mechanisms. Our research, conducted in eBEST, was focused on analyzing different trust building mechanisms and their added value for increase of trust. On the base of the research we have identified and proposed most efficient trust building mechanisms for eBEST platform to ensure improved, trusted and effective collaboration environment.

Generally, each relation is based on trust and loyalty. Trust building and loyalty are based on willingness to give to other subject what he is looking for. It is visible in business and also in social relations. Trust is considered in different research disciplines as the basis for successful human relationships. In business environment, the trust is critical factor of cooperation and cooperation is basis for ecosystems. From this point of view, the trust is the facilitator of effective business transactions (Williamson 1993; Noteboom 1996) and it can increase customer's satisfaction (Dwyer, Schurr et al. 1987; Ganesan 1994; Morgan and Hunt 1994; Doney and Cannon 1997; Geyskens, Steenkamp et al. 1999). Together, it helps companies to reduce the risk related with opportunism in exchange relations (Morgan and Hunt 1994; Pavlou 2002). Generally, the trust allows cooperative behavior within organization, between organizations and in the relation to final consumer (Hennart 1988; Morgan and Hunt 1994; Noteboom 1996; Parkhe 1998; Lewis 1999;

Brower, Schoorman et al. 2000; Child 2001; Chami a Fullenkamp 2002; Boersma, Buckley et al. 2003). The trust can serve as the source of competitive advantage (Barney and Hansen (1994) and it has impact on several economic indicators as transaction cost reduction, sustainable growth, price premium (Fukuyama 1995, Ba and Pavlou 2002, Dorčák, P. and Pollák, F. 2011).

The trust is social phenomenon. It contributes to social coordination and is considered as substitute of information about other players on the market, esp. in the environment of “virtual anonymity”. The concept of trust and its definition was analyzed by many authors and many times from different perspectives and socio-economic domains (Endress 2002, Rousseau, Sitkin et al. 1998; Shockley-Zalabak, Ellis et al. 1999; Fukuyama 1995; Doney, Cannon et al. 1998; Ashraf, Bohnet et al. 2004, Lewis and Weigert 1985; Lewicki and Bunker 1995; McAllister 1995; Mishra 1996; Tschannen - Moran and Hoy 2000). Many of them define the trust as positive expectations and willingness to be vulnerable (Rousseau, Sitkin et al. 1998; Shankar, Urban et al. 2002; Ferrell 2004, Lewis and Weigert 1985, Jones and Morris 1999). These positive expectations were defined by Barney and Hansen (1994) as belief of actor A that actor B will act consistently for benefit of actor A. Mayer, Davis and Schoorman (1995) differentiate the trust from past experiences and final results of cooperation (Pavlou 2002).

According to Ganesan (1994), trust consists from two elements: credibility and benevolence. The credibility Cognitive-based trust or "credibility" is a belief, sentiment, or expectation about partner's trustworthiness determined by his competences, reliability or dependability. Affect-based trust or "benevolence" is a purpose or behavior that is based on dependence on the partner and involves vulnerability and uncertainty on the part of the trustor. Benevolence is about partner's intention and motives to be a beneficial to other side in new situation, where no previous transaction between partners exists.

If we take into account mentioned approaches to trust definition but with the character of electronic business networks with added services possibly provided by external service providers integrated into the platform we can develop our definition. It will better represent our research and practical problems in this field:

“Trust is objective and subjective quantifiable confidence of trustor in some level of competence, truth, security and reliability of other subject or in third party in the specific context built on the base of historical activities and functionalities of environment. “

This definition contains not only interaction between business partners but also in functionalities of environment, where these interactions are created and together, in ability of the environment to manage and maintain these interactions. Managing and maintaining of interactions related to an ability of solving trust disruption and restoring its status.

3. Trust and ICT

Trust in information and communication technology (ICT) is an important concept. Nowadays, people depend on ICT more than ever before. The Internet has emphasized world's dependence on IT by using huge amount of SW application, media, general information etc. (Pollák, F. and Dorčák, P. 2010).

Trust in ICT is similar to the trust within human interactions. The main difference according to McKnight and Chervany, (2001-2002) is in the object of trust, it means the trust of people into a specific technology. But one more important difference exists. It is the feature of trust asymmetry. You are able to build trust into the technology, but technology cannot build the trust into you. It is an important issue, as social-human version of trust is symmetric; it depends on actions and

reactions on both sites. If one person trusts another and the second person trust into the first one, the trust relations are built. In ICT we have only one side trust and whole trust depends only on the first impression of technology. Whole dynamics absents.

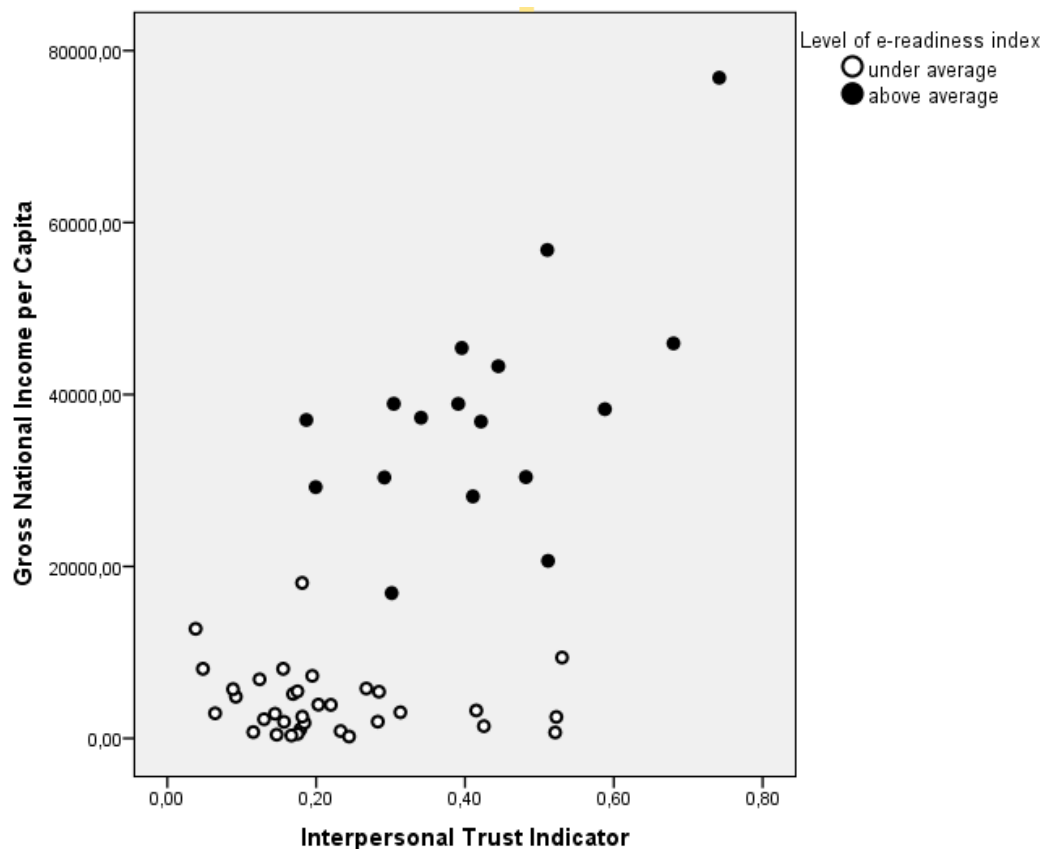
According to McKnight (2005), both an information technology and a person have similar concept of quality of competence in terms of what they can do. Trust in a person's competence is based on prediction that the person has the capability to realize the transaction or activity with responsibility. Trust in an IT's competence is based on expected functionality to realize tasks the trustor wants to do. But the reality is not so simple. If we have two groups of people and one sophisticated and complex technology or SW solution, one group with intention to innovations will trust the technology but second group will still have barriers to trust the technology, although the technology provides all efficient functions which are required. The nice example related to trust in trust building mechanisms is provided later.

Trust in information and communication technology determines use and adoption of a ICT. On the other hand, ICT can be a facilitator of the value of trust. ICT makes things transparent, information more reliable and timely.

When we are analyzing the role of interpersonal trust (country level data from World Value Survey) in economic performance (gross national income from World Bank), and analyzing the role of the ICT in this relationship, after implementing third parameter (e-readiness index by EIU - Economics Intelligence Unit), we see on graph 2, that it divides clearly countries on two groups. The E-Readiness Index is a tool to measure the capacity of a population to use ICTs by looking at how many people have the necessary skills and by identifying how they are currently used. From the graph 1 we can see that countries under average value of e-readiness show no relation between GNI and trust (based on data between years 2004 - 2009). But, the second group with higher e-readiness index show, that by increasing interpersonal trust we see also increasing GNI. It means, e-readiness or ICT usage clearly divides countries with high GNI sensitivity on trust from countries, where trust plays no role in achieving higher GNI.

It can provide interesting information about the role of ICT in trust value. Is it possible to have so significant impact of ICT on trust significance? According to the graph – yes! We can assume that ICT is the crucial factor between trust and GNI. ICT allows the trust to be more sensitive on economic performance as without ICT. It can be based on gaining better transparency, networking and efficient information saturation on the internet and new ICT network technologies.

Interpersonal trust phenomenon is visible in all areas or domains of life. In business environment, according to some studies, interpersonal trust is important for achieving benefits in supply chain processes as negotiation. According to Zaheer et al. (1998), interpersonal trust is important for the development of inter-organizational trust. In other literature, the impact of interpersonal trust on inter-organizational trust has implied significance. In the case of micro and small companies, inter-organizational trust is significantly related to trust between individuals in the company (Howorth, Westhead, & Wright, 2004; Larson, 1992; Sapienza & Korsgaard, 1996). Although, characters and performance outcomes of these two types of trust are different, generally, all's about the people (Zaheer et al. 2006).



Graph 1: e-Readiness as a driver for economic value of trust (2004 – 2009 data)

Although, a significant amount of literature on trust in an organizational context exists, especially in interpersonal trust, academic work specifically dealing with ICT role in inter-organizational trust is a more limited area of research.

The role of ICT in trust relations is visible also in inter-organizational business relations. Trust in C2C or B2C auction sites is usually linked with the term of rating, in B2B supply chains can be linked with supplier performance measurement which aggregate several evaluated areas into one rating or maps of key performance indicators. Although, the trust is more than ratings or evaluation of partner's behavior. It is possible to build trust also by services assuring, supporting, controlling or correcting different activities done by the company in the environment of digital business ecosystems. Trust building mechanisms (services) are changing through ICT support. Electronic environment is able not only to record and monitor whole information/data flow, but it is able to support better decision making in business processes, increase transparency of environment, improve effectiveness and efficiency of escrow services, online dispute resolution or other mechanisms. ICT seems to have crucial role in increasing value of trust in economics and business.

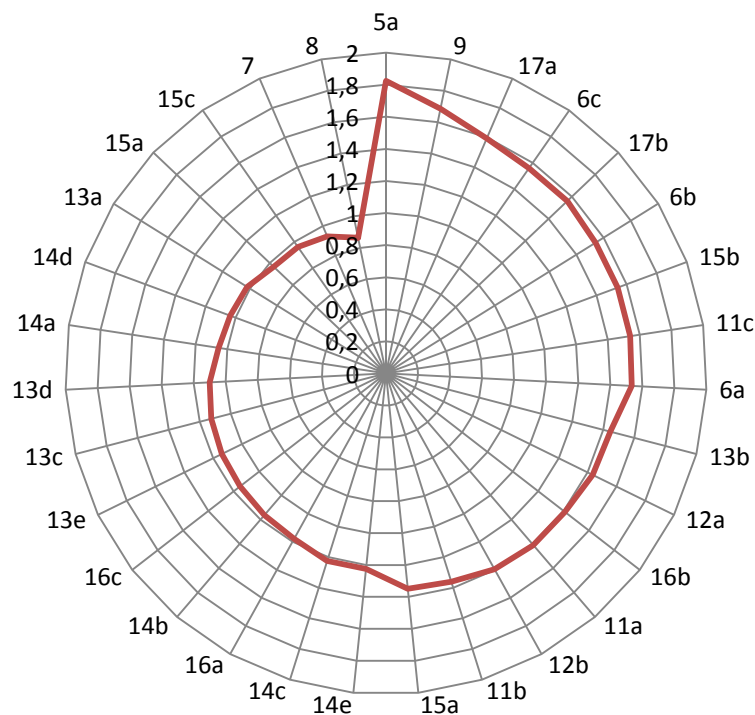
3.1. Trust building mechanisms for Digital Business Ecosystems

To enhance trust and basic trust marks, the several elements for improving confidence and generally supporting trust building in e-business were identified within our two projects eBEST and VEGA. Each general trust building area was decomposed into several implementation trust building strategies with different level of complexity, from simple to more complex. Each implementation strategy (concrete service or functionality) is numbered for graphical presentation of analysis results (Graph 2). The most interesting strategies or functionalities we have analyzed in our two projects are:

- *information quality*, where it must be ensured that information are correct, valid, up-to-date and potentially validate by third trusted party; trust building mechanisms (functionalities) were identified:
 - 5a Contact information; 6a Description of company's focus; 6b Product/service categories; 6c Detailed product/service description; 7 Company size; 8 Year of foundation; 9 Status of business activity,
- *certificates and references* to provide quality labels and information about past activities – partners or business information:
 - 11a National level certificates or marks of companies on the local market; 11b National level certificates or marks for foreign companies; 11c Known international established certificates; 12a List of important business partners; 12b List of conducted business,
- *reputation building* – to build credibility through ratings, feedbacks, discussion forums; e.g.:
 - 13a Positive-only feedback from the partners; 13b Positive and negative feedback from the partners; 13c Discussion forum; 13d Reports with aggregated historical data about the platform business activities of the company; 13e Rating presented as a simple symbol,
- *contract execution support* – support to create a legally enforceable agreement in which two or more parties commit to certain obligations in return for certain rights (Reinecke, Schoell, 1989). Efficient support of contract execution support can be achieved for example through contract clauses databases integration with data flow support. Trust building mechanisms (functionalities) considered:
 - 14a The integration of business negotiation outcomes into the contract; 14b Contract negotiation process tracking and recording; 14c Basic contract clauses and templates; 14d Database/service with complex contract clauses for the fee provided by specialized company; 14e Explaining contract template clauses and conditions,
- *online dispute resolution support* (ODR) – is a branch of dispute resolution which uses information and communication technology to replace the traditional out of court processes to facilitate the resolution of disputes between parties. It primarily involves negotiation, mediation or arbitration, or a combination of all three supported by intelligent software solutions e.g. for automatic negotiation of penalties etc. Trust building mechanisms (functionalities) can be then implemented as:
 - 15a Advisory support - recommendation of ODR experts to users; 15b Technical support; 15c Limited ODR; 15d Outsourced ODR service by specialized company;
- *escrow services* (ES) – which reduce the potential risk of fraud (for example the breach of contract) by acting as a trusted third party that collects, holds and disburses funds according to buyer and seller instructions, e.g.:
 - 16a Internal basic escrow service; 16b Bank as the mediator; 16c Trusted Third Party,
- *standardization activities* – for ensuring standard, ethic and fair processes and behavior through code of conduct, interoperability in the exchange of business documents with multilingual support based on ontologies etc., e.g.:
 - 17a Multilingual support with standard terms; 17b Code of Conduct

How concretely these mechanisms are able to support trust building is more described in Delina, Vajda and Bednár (2007).

On the one hand, these trust building mechanisms supported by ICT in digital business ecosystem were identified as facilitator of trust (it means also intensity of cooperation between ecosystem actors) – services, which can improve functionalities for reduction of information uncertainty, unfair practices, improvement of contract condition assuring, execution and problem solving. All these services have to build trusted business environment for inter-organizational business cooperation. According to McKnight (2005), best functionalities provided best quality of e-services should be the most trusted. But as we see from the graph 2 (explanations of numbers are above in text), the most complex and high quality services are less trusted. The reason is that the people with no or little skills and experiences have barriers to trust complex services, difficultly understandable. So the argument, that in the technology area the quality of services is most important, can be not so strong, esp. in inter-organizational business relations.



Graph 2: Trust in trust building e-services (Note: values of trust were 0 – no significance, 1 – medium significance, 2 – high significance for increasing trust)

In this case, trust has one more element and it is past experience or skills with the technology. New technology are still barrier and avoiding this problem can be solved only by optimized and customized strategy of services implementation. For users with low level of e-skills it is necessary to provide more simple services and after some time of obtaining experiences to provide more and more complex mechanisms. We are dealing with two levels of trust here. One is the general problem of trust into new technologies; the second is the trust into new mechanisms building trust. According to logic, the people and companies should have no problem with the trust into services or mechanisms as they will provide them what they are looking for – mechanisms which will provide them reduced uncertainty and higher intentions to cooperation a benefits or competitive advantages obtaining. It is the paradox, when people in some way don't trust high quality trust

building mechanisms which are too complex. Together, it combines two opposite phenomena – problem of trust in new technologies and new way how to build higher trust.

On the other hand, synergies in trust building mechanisms can be found. When we consider trust building services as ODR or ES, these services are provided usually by independent subject, which can be also evaluated by rating or assured by third party. By using multiplicative trust through complementary trust building mechanisms we can talk about synergies in trust values. Optimal combination of trust building services creates higher trust for final trust building service in the trusted chain, e.g. if I need ODR for solving my contractual problems with my supplier I am able to select ODR provider according to his rating generated by previous ODR provider's clients. It will help me to trust more in this service as without rating or reputation building mechanism used. Conceptual model is provided below:

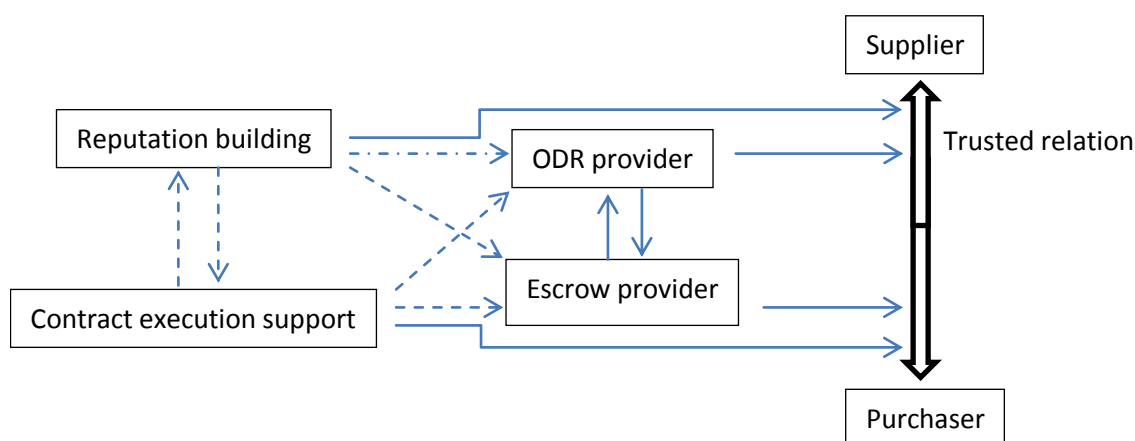


Figure 1: Conceptual model of synergy interconnections between trust building mechanisms

As we can see from the model, several trust building mechanisms can be determined by each other. Reputation building which contains ratings, feedbacks, references can support contract execution support by adding ratings or feedbacks e.g. to contract clauses used as template for new contract proposal by the company. Rating is generated according to experiences from users. Together, rating can be used for evaluation of ODR and Escrow providers to provide knowledge about satisfaction with their services to other companies in the ecosystem. Contract execution process monitoring, tracking and recording as a part of contract execution support mechanisms can support reputation by providing information about correct business processes or to provide necessary information for ODR provider as evidence for problem solving and final decision. Together, it can support escrow service provider with information-negotiated contract conditions to know, which conditions have to be fulfilled and how. Of course, each of them separately influence whole contractual life cycle between supplier and purchaser.

Using interaction between different trust building mechanisms or services it is possible to increase the value of trust for particular mechanism. The open issue and the main task is to find optimal way how to interlink particular trust building mechanism and build optimal trust building strategy to overcome barriers of users with little e-skills to start using more complex and more efficient trust building services on the electronic business platforms or generally digital business ecosystems.

4. Conclusion

Trust is a visible social phenomenon with still higher impact on economic environment. Not only financial crisis and trust reduction into financial institutions, but also trust between actors within

supply chains influence the economic performance of countries. Generally, trust can improve cooperation and reduce transaction cost with higher efficiency. On the other hand, the trust is based on credibility which can be much more supported by ICT, which can bring higher transparency, information access and efficiency of trust building processes. Very interesting example is digital business ecosystem, where network character with trust building mechanisms as self-regulating feature can be more efficient and effective environment as in physical world. To improve cooperation by new ICT functionalities we have found interesting issue, where new ICT based trust building mechanism is not as trusted as simple one. It seems, it depends on a level of e-skills, when higher level of e-skills means higher trust into more complex and innovative trust building mechanisms. One important factor can be used to support trust building mechanisms deployment in digital business ecosystems. It is synergy or multiplicative trust in cooperation processes, where new and complex trust building mechanisms can be supported by more trusted simple mechanisms as for example ratings. Interlinking and synergy relations between several types of trust building mechanisms or services can reduce barriers in adoption of these new facilitators of e-cooperation and achieving higher market efficiency in supply chains.

Acknowledgement

The research was realized within project eBEST “Empowering Business Ecosystems of Small Service Enterprises to Face the Economic Crisis” FP7-SME-243554-2 financed by European Commission and national project “Strategies of trust building on Single European Electronic Market” VEGA - 1/0679/10 financed by Ministry of Education, Science, Research and Sport of the Slovak Republic.

5. References

- Aoki, Masahiko. (1988). *Information, Incentives, and Bargaining in the Japanese Economy*, new York: Cambridge University Press.
- Asanuma. Banri (1989). ‘Manufacturer-Supplier Relationships in Japan and the Concept of Relation-Specific Skill’. *Journal of the Japanese and International Economies*, 3.1-30.
- Ashraf, N., Bohnet, I., Piankov, N., 2003. Is trust a bad investment? Working paper, Kennedy School of Government, Harvard University."
- Atif, Y. (2002). Building Trust in Electronic Commerce. *IEEE Internet Computing*, Jan-Feb 2002, vol 6, No. 1, pp. 18-24. ISSN 1089-7801
- Ba, S., Pavlou, P.A. (2002). Evidence of the effect of trust building technology in electronic markets: Price premiums and buyer behaviour. *MIS Quarterly*, September 2002, vol. 26, no. 3, pp. 243-268. ISSN 0276-7783
- Barney, J. B. and M. H. Hansen (1994). "Trustworthiness as a source of competitive advantage." *Strategic Management Journal* 15: 175-190.
- Barney, J. B. & M. H. Hansen (1995). "Trustworthiness as a Source of Competitive advantage." *Strategic Management Journal*. Vol. 15.175-190.
- Boersma, M. F., P. J. Buckley, et al. (2003). "Trust in international joint venture relationships." *Journal of Business Research*(56): pp. 1031-1042.
- Brower, H. H., F. D. Schoorman, et al. (2000). "A model of relational leadership: the integration of trust and leader-member exchange." *Leadership quarterly* 11(2).
- Casson, M. (1991). *The Economics of Business Culture*, Oxford: Clarendon Press.
- Clark, Kim B. & Takahiro Fujimoto (1991). *Product Development Performance*. Boston:Harvard Business School Press.

- Delina, R., Vajda, V., Bednár, P. (2007). Trusted operational scenarios: trust building mechanisms and strategy for electronic marketplaces [on-line]. August 2007 [August 2007]. Kranj: Moderna organizacija, 2007. 78 p. ISBN 978-961-232-205-2 <<http://www.seamless-eu.org/deliverables/TrustedOperationalScenarios.pdf>>
- Doney, P. M. and J. P. Cannon (1997). "An examination of the nature of trust in buyer-seller relationships." *Journal of Marketing* 61: pp. 35-51.
- Doney, P. M., J. P. Cannon, et al. (1998). "Understanding the influence of national culture on the development of trust." *Academy of Management Journal* 23(3): 601-620.
- Dorčák, P., Pollák, F. (2011). "Influence of virtual social networks on increase in sales in electronic commerce". In: Organizacija prihodnosti: 30. mednarodne konference o razvoju organizacijskih znanosti, Slovenija, Portorož, 23.-25.3.2011. - Kranj : Moderna organizacija, 2011. - ISBN 978-961-232-246-5. - P. 260-267.
- Dore, Ronald (1983). "Goodwill and the Spirit of iMarket Capitalism." *British Journal of Sociology*. Volume XXXIV, No.4.
- Doucek, P. (2008). "Applied information management - Management reference model - Security metrics". In CHROUST, G. -- DOUCEK, P. -- KLAS, J. (ed.). IDIMT-2008. Linz: Universität Linz, 2008, s. 81--106. ISBN 978-3-85499-448-0.
- Dwyer, F. R., P. H. Schurr, et al. (1987). "Developing buyer-seller relationships." *Journal of Marketing* 51(2): 11-27.
- Dyer, Jeffrey H. (1996). "Specialized Supplier Networks as a Source of Competitive Advantage: Evidence from the Auto Industry," *Strategic management Journal*, Vol. 17,4,271-292.
- Dyer, Jeffrey H. (1997). "Effective Interfirm Collaboration: How Firms Minimize Transaction Costs and Maximize Transaction Value." *Strategic Management Journal*. Vol 18:7, 535-556.
- EIU. Economics Intelligence Unit. The 2007 and 2006 e-readiness rankings. http://www.eiu.com/site_info.asp?info_name=eiw_2007_e_readiness_rankings&rf=0
- Endress, M. (2002). *Vertrauen*. Bielefeld. ISBN 3-933127-78-5
- EU Commission. (2002). Open consultation on "Trust barriers for B2B e-marketplaces" Presentation of the main results [On-line]. November 5, 2002
<http://europa.eu.int/comm/enterprise/ict/policy/b2bconsultation/consultation_en.htm>
- European Communities. (2007). Resources by sector [on-line]. 2007. <http://www.ebusiness-watch.org/resources/by_sector.htm>
- Farhoomand, A., Lovelock, P. (2001). *Global e-Commerce – Texts and Cases*. New York: Prentice Hall, 2001. ISBN 9780130612298
- Ferrell, O. C. (2004). "Business ethics and customer stakeholders." *Academy of Management Executive* 18(2): 126-129.
- Fukuyama, F. (1995). *Trust - The social virtues and the creation of prosperity*. New York, New York, Simon & Schuster Inc.
- Ganesan, S. (1994). Determinants of long-term orientation in buyer-seller relationships. *Journal of Marketing*, April 1994, Vol. 58, pp. 1-19. ISSN 0022-2429
- Geyskens, I., J.-B. E. M. Steenkamp, et al. (1999). "A meta-analysis of satisfaction in marketing channel relationships." *Journal of Marketing Research* 36(May): 223-238.
- Hennart, J. (1988). "A transaction cost theory of equity joint ventures." *Strategic Management Journal* .(9): pp. 361–374.
- Hill, Charles W.L. (1995). "National Institutional Structures. Transaction Cost Economizing, and Competitive Advantage: The Case of Japan." *Organization Science*. Vol. 6, No. 2.
- Howorth, C., Westhead, P., & Wright, M. (2004). Buyouts, information asymmetry and the family management dyad. *Journal of Business Venturing*, 19(4), 509–534.
- Chami, R. and C. Fullenkamp (2002). "Trust and efficiency." *Journal of Banking & Finance*(26): pp. 1785 -1809.
- Child, J. (2001). "Trust-The Fundamental Bond in Global Collaboration." *Organizational Dynamics* 29(4): pp. 274-288.

- Jones, S., Morris, P. (1999). Trust-EC: Requirements for trust and confidence in e-commerce. Technical Report EUR18749 EN, European Commission Joint Research Centre, 1999
- Jones, S., Wilikens, M., Morris, P., Masera, M. (2000). Trust requirements in e-business: A conceptual framework for understanding the needs and concerns of different stakeholders. *Communications of the ACM*, 2000, Vol. 43, No. 12, pp. 81-87. ISSN 0001-0782
- Larson, A. (1992). "Network Dyads in Entrepreneurial Settings: A Study of the Governance of Exchange Relationships," *Administrative Science Quarterly*(v. 37.76-104.
- Lee, M., Turban, E. A. (2001). Trust Model for Consumer Internet Shopping. *International Journal of Electronic Commerce*, 2001, Vol. 6, No. 1, pp. 75-91. ISSN 1086-4415
- Lewicki, R. J. and B. B. Bunker (1995). Trust in relationships: A model of trust development and decline. *Conflict, Cooperation, and Justice*. B. B. Bunker and J. Z. Rubin. San Francisco, CA, Jossey- Bass: pp. 133-173.
- Lewis, D. J. and A. Weigert (1985). "Trust as a social reality." *Social Forces* 63(4): pp. 967-985.
- Lewis, J. D. (1999). *Trusted Partners- How companies build mutual trust and win together*. New York, Simon & Schuster Inc.
- Lorenz, Edward H. (1988). "Neither friends nor strangers: Informal networks of subcontracting in French industry." in *Trust: Making and Breaking Cooperative Relations*. New York: Blackwell. pp. 194-210
- Mayer, R. C., Davis, J. H. and Schoorman, F. D. (1995). "An Integrative Model of Organizational Trust," *Academy of Management Review* (20:3), July 1995, pp. 709-734.
- Mayer, R. C., J. H. Davis & F.D. Schoorman (1995). "An Integrative Model of Organizational Trust." *Academy of Management Review*, Vol. 20. No. 3, 709-734.
- McAllister, D. J. (1995). "Affect- and Cognition-Based Trust as Foundations for Interpersonal Cooperation in Organizations." *Academy of Management Journal* 38(1): 24-59.
- McKnight, D. H. (2005). "Trust in Information Technology." In G. B. Davis (Ed.), *The Blackwell Encyclopedia of Management*. Vol. 7 *Management Information Systems*, Malden, MA: Blackwell, pp. 329-331.
- McKnight, D. H. and Chervany, N. L. (2001-2002). "What Trust Means in E-Commerce Customer Relationships: An Interdisciplinary Conceptual Typology." *International Journal of Electronic Commerce* 6(2), 2001-2002, pp. 35-59.
- McKnight, D. H., Cummings, L. L. and Chervany, N. L. (1998). "Initial Trust Formation in New Organizational Relationships," *Academy of Management Review* (23:3), 1998, pp. 473-490.
- Mishra, A. K. (1996). Organizational responses to crisis: The centrality of trust. *Trust in Organizations: Frontiers of Theory and Research*. R. M. Kramer & T. R. Tyler (Eds). Thousand Oaks, CA, Sage: 261-287.
- Morgan, R., Hunt, S. (1994). The Commitment-Trust Theory of Relationship Marketing. *Journal of Marketing*, 1994, Vol. 58, pp. 20-38. ISSN 0022-2429
- Nachira, F., Louarn, L.M. (2007). The Information Resource about the European approach on Digital Business Ecosystems [on-line]. 2007. <<http://www.digital-ecosystems.org/>>
- Nishiguchi, Toshihiro. (1994). *Strategic Industrial Sourcing*. New York: Oxford University Press.
- North, Douglass C. (1990). *Institutions, Institutional Change and Economic Performance*, Cambridge University Press, Cambridge, UK.
- Noteboom, B. (1996). "Trust, opportunism and governance: a process and control model." *Organizational Studies* 17(6): pp. 985– 1010
- Parkhe, A. (1998). "Understanding Trust in International Alliances." *Journal of World Business* 33(3): pp.219-240.
- Pavlou, P. A. (2002). "Institution-based trust in interorganizational exchange relationships: the role of online B2B marketplaces on trust formation." *Journal of Strategic Information Systems* 11: 215-243.
- Pollák, F., Dorčák, P. (2010). "Internet as the new mass media - traditional and new forms of internet advertisement." In: *Management 2010. (Part I.) : knowledge and management in times of crisis and ensuing development* / R. Štefko, M. Frankovský, P. Adamišin (Eds.). - Prešov : University of Prešov in Prešov, 2010. - ISBN 978-80-555-0257-1. - P. 456-463.

- Prins, J.E.J., Ribbers, P.M.A., van Tilborg, H.C.A., Veth, A.F.L. & J.G.L. van der Wees (Eds.) (2002). *Trust in Electronic Commerce: The role of trust from a legal, an organizational and a technical point of view*. Kluwer Law International, The Hague (The Netherlands), ISBN 90-411-1845-4.
- Raisch, W. (2001). *The E-Marketplace – Strategies for Success in B2B Ecommerce*. McGraw-Hill, 2001. ISBN 978-0071361231
- Rousseau, D. M., S. B. Sitkin, et al. (1998). "Not so different after all: A cross-discipline view of trust." *Academy of Management Review* 23(3): 393-405.
- Rousseau, D. M., Sitkin, S. B., Burt, R. S. and Camerer, C. (1998). "Not So Different After All: A Cross-Discipline View of Trust," *Academy of Management Review* (23:3), 1998, pp. 393-404.
- Salam, A.F. et al. (2005) *Trust in E-commerce*, *Communications Of the ACM* Vol. 48. No. 2 February 2005, p. 73-77
- Sapienza, H. J., & Korsgaard, A. (1996). Procedural justice in entrepreneur-investor relations. *Academy of Management Journal*, 39(3), 544–574.
- Shankar, V., G. L. Urban, et al. (2002). "Online trust: a stakeholder perspective, concepts, implications, and future directions." *Journal of Strategic Information Systems* 11: 325-344.
- Shockley-Zalabak, P., K. Ellis, et al. (1999). *Measuring Organizational Trust -Trust and Distrust across cultures -The Organizational Trust Index*, IABC Research Foundation.
- Tschannen - Moran, M. and W. K. Hoy (2000). "A Multidisciplinary Analysis of the Nature, Meaning and Measurement of Trust,." *Review of Educational Research* 70(4): pp. 547-593.
- Williamson. Oliver E. (1993). "Calculativeness. Trust. and Economic Organization." *Journal of Law & Economics*, vol. XXXVI. 453-486.
- World Bank. World DataBank - World Development Indicators (WDI). Accessible from: <http://databank.worldbank.org/ddp/home.do>
- WVS. World Value Survey <http://www.worldvaluessurvey.org/>
- Zaheer, A. and Harris, J. (2006). *Interorganizational Trust*. In O. Shenkar and J. Reuer (eds), *Handbook of Strategic Alliances*, 169-197. Thousand Oaks, CA: Sage
- Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science*, 9(2), 141–159.

ECONOMICAL ASPECTS OF REPUTATION MECHANISMS ON ELECTRONIC MARKETS

Radovan Dráb

Technical University of Košice

Faculty of Economics

radovan.drab@tuke.sk

Abstract

Trust and trust building issues are very often discussed topics regarding electronic marketplaces. Reputation mechanisms are according to many studies the most trust generating mechanisms currently used on e-markets. Main objective of this paper is to identify the procurers' behavior on e-market providing reputation mechanism in form of rating and historical transactions information. For data gathering was used experimental approach based on Design of Experiment using web based platform. Results were in this stage analyzed using descriptive statistic and working hypotheses verified using simple statistical tests.

Keywords

Trust, Electronic Marketplace, Reputation Mechanisms, Rating, Price Premiums

1. Introduction

Most of the buyer seller relations are characterized by a degree of information asymmetry, while it is usual that seller has more and better information about the quality of goods and services than the buyer (Mishra et al. 1998). The fact that the buyer has not complete information about the seller behavior, leads to a known problem of information asymmetry (Akerlof 1970), which can in the end lead to seller's opportunistic behavior.

In online auctions and electronic markets, opportunistic behavior can have a form of unexpected shipment delays or even undelivered goods against payment or other forms of fraud. Concerns about such practices can lead to buyers mistrust in on-line products and services, and becoming a threat to e-markets. (Choi et al. 1997, Jarvenapaa et al. 2000).

All these undesirable practices increase buyers costs and mistrust in e-markets. The lack of trust was identified as one of the most important barrier of usage of e-markets (Lee and Turban 2001, Kuller 2005).

Electronic markets with their ICT services represent a gate to new markets, cost saving, and increase of competitiveness not only for companies. A positive relation between electronic commerce related ICT investments and company performance was described in various studies (Dorčák, Delina, 2011). Also consumers can profit from e-markets with sophisticated ICT services, increasing their living status.

There were made several researches focused on trust building and trust building mechanisms. During these analyses many researchers identified the reputation mechanisms as the most

significant when building trust on e-markets (Delina, Dráb, 2010). There were also identified some weaknesses of these reputation mechanism. According to a congenial IT provider, rating mechanism at company level are only short time trust building boosters, but later rating becomes only a control mechanism for opportunistic behavior prevention (Dráb, 2009). Also the implementation cost of rating mechanisms is high, and the economic value of such a solution is still not clear. According to these findings we can raise a question what is the role of other trust building mechanisms.

This paper analyses how rating, price and historical transaction evidence affects procurers behavior. This paper should answer the question if the only factor in procurer's decision is the lowest price, or are there any significant relations on trust building mechanisms if they are present.

2. Researches on reputation mechanisms

The economic impact of reputation mechanisms as one of the most important trust building mechanism was analyzed in many studies (Resnick et al. 2006). Reputation mechanisms are systems able to inform the market about past agents' behavior in trade. The value of reputation mechanisms in general relies on the assumption that past behavior is a reliable predictor of future behavior (Wilson 1985). Most of these researches were focused on solving the question how the purchasing price of goods reacts by changing the seller's rating. All of these studies were carried out on data gathered from auction platforms like eBay, so from a C2C (customer to customer) or B2C (business to customer) markets. Also Resnick (Resnick et al., 2006) studied how the sellers' rating affects the price premium. Price premium for electronic market is defined as the sum of money exceeding the average price, which was reached by several vendors providing perfectly identical product in a given period (Pavlou and Dimoka, 2006). Resnick assumed that in conditions where the buyer decides on the credibility of the seller, the sellers with higher rating will be rewarded with higher prices so the price premium will be in positive numbers. On the other hand sellers with no rating have to offer to buyers a compensation or advantage - lower price. In order to measure the impact of rating on price premium, they carried out controlled an experiment on eBay market. The results showed that the market rewarded sellers with higher rating better than those with lower one. The difference in price between the seller with highest and lowest rating was 8,1% (Resnick et al. 2006). The impact of negative rating was not significant during the analysis.

Similar analysis based on eBay data was carried out by Pavlou and Dimoka (2006). They based their analysis not only on seller's numerical rating data but also on analysis of short text comments. They assumed that these text comments, unlike the numerical rating, contain important information affecting the building of trust in the seller's benevolence and credibility (Pavlou and Dimoka, 2006), and these different levels of sellers trust has also lead to changes in price premiums.

Adding text comments to the analysis rating impact on price premiums resulted in an increase of variance of price premiums ($R = 50\%$), than previously indicated value in the literature ($R = 20-30\%$) (Pavlou and Dimoka, 2006). Based on the results can be expected that electronic markets using the rating mechanism based solely on numerical ratings can be compared to text-based mechanism at a disadvantage.

3. Methodology of research

According to these findings it's obvious that the reputation mechanisms present on any online marketplace plays a significant role in building trust and in price creation. This paper focuses on

identification of behavior model of procurers. To accomplish this objective we have prepared a controlled experiment using a theoretical online marketplace with various sellers characterized by several factors including rating, historical transactions and price. These sellers were assigned five randomized factors, according the conditions from design of experiment methods. Using these methods we prepared a set of sellers with these factors grouped by six sellers. We have chosen the sequential approach, and asked the buyers (procurers) to sort the sellers from best to worst according their preferences.

3.1. Description of respondents

For our experiment have been chosen three separate groups of respondents. First group consisted of procurers and people working at procurement divisions in companies. Here we have assumed that these people have already their own purchasing model that they will apply by their decision. Respondents from private sector are used to stick to their approved strategy for selecting a seller to contract. These strategies are highly affected by the situation and information available. A very significant role by these decisions plays the role of trust represented in this research by reputation mechanism and historical evidence. To compare results and see differences in behavior we have run this experiment on two other respondent groups. Second group consisted of academics they already have knowledge about electronic markets and issues about role of trust and reputation mechanisms. By this group we assumed that they will tend to behave theoretically right and respond with awareness of rating and historical transactions. Third group of respondents consisted of academics with no e-market skills and experiences. Here should be the lowest price strategy most visible.

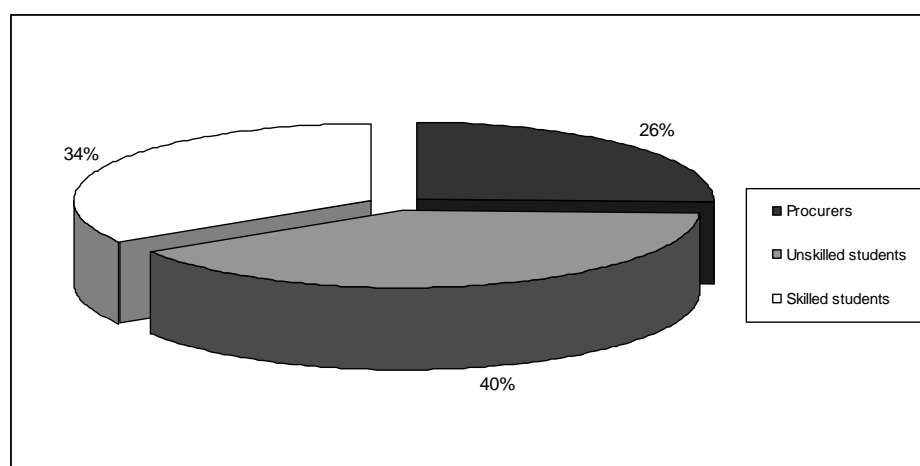


Figure 1: Respondent sample split; Source: author

3.2. Design of Experiment

3.2.1. Setting objectives

Main objective is to identify the behavior of procurers.

This experiment is a combination of comparative and screening experiment. Identification of an ordered set of sellers (comparative part), and identification of the most influencing factors that affected the ordering (screening part).

To support the main objective we have set sub objectives in form of working hypotheses, they should help to identify the role of trust represented by two sets of ratings and by historical

transactions, in contract execution and its influence on price premiums. Here are the main working hypotheses:

- H_1 : Procurers from private sector will mainly consider also other factors then price in their decisions.
- H_2 : Skilled academics will mainly consider also other factors then price in their decisions.
- H_3 : Unskilled academics will prefer the lowest price strategy.
- H_4 : Sellers with higher rating will be rewarded with higher price premiums.

3.2.2. Setting process variables

Using the combination of two experimental designs defined the process variables. Output variable is an ordered set that represents the sellers order after the experiment execution. Other variables are factors that affected the sellers order. Each seller is described by five simple factors.

Rating

Rating of each seller is divided into two parts; first part is represented by internal rating and the second by external rating.

Internal rating represents the current respondent's satisfaction with the past experiences of the current seller. We assume that this rating was assigned to the current seller in the past by the respondent currently making the decision. The set of possible values of this rating is $I_r \in \{0;5;6;7;8;9;10\}$ when the 5 is the worst, 10 is the best and 0 means that this seller is a newcomer on the market with no rating.

External rating represents the market (other procurers, buyers) satisfaction with past experiences with the current seller. This rating was assigned by other market participants. Range of this variable is same as for the internal rating $E_r \in \{0;5;6;7;8;9;10\}$

Historical transactions

Also historical transactions are divided into two parts, internal and external transactions.

Internal transactions represent the amount of past transaction made between current respondent and current seller. Due to simplicity of the experiment we have set the range of this variable to a scale of three $I_t \in \{0;1;2\}$, while the 0 represents zero transactions, 1 represents the range $\langle 1;10 \rangle$ and the 2 represents more than 10 past transactions.

External transaction represents the historical amount of all past transactions made on current market. Also the range of this variable is the same as for the internal transactions $E_t \in \{0;1;2\}$, with the change that 1 represents interval $\langle 1;30 \rangle$ and 2 represents more than 30 past transactions.

Price

Purchasing price is a unique factor and it will be represented as an amount of fictional currency that has to be paid for the goods. For the experiment simplification we used 5 different price levels. Base price was set to 100, and other 4 prices are increased by 5, 10, 15 and 20 %.

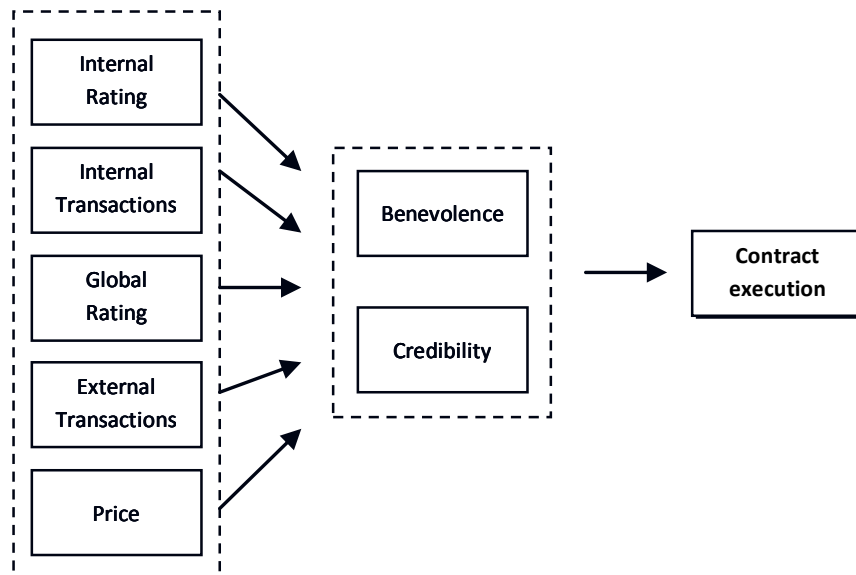


Figure 2: Relations between variables; Source: author

3.2.3. Experimental design selection

We have several factors (rating, transaction evidence and price) under investigation that are directly influencing the output - order. Respondents have to compare the sellers with their different factors and establish an ordered set. Let's describe this process as an example. Procurer enters this electronic application and can see 6 anonymous sellers labeled from 1 to 6 selling exactly the same good for their prices. Each of these sellers has various values regarding those factors. Procurer decides that seller number 3 is for him the best one, so he moves him on the first place. Using his own individual strategy moves all the sellers show in a set that fits his preferences. After his actions could the sellers order look like this: 3, 5, 6, 1, 4, 2.

Then the other part of the analysis is the identification of factors that influenced the ordering. Therefore the design of experiment should be a combination of comparative and screening design. Our experiment has also features of randomized block design (RBD). We have 5 factors specified. Each of the factors has its number of levels (range). To ensure that the experiment will take in account all the possibilities we used RBD to prepare the sellers with their factors. Using the ranges mentioned above with the prices we have 720 unique combinations of all the factors. We used a generator to assign these factors. After this we grouped 6 sellers in one set so that the set had 4 different prices and 2 repeated.

We have also prepared predefined sets of sellers with the aim to answer other questions of our research.

3.2.4. Executing the design

For executing the experiment we have used a web platform based on php and sql database. Data gathering and execution of the design was sequential. Each respondent was shown 48 sellers, 6 in each round, in total of 8 rounds. We needed approx. 25 unique respondents to use up all the combinations. As mentioned above we have run 3 separated experiments with 3 different respondent groups.

4. Data analysis and interpretation

We will analyze the data using basic statistics, pivot tables and logical functions in Excel and basic statistical tests using SPSS. We will present the result according to each working hypothesis.

H1: Procurers from private sector will mainly consider also other factors then price in their decisions.

From the database sample consisting only from RBD assigned factors we can see that 55% of respondents have chosen the lowest price strategy no matter what the sellers rating or historical transactions were. The remaining 45% of respondents preferred rating and historical transactions than the lowest price. In average they paid for the same good a price premium of 4,8%. It means that in case where the selection of seller was based on other factor than price, procurers awarded them by paying a higher price. The definition of price premium in this research is described as a difference:

$$\text{price premium} = \frac{(\text{winners price} - \text{min Price})}{\text{winners price}} \%$$

The situation significantly changed with the lower and higher purchasing prices. When the purchasing price dropped, two thirds of respondents have chosen rather higher rating, than a lower price. Only one third used the lowest price strategy. Almost 34% of respondents have chosen the seller with best rating and rewarding him with a price premium of 4%. Average price premium by lower purchasing price was 1,7%.

We got almost same behavior when the purchasing price rose significantly. When we raised the purchasing prices for 1000%, the behavior remained same as in the situation with lowest prices. Only 33% used the lowest price strategy and 66% of respondents have preferred other factor than price. Again as with low prices the third of the respondents have chosen the sellers with best reputation, and rewarded them with a price premium of 20%. Average price premium in the situation with high prices was 10,3%.

To test this hypothesis we have used simple bivariate correlation and Spearman's correlation coefficient to see the strength and direction of the association between our data see the next table.

			IR	GR	IT	GT	price	order
Spearman's rho	order	Correlation Coefficient	-,419**	-,128*	-,138**	,009	,442**	1,000
		Sig. (2-tailed)	,000	,010	,006	,864	,000	.
		N	402	402	402	402	402	402

Table 1: Correlation in data; Source: author (Note: *. Correlation is significant at the 0.05 level (2-tailed).

**** Correlation is significant at the 0.01 level (2-tailed).)**

From the table we can clearly see that there are several significant associations identified. It's obvious that there is a positive moderate correlation between price and order. But to confirm the working hypothesis we can see that there is also a very significant negative correlation between order and internal rating. This means the higher the sellers rating the better rank in order. Same assumption can be seen with the internal historical transactions. Global rating is less correlated than internal and also less significant. When observing the relationship between internal rating and sellers' placement (order) we can see linear patters in the boxplots (see picture below).

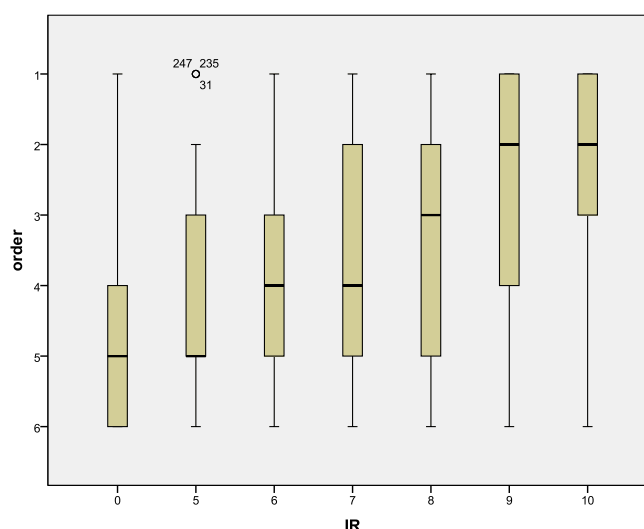


Figure 3: Boxplot - Internal rating and order relation; Source: author

Looking at those results we can say that the private sector procurer's behavior tends to count not only on lowest price strategy but also on reputation mechanisms. In case of very low and very high prices it's evident that here the role of rating plays a significant role by decision process.

H₂: Skilled academics will mainly consider also other factors then price in their decisions.

The analysis of this database is very similar to the analysis for previous working hypothesis. So we present the results in a pivot table. Table presents the most interesting results from the skilled academics database in three separate blocks. First RBD block is based on the randomly assigned sellers factors, second block is based on data predefined with low purchasing price and third is based on data with high purchasing price.

	RBD data	Low purchasing price db	High purchasing price db
Low price strategy respondents	49%	5%	0%
Reputation preferred respondents	51%	95%	100%
- Top rating	n/a	47%	62%
Price premium	n/a	4%	20%
- Average rating	n/a	24%	24%
Price premium	n/a	1,40%	10%
Average price premium	4,70%	2,30%	16,90%

Table 2: Descriptive results from skilled students' database; Source: author, based on experiment data

For this hypothesis we have used the same process. As we can see in Table 3 the situation is more or less the same as with the real procurer's data. But the main difference is in price correlation which is still significant, but lowers as by the procurer's database. To determine which factor affected the ordering the most we have tried to fit a linear regression model on those data with stepwise factor elimination.

			IR	GR	IT	GT	price	Order
Spearman's rho	Order	Correlation Coefficient	-,423**	-,214**	-,231**	-,043	,259**	1,000

		Sig. (2-tailed)	,000	,000	,000	,287	,000	.
		N	606	606	606	606	606	606

Table 3: Correlation in skilled academics data; Source: author, based on experiment data

As we can see in Table 4 using the stepwise elimination of predictors we created 3 linear regression models. As the best model with the highest sum of squares we can consider the model 3.

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	498,639	3	166,213	78,858	,000c
	Residual	1268,861	602	2,108		
	Total	1767,500	605			

IR Table 4: ANOVA tests for dependent – order; Source: author (Note: a. Predictors: (Constant), b. Predictors: (Constant), IR, price, c. Predictors: (Constant), IR, price, GR)

According partial correlations of factors we can say that in this respondents group is the internal rating the leading indicator or seller ordering. Although price is still the second most significant factor. Global rating had the third highest partial correlation. All other factors were eliminated by the stepwise procedure.

H3: Unskilled academics will prefer the lowest price strategy.

Here we have assumed the opposite situation as for the previous student group. Again we present the results in a pivot table and simple statistical test.

	RBD data	Low purchasing price db	High purchasing price db
Low price strategy respondents	39%	8%	11%
Reputation preferred respondents	61%	92%	89%
- Top rating	n/a	61%	56%
Price premium	n/a	4%	20%
- Average rating	n/a	11%	8%
Price premium	n/a	1,20%	10%
Average price premium	5,74%	3,20%	15,90%

Table 5: Descriptive results from unskilled students' database; Source: author, based on experiment data

Based on the data we can clearly see that this working hypothesis probably will not be approved. We can see that most of the respondents have made their decision based rather on reputation mechanisms than only on lowest price. This could be caused by student general knowledge about e-markets. This respondent group was the youngest, so we can assume they already knew how an C2C market like eBay works. But this assumption from descriptive statistic had changed after linear model fitting.

Using the same stepwise procedure as by the previous hypothesis we can see in Table 6 that price was chosen as the most significant predictor, so the hypothesis was set right and we can say that unskilled respondents have used the lowest price as the main factor by their decision about seller. We have to mention that also internal and global rating was chosen as significant factor for ordering.

Model		Unstandardized Coefficients		t	Sig.	Correlations		
		B	Std. Error			Partial	Tolerance	VIF
1	(Constant)	-6,661	1,073	-6,208	,000			
	price	,092	,010	9,489	,000	,379	1,000	1,000
2	(Constant)	-4,743	1,008	-4,705	,000			
	price	,090	,009	9,992	,000	,396	,999	1,001
	IR	-,234	,024	-9,814	,000	-,390	,999	1,001
3	(Constant)	-3,253	,992	-3,280	,001			
	price	,092	,009	10,615	,000	,417	,998	1,002
	IR	-,230	,023	-10,032	,000	-,398	,998	1,002
	GR	-,231	,034	-6,860	,000	-,284	,998	1,002

Table 5: Linear regression data for unskilled academics; Source: author, based on experiment data

Summary of results from these working hypotheses:

- 47% of all respondents have chosen price as the only factor for their decisions.
- 52% of all respondents have chosen rating and historical transaction as the factor for their decision.
- Sellers with higher rating were rewarded with average price premium of 6,9 %.

H₄: Sellers with higher rating will be rewarded with higher price premiums.

This working hypothesis was analyzed only on data from procurers' database. In our experiment we have used 2 types of rating so we will analyze them separately. Price premiums were calculated using the formula described above. After computation we got 5 levels of price premiums. The relation of price premium to internal rating can be seen in figure 4.

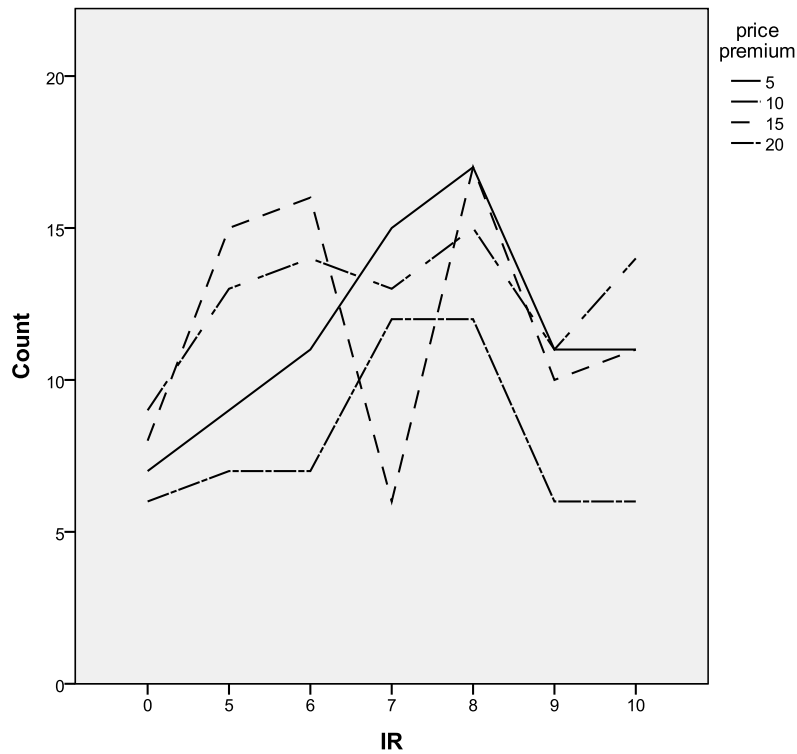


Figure 4: Relation - Internal rating and price premium; Source: author

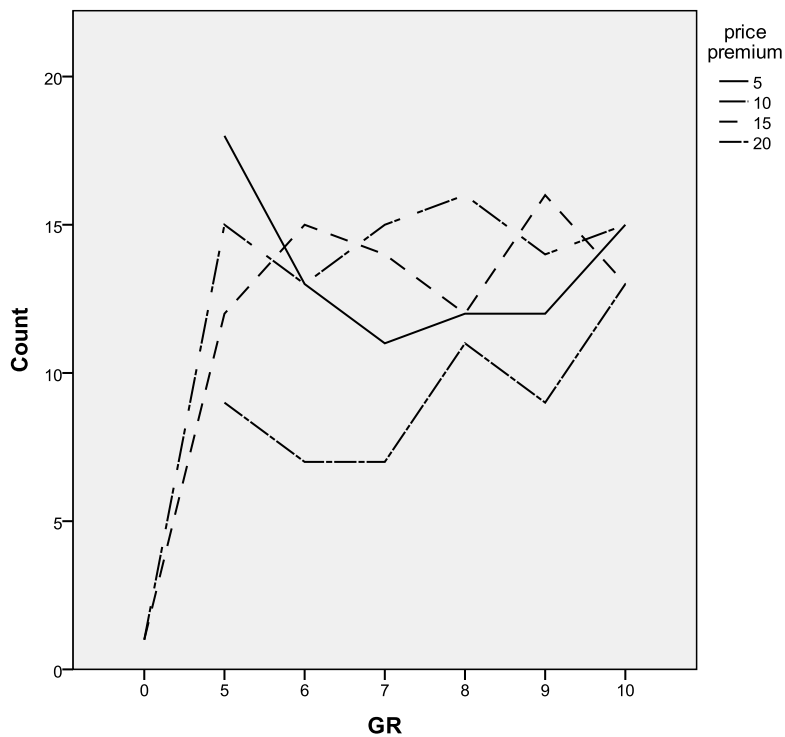


Figure 5: Relation - Global rating and price premium; Source: author

As we can see the increase in internal rating from 7 to 8 increased the count of all price premiums. Also the shift from 9 to 10 had this positive effect. Despite the correlation test did not confirm the relation we can say that seller with higher internal rating is rewarded with a higher price premium. Increase in seller's internal rating for 1 point caused a 5.9 % increase in price premium in average.

Similar results can be observed also by global rating and price premium relation. Increase in seller's global rating for 1 point caused a 2.57 % increase in price premium in average. As we can see in figure 5 the positive correlation between those factors is more visible.

As a summary we can assume that there is a positive relation between price premium and rating in global.

5. Discussion

Results from this research show that factors as internal and external rating can significantly affect subjects' decisions in business relations on electronic markets. Using data from our experiment we could not confirm the hypothesis in procurers' database. Price still plays a crucial role by decision. These results were expected if we assume that almost all companies put their efforts on lowering costs. Procurers therefore preferred the lowest price strategy. When analyzing the skilled academics database internal rating was identified as the most significant predictor of the ordering. Global rating ended as the third predictor after price. Global rating becomes more significant when the buyer has no direct evidence of the seller reflected in his internal rating. As the indirect verification of the first two hypotheses was the acceptance of the third hypotheses were unskilled academics preferred the lowest strategy. Analysis of price premiums showed a positive relation to rating. This supports the assumption, that market rewards sellers with higher rating with an additional profit.

6. Conclusion

Price plays a very significant role in procurement. This research showed that this assumption is not correct and in electronic markets price is not the leading indicator of successful contractation. According to results from this analysis we can see that rating as a reputation mechanism helps building sellers trust and should be present at e-marketplaces and e-procurement platforms. Current e-markets provide rating mechanisms at various complexity levels by default. In this research we have discovered that more than a half of all respondent (including procurers) are making their buying decisions based on seller's rating and on historical transactions. Those finding are supported by statistical tests. Also we have verified the fact that market rewards sellers with higher rating with increase in purchasing price so called price premium. In average the sellers with higher rating have been rewarded by a price premium of 6,9 %. This paper represents only a fragment of research in this field that could be carried out. Historical transactions evidence and other factors can raise new interesting questions to be solved.

Acknowledgement

The research was realized within project "Strategies of trust building on Single European Electronic Market" VEGA - 1/0679/10 financed by Ministry of Education, Science, Research and Sport of the Slovak Republic.

7. References

- Akerlof, G. A. (1970). "The Market for "Lemons": Quality Uncertainty and the Market Mechanism." *The Quarterly Journal of Economics* 84(3): 488-500.
- Choi, S. -Y., Stahl, D. O., and Whinston, A. B. (1997). *The Economics of Electronic Commerce*, Macmillan Technical Publishing, Upper Saddle River, NJ, 1997.

- Dellarocas, C. (2001) Analyzing the economic efficiency of eBay-like online reputation reporting mechanisms. In Proc. of the 3rd ACM Conf. on Electronic Commerce (EC01), pages 171–179, 2001.
- Delina, R., Dráb, R. (2010), Socio-ekonomické aspekty budovania dôvery na elektronických obchodných platformách. In: *Ekonomie a management*. Vol. 13, no. 4 (2010), p. 110-121. - ISSN 1212-3609
- Dorčák, P., Delina, R. (2011). Vplyv elektronických marketingových podnikových riešení na ekonomickú výkonnosť In: *Ekonomický časopis*. - ISSN 0013-3035. - Roč. 59, č. 1 (2011), p. 44-58.
- Dráb, R. (2009), Ekonomické aspekty dôvery v medzifiremných vzťahoch In: *MLADÍ VEDCI 2009 : zborník z 3. medzinárodnej doktorandskej konferencie : Herľany 9.-10. november, 2009*. - Košice : TU, EkF, 2009 S. 41-51. - ISBN 978-80-553-0296-6
- Jarvenpaa, S. L., Tractinsky, N., and Vitale, M. (2000). Consumer Trust in Internet Stores,. *Information Technology and Management*
- Kuller, E. (2005). Trust barriers for the B2B e-marketplaces. <http://www.emarketservices.com/clubs/ems/prod/Trust%20barriers.pdf>
- Lee, M., Turban, E. A. (2001). Trust Model for Consumer Internet Shopping. *International Journal of Electronic Commerce*, 2001, Vol. 6, No. 1, pp. 75-91. ISSN 1086-4415
- Mishra, D. P., Heide, J. B., Cort, S. G. (1998). "Information Asymmetry and Levels of Agency Relationships," *Journal of Marketing Research* (35), 1998, pp. 277-295.
- Resnick, P., Zeckhauser, R., Swanson, J., Lockwood, K. (2006). The value of reputation on eBay: A controlled experiment, dostupné online <http://www.si.umich.edu/~presnick/papers/postcards/>
- Pavlou, P., A., Dimoka, A. (2006). The Nature and Role of Feedback Text Comments in Online Marketplaces: Implications for Trust Building, Price Premiums, and Seller Differentiation, University of California
- Wilson, Robert (1985). Reputations in Games and Markets. In *Game-Theoretic Models of Bargaining*, edited by Alvin Roth, Cambridge University Press, pp. 27-62.

THE USE OF HIDDEN DATA IN ELECTRONIC BUSINESS NETWORKS: BENCHMARK AND NETWORK PERFORMANCE INDICATORS

František Janke

Department of Banking and Investment

Faculty of Economics

Technical University of Košice

frantisek.janke@tuke.sk

Abstract

Implementation of different B2B networks and digital business ecosystems improved the efficiency of business processes in terms of collaboration, communication and knowledge flow. In addition to these effects, B2B networking provides the data which was not available till now - ICT-based networks aggregate the data describing the companies' business behaviour in inter-organizational relationships. Such new behavioural business market statistics can be used for several analyses in order to increase the efficiency and effectiveness of business and network processes, as companies are now able to compare with other companies and the data describing the whole network is available. In this paper, two concepts of such analyses – benchmark and network performance assessment – are proposed. Both concepts are based on data related to procurement procedure of companies. First proposed concept – benchmark indicator - assesses, whether procurement procedure is conducted in proper way concerning supplier's competition aspect. Second proposed concept – network performance indicator assesses, whether the network supply is adequate to network demand.

Keywords

B2B Network, Digital Business Ecosystem, Business Market Statistics, Electronic Procurement, Indicator, Benchmark, Performance

1. Introduction

In recent years, the adoption of business-to-business (B2B) networks has been discussed and many ICT based tools have been developed to provide space for easier cooperation among companies. A B2B network can be defined as a structure in which different nodes presented by companies are related to each other by specific threads presented by relationships between them (Håkansson and Ford, 2002). The aim of this concept was to build closer contact among companies in order to ease the processes of communication and collaboration. During last decade, several ICT platforms based on the B2B networking concept have been developed, for instance platforms as a part of projects supported by European Union – FP6-IST-4-27083 Project FLUID-WIN, FP6-IST-4-26476 Project SEAMLESS, FP7-SME-2-243554 Project eBEST.

Later on, the B2B networking process moved on next level by adopting the concept of digital business ecosystem. Based on (Nachira et al., 2007), digital ecosystem (DE) is defined by

(Van Egeraat and Curran, 2010, p.1) as “*a self-organizing digital infrastructure established with the aim of creating a digital environment for networked organizations which is capable of supporting co-operation, knowledge sharing, the development of open and adaptive technologies and evolutionary business models*”. Communication and collaboration structures of DBE facilitate collective learning, knowledge flow and innovation across companies and other actors (Van Egeraat and Curran, 2010). A digital business ecosystem consists of three different networks - ICT, social and knowledge network (Nachira et al., 2007).

Both of these pro-collaborative concepts aim to make the inter-organizational business processes more effective. When comparing these two concepts, both DBE and B2B networking provide better communication and collaboration channels; DBE in advance improves the flow of knowledge and innovation among actors in order to enhance the collective learning. When assuming the environment composed merely of companies, we can say that by excluding the innovation and knowledge transfer from DBE concept, the basic B2B network would be obtained.

As both concepts are based on ICT, they provide different tools easing company's internal processes, such as procurement or selling (e-auction, e-tender, e-catalogue). Therefore, one not yet mentioned advantage of these electronic pro-collaborative concepts has to be considered – as the *business platforms link large number of companies, they aggregate market data that describes their “everyday” behaviour and this data can be used for different analyses*. This hidden data can be called as a *business market statistics*. Business market statistics are mathematical data presenting behaviour of company / companies in the business relations (market). For instance, following behaviour can be recorded in mathematical form:

- communication among companies (e.g. sent request for information),
- the way how the procurement was conducted (e.g. number of invited companies, the setting of electronic reverse auction),
- the results of conducted procurement processes (e.g. who was the winner of selection procedure, what was the best price),
- the level of producer's success (e.g. number of won selection procedures),
- time sequences (e.g. reaction time for answering the request),
- changes in reputation mechanisms (e.g. level of rating, number of references), etc..

Until now, companies have been able to collect this information in electronic way only concerning their own behaviour (Novotný, 2009). Different evaluating metrics for companies' processes were discussed and proposed. (Kaplan and Norton, 1992), (Maskell, 1991) and (Gavurová, 2010) divide metrics into financial for strategic goals evaluation and non-financial metrics for operational assessment. Mainly Balanced Scorecard System has been discussed and deployed in recent years (Kaplan and Norton, 1992 and Gavurová, 2011). When looking at the companies processes, (Shea et al., 2006) and (Dorčák and Delina, 2011) discuss metrics applicable for customer relation management (CRM), while following authors - (Stewart, 1995), (Gunasekaran, Patel and McGaughey, 2004) and (Delina, 2004) - deal with procurement processes and supply chain management (SCM) metrics.

Today, as market aggregated data concerning companies' behaviour are available, brand new analyses can be conducted. Companies and other network actors can now assess its behaviour in contrast with other companies or actors (benchmark analysis) or can analyze business network (partial market) conditions in a different way. Hence, this newly gathered business data concerning

companies' "everyday" behaviour acts as a new source for different analyses for better decision making in order to increase the efficiency of business processes.

The aim of this paper is to propose new indicators based on this data to extend the information basis for better decision making concerning business companies' or networks' processes.

2. Background: Companies' behaviour in business relationships

All proposed indicators are based on companies' behaviour in business relationships. In the terms of business processes, business relationships are mainly formed because of the exchange of the product on seller side and the payment on buyer side. Every activity which precedes or comes after this exchange influences the inter-organizational relationship. This behaviour is caught in the procurement processes of companies, as in these processes, every single information concerning invited suppliers, the prices, the ability to fulfil agreement, etc. is available. And when using electronic support for procurement processes (in our case it can be the B2B platform's procurement tool), all this data can be easily recorded. In this article, information gained from procurement processes will be used for indicators proposal.

First step preceding new business relationship between two or more unknown companies is the situation, when a company needs to buy particular product. Company willing to purchase the product, in order to achieve the best price, arranges the selection procedure using different strategies and procurement mechanisms. Firstly, the company analyzes the market. In the terms of electronic procurement (e-procurement), it uses following requests:

- Request for information (RFI) – company sends request for information in order to find out, if the supplier is able to fulfil the specific order. We can say that in this case the company has almost no idea about the abilities or product range of supplier.
- Request for proposal (RFP) – company sends request for proposal in order to receive alternatives offered by supplier which could fulfil its need. So in this case, company knows the abilities or product range of supplier.
- Request for quotation (RFQ) – request for quotation is sent when company precisely knows the specific type of product it needs and it only needs to know, what price the supplier offers. In this case, again, the company knows the abilities or product range of supplier.

The requests were listed chronologically, it means RFI precedes RFP, and it precedes RFQ. Selection procedure ends with the applicants' (suppliers') prices, which are assessed and the most suitable offer is chosen. Process of market analysis is finished with request for quotation (RFQ). That is why in following proposals only RFQs will be discussed and used.

3. Indicators

Using mentioned data, several concepts of processes efficiency increasing can be proposed. In this paper, two of them, based on procurement data, will be proposed:

- benchmark indicator – assessing the companies behaviour with the behaviour of all other companies participating B2B network,
- market performance indicator – assessing the relationship between network supply and network demand.

3.1. Benchmark Indicator

First type of indicators – benchmark indicator is used for the assessment of the company's internal processes appropriateness. Company can, due to access to aggregated business market data, compare its own behaviour with behaviour of other business network participants.

3.1.1. Indicator concept

First indicator describes the effectiveness of company's procurement process as it assesses if the company invites "sufficient" number of suppliers to its selection procedure. By word "sufficient" we mean "as good as" the other companies do. We name this indicator "*Procurement Transparency Indicator*" (*PTI*) as it describes the willingness of companies to bring competition into their selection procedures. It is based on the comparison of weighted average of number of invited suppliers, where weight is the value of contract, between company and other networked companies. The contract value was chosen as a weight as higher attention should be paid to more expensive purchases.

3.1.2. Indicator methodology

Proposed concept is based on comparison of the assessed company's average number of suppliers invited to selection procedure for specific product with the average number of suppliers invited by other companies in the business network (at business platform) in all selection procedures for specific product family. We now have to assume following precondition – at the ICT based network, there must be obligation for sellers to register products into product families.

By average number of invitations the average number of RFQs sent by company (companies) to its suppliers is meant. It is presented in formula 1 and formula 2. The calculation of weighted average, where the value of contract would be the weight, is suggested. Indicator 1 presents the weighted average of sent RFQs concerning all companies in the network except assessed company. Indicator 2 presents the weighted average of RFQs sent by assessed company. We can say that Indicator 2 is calculated for assessed company, and Indicator 1 is calculated for all other companies in the network.

$$PTI1 = \frac{\sum_{i=1}^n RFQ_i \cdot VC_i - \sum_{i=1}^m RFQ_i^* \cdot VC_i^*}{\sum_{i=1}^n VC_i - \sum_{i=1}^m VC_i^*} \quad (1)$$

$$PTI2 = \frac{\sum_{i=1}^m RFQ_i^* \cdot VC_i^*}{\sum_{i=1}^m VC_i^*} \quad (2)$$

PTI1 *Procurement Transparency Indicator 1 – indicator related to all platform companies except assessed company,*

PTI2 *Procurement Transparency Indicator 2 – indicator related to assessed company,*

RFQ_i *number of requests for quotation (RFQs) sent by any platform company related to selection procedure "i" for specific product family which took place in specific period of time,*

VC_i *value of contract related to selection procedure "i",*

- i ordinal number of selection procedure of during specific period of time according to time when it happened - 1, 2, 3, ...,
- n total number of all RFQs sent by any platform company for specific product family during specific period of time,
- RFQ^*_i number of RFQs sent by assessed company related to selection procedure “ i ” for specific product family which took place in specific period of time,
- VC^*_i value of contract related to selection procedure “ i ”,
- m total number of all RFQs sent by assessed company for specific product family during specific period of time.

3.1.3. Interpretation of indicator values

Company can easily assess its habits concerning the invitation of suppliers comparing the value acquired from Indicator 2 (formula 2), which presents its own situation, with the value acquired from Indicator 1 (formula 1) presenting the habits of all other participants buying specific product family. Company should try to have the Indicator 1 higher than Indicator 2, or if not, to be very close to it. This means buying things in a manner which is comparable with other companies' manners, or better.

3.2. Business network performance indicator

Business network performance indicator refers to economic situation among networked companies. It acts as a market performance indicator related to only companies which are a part of a business network. By this indicator describes the relations between network demand and network supply are described.

3.2.1. Indicator concept

Market performance indicator should help us answer the question if the market supply is adequate to market demand. By answering this question we might be able to say, whether the supply is sufficient or if more companies are necessary to be invited to join the network. When focusing on network market supply, traditionally we would monitor the total number of particular products offered. But such an indicator would not answer the question if the market supply is adequate to market demand. To measure the adequacy of network supply to network demand following concept is suggested.

3.2.2. Indicator methodology

The most appropriate variables for describing the relationship between demand and supply on the electronic business network are “RFI”, “RFP” and “RFQ” requests sent from companies to their suppliers within electronic business network. All these three variables presents companies' needs so we can say they all present the network demand. As the selection procedure ends with sending of RFQ and this request presents final and real interest of buyer to buy some product, only this request will be concerned in following proposal. Before stating the formula, the process of sending RFQ and possible reactions of supplier need to be understood.

After company sends RFQ to specific potential supplier, what presents company's willingness to buy specific product, three scenarios can happen as a response of supplier:

1. supplier sends the price,

2. supplier says he does not produce or sell this product,
3. or supplier does not answer - no feedback, where it can be caused by following reasons:
 - a. supplier does not produce or sell this product,
 - b. supplier produces or sells this product but is not willing to answer because of various reasons,
 - c. supplier missed incoming RFQ.

Let us assume supplier cannot miss incoming RFQ due to various notifications which can be used in electronic business interface. Excluding missing of incoming RFQs, we can divide situations in following way:

- possibility 1.) presents *positive reply* for RFQ from supplier,
- and possibilities 2.), 3.a), 3.b) can be presented as *negative replies* from supplier.

Suppliers' abilities to deliver the requested product, what presents the ability of network supply, are presented by the positive reply for RFQs. And when the number of all positive replies for RFQs by all networked companies for specific product during specific period of time with the number of RFQs sent by all networked companies for specific product during specific period of time is compared, we get the ratio, which describes the *adequacy of network supply* to network demand. This ratio is caught in following formula (formula 3):

$$ANSI = \frac{R^+_{RFQ}}{RFQ} \quad (3)$$

where

ANSI *Adequacy of Network Supply Indicator,*

R^+_{RFQ} *the number of positive replies for RFQ received by companies for specific product during specific period of time,*

RFQ *the number of all RFQ sent by all the companies for specific product during specific period of time.*

3.2.3. Interpretation of indicator values

The value of Adequacy of Network Supply Indicator is a part of interval from 0 to 1 as number of replies for RFQs cannot be higher than number of RFQs sent. If the value of ANSI is high, most of companies meet positive replies for RFQs and that means that the network supply is adequate to network demand. On the other hand, if the value is low, most of companies receive negative reply or receive no reply which means that network supply is not adequate to network demand.

At the end, it is important to repeat the precondition of this concept - to use this indicator the goal is to make sure no supplier will miss received RFQ, so all actions taken by suppliers can be divided to positive and negative replies.

4. Conclusions

Proposed indicators present new concept of increasing the efficiency of company's and networks' business processes, as indicators' values describes the company's or network's situation from new perspective – behavioural. The signal provided by these indicators can be useful for different actors

from the business network. Results of Procurement Transparency Indicator can act as information supporting the decision making in terms of effectiveness of company's procurement processes. Procurement professionals, but also managers can learn from the behaviour of other companies. This supports the digital business ecosystems' concept of collective learning.

Open research question in this field is the determination of the optimal value of Procurement Transparency Indicator as this average number should level out. Also determination of the indicator level distinguishing the acceptable and non-acceptable behaviour should be discussed.

Concerning second proposed indicator (Adequacy of Network Supply Indicator) the information whether business network needs more suppliers providing particular product, can be used by different actors. Firstly, it can be useful information for business network administrator (network "caretaker" or manager) who could increase the efficiency of business network processes by inviting new external suppliers of particular product. Secondly, companies producing similar products to product which is scarce might be interested in using this type of information. They could then transform their production into the scarce one and ensure sales.

First open research question in this field is the determination of minimum value of this indicator which would describe the business network situation as satisfactory. Secondly, the business model, how should such information be provided to companies willing to produce particular product and if the fee would be accepted for such a consultation service should be discussed.

Acknowledgement

The research was realized within project eBEST "Empowering Business Ecosystems of Small Service Enterprises to Face the Economic Crisis" FP7-SME-243554-2 financed by European Commission and national project "Strategies of trust building on Single European Electronic Market" VEGA - 1/0679/10 financed by Ministry of Education, Science, Research and Sport of the Slovak Republic.

5. References

- Delina, R. (2004). Aplikovaná ekonometrika pri hodnotení efektívnosti elektronického obstarávania. *Ekonomie a Management*, 7(2), 35-46, ISSN 1212-3609
- Dorčák, P., Delina R. (2011). Vplyv elektronických marketingových podnikových riešení na ekonomickú výkonnosť. *Ekonomický časopis*. 59 (1), 44-58, ISSN 0013-3035
- Gavurová, B. (2010). Meranie výkonnosti v organizáciách s dôrazom na aplikáciu systému Balanced Scorecard. Košice: Technická univerzita v Košiciach, Ekonomická fakulta, ISBN 978-80-553-0437-3
- Gavurová, B. (2011). Systém Balanced Scorecard v podnikovom riadení. *Ekonomický časopis*, 59 (2). 163-177, ISSN 0013-3035
- Gunasekaran, A.; Patel, C.; McGaughey, E. R. (2004): „A framework for supply chain performance measurement, Science direct“, *International Journal of Production Economics*, 87
- Kaplan, R.S., Norton, P.D. (1992). The balanced scoreboard measures that drives performance. *Harvard Business Review*, 70 (1), 71–79.
- Maskell, B.H. (1991). *Performance Measurement for World Class Manufacturing*. Productivity Press, Inc., Portland, OR.
- Nachira, F, P Dini, and A Nicolai (2007). A Network of Digital Business Ecosystems for Europe: Roots, Processes and Perspectives. In: *Digital Business Ecosystems*. Ed. by F Nachira et al. European Commission, 1–20. Retrieved March 25th, 2011 from <http://www.digital-ecosystems.org/book/pdf/0.3.pdf>

- Novotný, O. (2009). ICT performance reference model in the context of corporate performance management systems. In: IDIMT-2009 System and Humans – A complex Relationship. Linz: Trauner Verlag Universitat, 13-16, ISBN 978-3-85499-624-8
- Shea, T., Brown, A., White, S.D., Curran-Kelly, C., and Griffin, M. (2006). Customer Relationship Management (CRM) Metrics – What's the Holdup?. *International Journal of Enterprise Information System*, 2(3), 1-9.
- Stewart, G., 1995. Supply chain performance benchmarking study reveals keys to supply chain excellence. *Logistics Information Management* 8 (2), 38–44.
- Van Egeraat, C. and Curran, D. (2010). Social Network Analysis of the Irish Biotech Industry: Implications for Digital Ecosystems (NIRSA). Working Paper Series, 55, NIRSA - National Institute for Regional and Spatial Analysis.

ROLE OF TRUST BUILDING MECHANISMS AS A NECESSITY REQUIREMENT OF ENTRY TO E-BUSINESS ENVIRONMENT

Michal Tkáč

Department of Banking and Investment
Faculty of Economics
Technical University of Kosice
michal.tkac@tuke.sk

Abstract

The purpose of this paper is to identify the role that trust building mechanisms (TBMs) play in companies' decisions about entry to online markets. Our research is based on the questionnaire study of 446 Slovak organizations, where the role of 31 different TBMs is investigated. Firstly, we analyze whether size and ICT experience of companies influence the quantity of TBMs required by those companies. Aim is to determine whether number of TBMs required by companies to entry e-business environment is influenced by general characteristics of organizations. Another part of research is focusing on particular TBMs. Here we examine which TBMs are necessary for most of the companies in order to entry e-business environment.

Keywords

Trust, Trust Building Mechanisms, Entry Barriers, Eskills

1. Introduction

Insufficient trust is from companies' point of view one of the most frequently mentioned barrier of entry to e-business environment. As the Commission of the European Communities suggest, in order to establish stable online environment which will attract new customers and businesses, it is important to build trust and confidence. In other words it means, consumers and business must feel confident, that their transactions will not be intercepted or modified, that both sellers and buyers own the identity they claim, and that the transaction mechanisms are available, secure and legal (eMarketServices, 2005). Besides the role of eGovernment described in Doucek (2004), also e-business platform which operates on micro level should implement mechanisms to establish environment suitable for their economic growth (Dorčák and Pollák, 2011). Trust building mechanisms (TBMs) were design for that purpose. Their aim is to assure certain level of trust between business partners. Companies acknowledge this trust by requiring implementation of appropriate TBMs in e-business environment. Moreover some of the trusts building mechanisms are used by companies to measure performance of business partners as part of internal performance measurement systems such as Balanced Scorecard (Gavurova, 2011). Non existence of such TBMs in e-business environment can be therefore understood as a barrier of entry. In order to eliminate them, it is essential to identify TBMs, which gain trust of companies and also investigate the

discrepancies between portfolios of trusted TBMs among companies with different size and experience in e-commerce.

2. Trust building mechanisms

Trust is a complex, comprehensive, and changeable concept, because it deals with relationships, which are not consistent over the time and the levels of trust can vary within the same relationship (Lewicki and Bunker, 1996). Nicholson et. al, (2001) conceptualized trust as a cumulative process that builds on several, successful interactions. On the other hand companies willing to entry to online environment don't have many successful interactions because most of their potential partners are new for them. To reduce the risk and uncertainty that come from doing business in on-line environment (Delina, 2009), companies can support their decision by use of mechanisms which can raise the perceived trustworthiness of the potential partner and increase the company's level of trust in the potential partner; the trust building mechanisms. (Chopra and Wallace, 2003) As Gefen et al. (2008) stated, there is a certain distinction between trust and trustworthiness. Trust can be described "as a willingness to depend" whether trustworthiness represents "integrity, ability and benevolence" of trustee. (Gefen et al., 2008) Follow the logic, companies which consider certain TBMs as necessary to entry on-line markets are willing to depend on them, therefore they trust them. Magnitude of this dependency (trust) is base on company's perception of how precisely can particular TBM evaluate or secure trustworthiness of potential partner. It is therefore important for e-business environments, where lack of trust is always an issue (Qing et al. 2009), to implement most required respectively most trusted TBMs in order eliminate entry barriers and attract new companies. These assumptions arise several interesting questions: Does the number of required TBM change based on companies' characteristics such as size or experience in e-commerce? Which of TBM are companies considered as necessity in order to entry to e-business environment? To answer these questions following research were conducted.

3. Methodology:

3.1. Sample description:

This paper is based on questionnaire survey, conducted within Slovak business environment. Methodological framework used for this research was based on similar survey performed within Seamless ICT STREP FP7 project. Results of this research together with English version of the questionnaire used for research described below are accessible from Delina et al. (2007). Our sample gathers data from 446 Slovak organizations which operated in 2009. The distribution of sample is provided in Table 1. Questionnaire examines 31 different TBMs presented in Table 2. For the purpose of this paper, these mechanisms were analyzed in term of necessity. In survey, companies had to choose which of TBMs are necessary for them to join online environment.

Company size (employees)	Experience of company in electronic commerce:				
	No	Low	Experience with internal ERP,e-business solutions	Experience with electronic marketplaces	Total
Micro (0-9)	21	131	73	8	233
Small (10-49)	5	57	41	2	105

Medium (50 –249)	3	25	26	3	57
Large (250+)	2	14	34	1	51
Total	31	227	174	14	446

Table 1: Description of sample distribution

3.2. Research methodology:

The research analyzes what TBMs are mostly requested by organizations in order to enter to e-business environment. As mentioned before, absence of TBMs which are by organizations perceive as necessary could be interpreted as barriers to entry to e-business environment.

In the first part, we analyze whether e-commerce (EC) experience of companies influences the number of TBMs requested by companies. In other words, we try to define whether number of requested TBMs differs in companies with different e-commerce experience. For that purpose following null hypothesis was tested: *H1: The distribution of entry barriers is the same across samples representing different experience of companies in electronic commerce.*

Secondly, we investigate whether size of companies influences the number of TBMs requested by companies. Here we examine whether smaller companies, have different entry barriers than the larger ones. For that purpose following null hypothesis was tested: *H2: The distribution of entry barriers is the same across samples representing different size of companies.*

In order to measure quantity of required TBMs a new variable called “entry barriers” was created. It specifies how many TBMs particular company consider as necessary to entry to online environment. This variable is used to examine how the distribution of required TBMs is changing based on e-commerce experience and size. Differences between particular distributions are investigated by use Kruskal-Wallis test of independent samples at $\alpha=0.05$ significance level. It test “null hypothesis that the population medians are equal, versus the alternative hypothesis that there is a difference between at least two of them” (Bewick et al; 2004). This particular test is described as nonparametric version of one way analysis of variance (ANOVA) (Bewick et al; 2004). Non-parametric test was selected based on categorical structure of the data.

Last part of research examines particular TBMs. Here we analyze which of 31 TBMs (Table 2) are mostly required by companies in order to entry to e-business environment. Purpose of this analysis is to determine how concrete TBMs fulfill their purpose of building confidence within companies.

d_5a	Contact information (name and address, legal form, web page, contact person, etc.)
d_6a	Description of company's focus
d_6b	Product/service categories
d_6c	Detailed product/service description
d_7	Information about the company size
d_8	Year of foundation
d_9	Status of business activity (i.e. valid, bankrupt, winding-up)
d_11a	Nation level certificates or marks (e.g. mark of quality, Top/Best company in industry, etc.) of companies on the local market (in the same country)
d_11b	Nation level certificates or marks (e.g. mark of quality, Top/Best company in industry, etc.) for foreign companies

d_11c	Known international established certificates, e.g. ISO
d_12a	List of important business partners (suppliers and customers)
d_12b	List of conducted business (e.g. known buildings, clothing collection, etc.)
d_13a	Positive-only feedback from the partners
d_13b	Positive and negative feedback from the partners
d_13c	Discussion forum where partners of the company have the option of adding some comments about trading with concerned firm.
d_13d	Reports with aggregated historical data about the platform business activities of the company
d_13e	Rating presented as a simple symbol or number for example percentage with presenting the number of total transactions
d_14a	The integration of business negotiation outcomes into the contract
d_14b	Contract negotiation process tracking and recording (according to requested privacy level)
d_14c	Basic contract clauses and templates
d_14d	Database/service with complex contract clauses for the fee provided by specialized company.
d_14e	Explaining contract template clauses and conditions
d_15a	Advisory support - Recommendation of ODR experts to users, what steps should be taken?
d_15b	Technical support - support by solving technical problems
d_15c	Limited ODR – till some level of complexity
d_15d	Outsourced ODR service by specialized company
d_16a	Internal service, where mediator is acting as ESP with appropriate bank account
d_16b	Bank will be the mediator through documentary credits
d_16c	Trusted Third Party – outsourced specialized company will provide the services
d_17a	Multilingual support with standard terms
d_17b	“Code of Conduct”

Table 2: Overview of examined TBMs

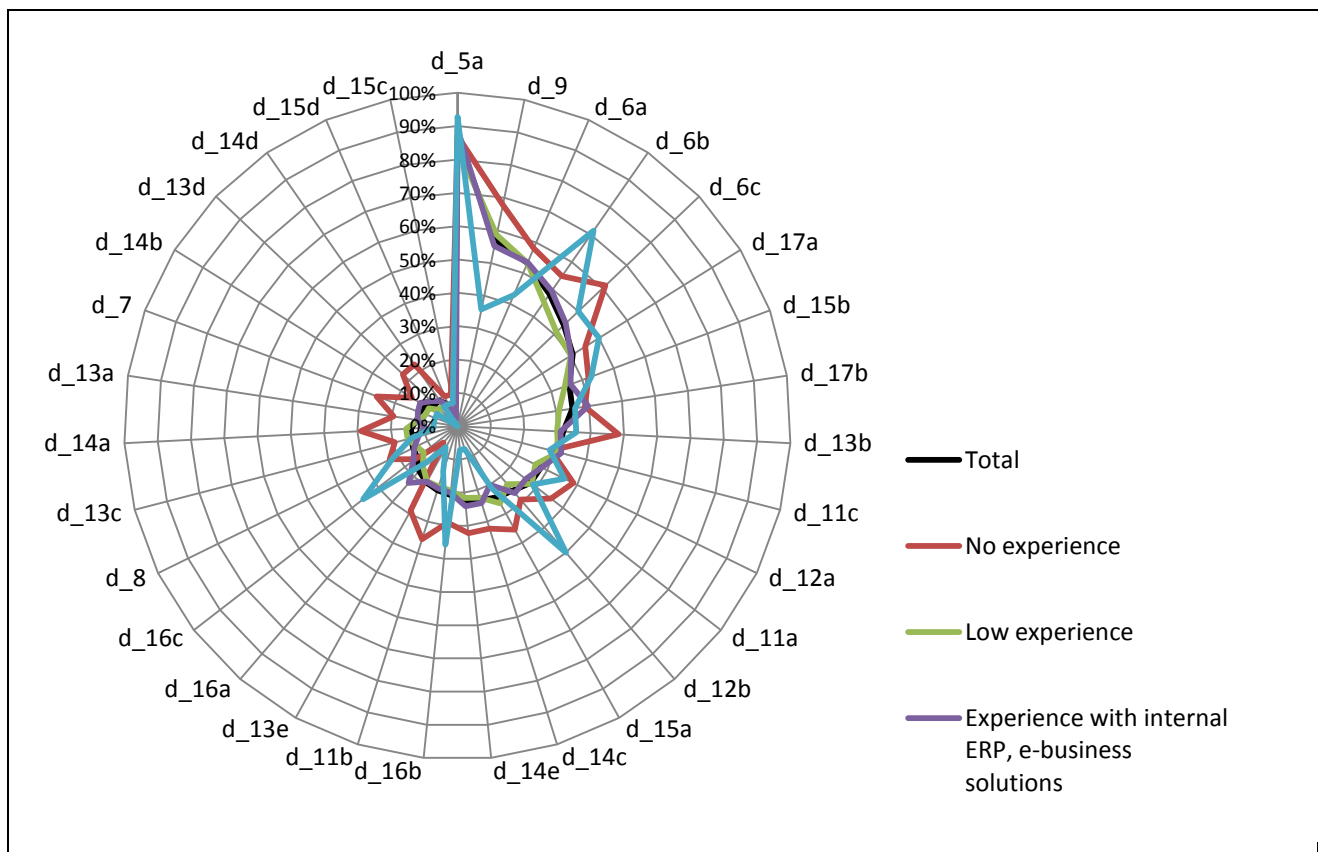
4. Research conclusions

4.1. Impact of companies' e-commerce experience on quantity of required TBMs

In order to define whether number of required TBMs is influenced by e-commerce experience of companies we test null hypotheses that distribution of entry barriers (created as a sum of TBMs marked as necessary calculated for every company) is the same across the samples (groups). Results of these tests are presented in Table 3. As can be seen Kruskal-Walis test doesn't confirm, that average quantity of trust building mechanisms requested by companies in order to entry to online environment, changes based on ICT experiences of companies.

H	Null Hypothesis	Test	Sig.	Decision
1	The distribution of entry barriers is the same across samples representing different experience of companies in electronic commerce.	Independent-Samples Kruskal-Wallis Test	0,137	Retain the null hypothesis.
Asymptotic significances are displayed. The significance level is 0,05.				

Table 3: Summary of hypothesis H1 tested by Kruskal-Wallis Test



Graph 1: Percentage distribution of necessary TBM based on the ICT experience of the company

To examine further, how e-commerce experience influences the portfolio of TBMs perceived by companies as a necessary to entry to e-business environment, graph 1 was created. As can be seen, the greatest discrepancies are between companies with no e-commerce experiences and companies with experiences with electronic market place. Highly experienced companies requested mostly 5 solutions: Contact information (93%) Product/service categories (71%) Detailed product/service description (50%) Multilingual support with standard terms (50%), and weren't very interested about the rest mechanisms. This phenomenon in the graph represents as series of spikes. On the other hand most of the companies with no experience in e-commerce required TBMs such as: Contact information (87%), Status of business activity (68%), Description of company's focus (63%), Detailed product/service description (61%). These companies also far more demanding than experienced companies and require adoption of many other TBMs (presence of spikes is low). Moreover companies with no e-commerce experiences more frequently request highly sophisticated

TBMs in order to entry markets. To conclude a portfolio of TBMs which are requested by companies with experiences with electronic market place is relatively similar for most companies across the group. On the other hand there are TBMs which are frequently required by companies with lower experience in e-commerce, but highly experienced companies don't require them often. (e.g. Nation level certificates or marks for foreign companies)

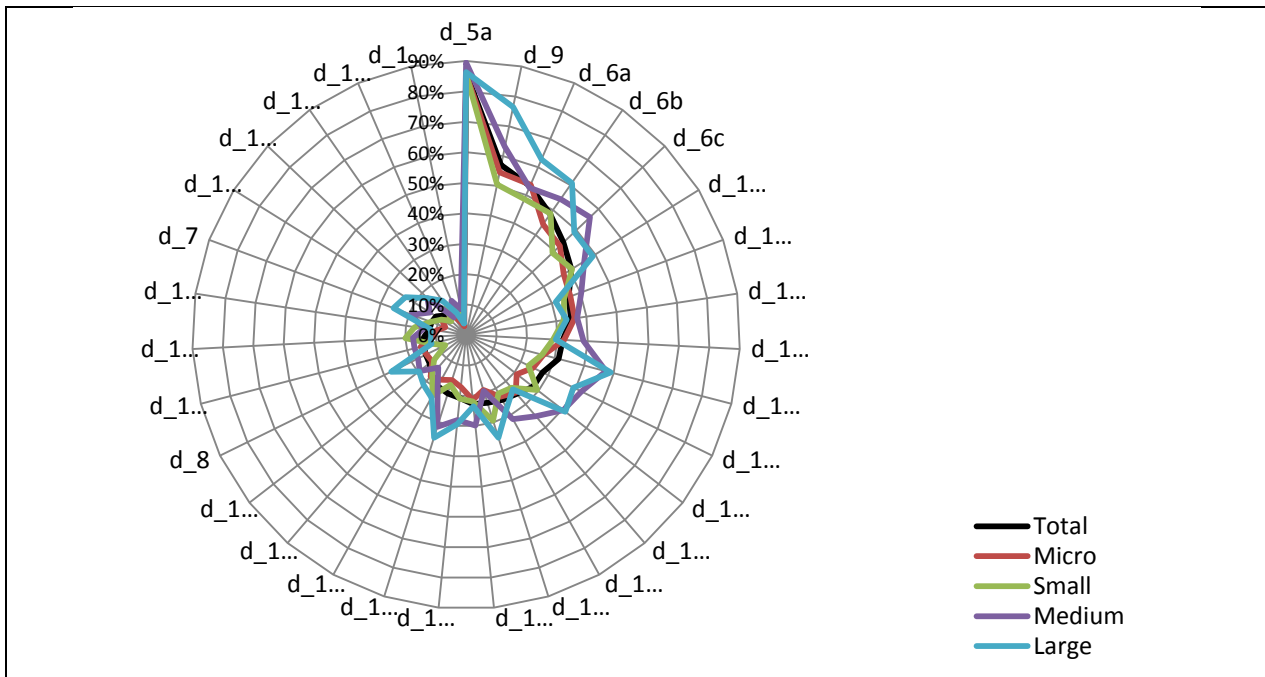
4.2. Impact of companies' size on quantity of required TBMs

The Kruskal-Wallis test was also used to test whether number of required TBMs is influenced by size of companies. It confirms existence of some differences, between groups representing companies with different size (Table 4). Moreover pairwise comparison showed, the significant discrepancies were between groups of micro and large sized companies and between groups of micro and medium sized companies. Medians of groups representing micro ($\tilde{x}_{micro} = 7$) and small ($\tilde{x}_{small} = 7$) sized companies were below medians of medium ($\tilde{x}_{medium} = 10$) and large ($\tilde{x}_{large} = 9$) sized organizations and were also below total median of all 447 companies ($\tilde{x}_{total} = 8$). Therefore it can be claimed that on average medium and large sized organizations request adoption of more TBMs than the smaller ones. These conclusions were also confirmed on graph 2. Here it can be seen, that lines representing micro and small are very close to each other as well as lines of medium and large companies. Outer layer of radar chart is almost exclusively represented by lines representing large and medium sized companies. This phenomenon can be explained by carefulness of medium and large sized companies. Although micro and small sized companies use every opportunity to find potential business partners, medium and large sized companies don't want to experiment on online environment unless it is really secured, so they request more mechanism to protect themselves.

H	Null Hypothesis	Test	Sig.	Decision
2	The distribution of entry barriers is the same across samples representing different size of companies.	Independent-Samples Kruskal-Wallis Test	0,005	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is 0,05.

Table 4: Summary of hypothesis H2 tested by Kruskal-Wallis Test



Graph 2: Percentage distribution of necessary TBM based on size of the company

4.3. Analysis of necessary TBMs as barriers of entry on online environment

In order to define which TBMs are for most of the companies perceived as most necessary, we compute for every single TBM percentage of organizations (total necessity), which consider a particular mechanism as necessary to entry the market. In Graph 1 and Graph 2, these percentages are marked as Total (black solid line). Mechanisms in the graph 1 a 2 are organized clockwise based on percentage they scored. As graphs illustrates, generally, companies required mostly simple and basic TBMs as: Contact information (86%), Status of business activity (57%), Description of company's focus (53%), Product/service categories (48%), Detailed product/service description (44%), Multilingual support with standard terms (41%), Technical support (36%). Other mechanisms as “Code of Conduct” (35%), Positive and negative feedback from the partners (32%) and Known international established certificates (31%) are important for more than one third of all organizations. On the other side of barricade, there are sophisticated solutions like: Reports with aggregated historical data about the platform business activities of the company (9%), Database/service with complex contract clauses for the fee provided by specialized company (9%) Outsourced ODR serviced by specialized company (7%), Limited ODR – till some level of complexity (4%). They are required by less than 10 % of companies from Slovak business environment. As findings suggest it seem that in term on necessity complexity of TBM mechanism is an issue. More complex the mechanism is, fewer companies consider it as necessary mechanism in term of entry to online environment. This can also be interpreted as, more complex the mechanism is, the fewer companies qualify this mechanism as a tool required to build confidence in entry to online environment.

5. Conclusion

Trust building mechanisms play crucial role in order to establish environment of trust in e-business platforms. Absence of these mechanisms can be perceived by companies as barriers of entry. In the study we, examined more than 31 TBMs, to define which are by companies perceived as necessary

to join online environment. Base of our findings it can be said, that companies request wide range of different TBMs. On the other hand it should be said, that the more complex TBM is, the fewer companies understand it, can rely on it and request it. Moreover number of requested TBMs seems to also depend on their size. The micro and small sized companies appear less demanding than the medium or larger ones. In term of experience in e-commerce, it doesn't seem to be factor that influences the number of requested TBMs, but it should be said that, there are a big differences between TBMs requested by highly eSkilled companies and companies with no experience in e-commerce.

Acknowledgement

The research was realized within national project "Strategies of trust building on Single European Electronic Market" VEGA - 1/0679/10 financed by Ministry of Education, Science, Research and Sport of the Slovak Republic.

6. References

- Bewick, V., Cheek, L. & Ball, J. (2004). Statistics Review 10: further nonparametric methods. *Crit Care*, 2 (8), 196–199.
- Chopra, K., Wallace, W. 2003. Trust in Electronic Environments. In *System Sciences, 2003. Proceedings of the 36th Annual Hawaii International Conference on System Sciences (HICSS'03)*, Big Island, Hawaii, 6.-9. January, 2003. IEEE Computer Society, 2003, pp. 331-340
- Delina, R. (2009). Reputation Building for Electronic Marketplaces. In: *1st International Ambient Intelligence Forum 2008 Proceedings*, edited by Mikulecky et al. *Ambient intelligence perspectives*, 1, IOS PRESS 66-72
- Delina, R., & Vajda, V. & Bednár, P. (2007). Trusted operational scenarios: trust building mechanisms and strategy for electronic marketplaces [On-line]. Available at: <http://mpira.ub.uni-muenchen.de/20243/1/MPRA_paper_20243.pdf> p. 78. ISBN 978-961-232-205-2
- Dorčák, P. & Pollák F. (2011). Influence of virtual social networks on increase in sales in electronic commerce. *Organizacija prihodnosti: zbornik 30. mednarodne konference o razvoju organizacijskih znanosti*, Slovenija, Portorož, 23.-25.3.2011. - Kranj : Moderna organizacija, p. 260-267.
- Doucek, P. (2004). E-society – perspectives and risks for European Integration, In: *IDIMT-2004: 12th Interdisciplinary Information Management Talks Conference*, Budweis, CZECH REPUBLIC, SEP 15-17, 2004 *Proceedings*, edited by Ch. Hofer, G. Chroust. *Schriftenreihe Informatik*, 12, Universitätsverlag Rudolf Trauner, 35–42.
- eMarketServices. (2005) "eBusiness Issues: Building Confidence". [On-line]. Available at: <http://www.emarketservices.com/start/Knowledge/E_business_Issues/Building_Confidence/index.html>
- Gavurová, B. (2011). Systém Balanced Scorecard v podnikovom riadení. *Ekonomický časopis*, 59 (2). ISSN 0013-3035
- Gefen, D., Benbasat, I. & Pavlou, A. P. (2008). A Research Agenda for Trust in Online Environments, *Journal of Management Information Systems*. 24 (4), 275–286.
- Lewicki, R. J. & Bunker, B.B. (1996). Developing and Maintaining Trust in Work Relationships, In: R.M. Kramer and T.R. Tyler (Eds.) *Trust in Organizations: Frontiers of Theory and Research*, Thousand Oaks. pp. 114–139. Sage
- Nicholson, C. & Compeau, L. & Sethi, R. (2001), The Role of Interpersonal Liking in Building Trust in Long-Term Channel Relationships, *Journal of the Academy of Marketing Sciences*, 29(1) (2001), 3-15
- Qing, Y., H. Lihua, H. & Yunjie, X. (2008). Role of Trust Transfer in E-Commerce Acceptance. *Tsinghua Science and Technology*, 13(3), 279–286

ROLE OF THE ARMY IN LOCAL DEVELOPMENT AS SEEN BY INHABITANTS OF POLISH MUNICIPALITIES

Marzena Piotrowska-Trybull

Management Institute
Management and Command Faculty
The National Defence University
m.trybull@aon.edu.pl

Abstract

The article presents selected results of the opinion poll with 506 participants from the Polish municipalities, where a military unit was stationed. Factors regarding local development as described in reference sources constitute the base for determining the interrelation areas and indicating the variables that might reflect potential influence and role of a military unit concerning its nearest surroundings. The article deals mainly with interrelations between the army and its neighbouring areas, including the army's influence on local labour market and activity of business entities.

Keywords

Municipalities, Local Development, Differentiation, European Union, Military Units, Interrelations, Role

1. Foreword

Differentiation processes of development depends on structure of resources in region, level of their concentration and prowess of usage by local and regional self-governments, as well as the ability of self-governments to cooperate with other regional subjects. The European Union also engages in activity, aiming at strengthening interregional cohesion. It is said in article 3 of The Treaty on European Union „EU (...) shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. (...) It shall promote economic, social and territorial cohesion and solidarity among Member States”.

In Poland and other member states of the European Union we can observe relatively significant differences between regions (level NUTS 2), but it is worth to underline that these differences become more apparent when we compare statistical units at a lower level (NUTS 3 or NUTS 5).

Local development is understood as a complex category. A. Jewtuchowicz claims that it is a process of diversifying and supporting economic and social activity with the use of mobilization and coordination of resources and energy within a particular area (A. Jewtuchowicz 2005, p. 58). It can be considered in four domains: economic, social, infrastructural and environmental. These domains are identified by factors illustrating local changes. Development on a local scale is determined by different factors, out of which we should take into consideration: economic structure

(including, investments, financial resources from the EU), competences, social ability to solve problems and to cooperate (activity of people), social infrastructure, technical infrastructure, economic infrastructure (business institutions), activity of local authorities.

Military units are one of the groups of subjects stationed within local territory. They are located in various parts of the country to fulfil their tasks. Army is a specific factor in the municipality and district, because the main purpose of its activity is to defend lives of civilians and take care of territorial integrity. Their localization may determine relationships with local surroundings and shape socio-economic condition of the analysed territory. Consequentially, the units obtain resources from the surrounding which enable those accomplishing particular tasks, whereas the surroundings are provided with the public good (security). Moreover, they exert indirect influence on local economy, especially as regards local labour market.

Municipal authorities are responsible for the local development of a given territory. Their goals include creation of conditions that are conducive to business activities and increasing the level of life quality of inhabitants.

Local development is determined by a series of factors exerting influence of varying intensity and pace on population and economy within a given region. Moreover, these factors are also variable – their significance is either diminished or increased depending on different periods. In 1970s, the process of development and its territorial differentiation in Poland was considerably determined by urbanisation and industrialisation (Gorzelać, 2009, pp. 88-89). Despite the fact that industry of many countries, regions and municipalities has remained an important constituent of their economic structure, it should be emphasised that its significance has been decreased by the service sector. Nowadays, we can single out the processes of metropolisation (Gorzelać, 2010, pgs.36-37) and servicing of national economy as the key factors as regards socio-economic development. Depending on goals and subjects of the research set forth in economic references, we can distinguish various categorizations of local development factors. One of the classifications is the division into: social, economic-environmental-areal and political-systemic factors (Bagdziński, 1994, p. 12).

2. Research information

The following part of the article is focused on socio-economic situation in 10 Polish municipalities that were subject to the opinion poll carried out in December 2010 and dealing with the military units' presence and their interrelations with nearest surroundings, as well as on selected results of the poll concerning the units' influence in local labour market, economy, technical infrastructure, social relations and environment.

The first step was to identify the municipalities where military units were stationed. The further selection was based on drawing 5 urban and 5 rural municipalities and at least 50 citizens from these regions participated into the poll. The poll was serviced by MillwardBrown SMG/KRC, with its registered seat in Warsaw (Kolipińska, Warsaw 2010), which applied CATI (Computer-Assisted Telephone Method) method.

The results obtained from 506 respondents were subject to analysis. At least 50 surveys were conducted in each of the municipalities. The sampling was quota-random. The division of respondents into age (18-34, 45-54, 55-75 years old) and gender (females, males) categories included the proportions of citizens in each of the municipalities. Phone sampling without replacement was carried out with equal probability for each number.

3. Profile of the municipalities

Municipalities included in the poll were differentiated as regards their population potential, area (see table 1) and character (urban, rural). Urban municipalities included: Będzin, Pyskowice, Wysokie Mazowieckie and Słupsk with Świnoujście. The two municipalities closing the list were also the district. The rural ones were: Andrespol, Czerwonak, Deszczno, Długołęka and Zabierzów.

The municipalities with the highest registered increase in number of citizens between 2003 and 2009 were: Długołęka – almost 14%, Czerwonak – 11%, Deszczno – 10%, Andrespol – over 9% and Zabierzów – 6%. It might be surmised that this increase mostly resulted from the immediate vicinity of large cities: Wrocław, Poznań, Gorzów Wielkopolski, Łódź and Kraków respectively. This indicates that intensive development of large urban centres facilitated the development of neighbouring municipalities. Population decrease amounting to 1-2% was observed in: Będzin, Pyskowice, Słupsk and Świnoujście.

Municipalities	Area in ha	Population, as of the end of December		Voivodeship
		2003	2009	
Andrespol	2334	11287	12317	Łódzkie
Będzin	3737	58760	58706	Śląskie
Czerwonak	8248	22583	25455	Wielkopolskie
Deszczno	16831	7175	7994	Lubuskie
Długołęka	21284	19692	22854	Dolnośląskie
Pyskowice	3089	19418	19048	Śląskie
Słupsk	4315	99247	97087	Pomorskie
Świnoujście	19723	41188	40756	Zachodniopomorskie
Wysokie Mazowieckie	1524	9236	9303	Podlaskie
Zabierzów	9942	21846	23412	Małopolskie

Table 1: Surveyed municipalities, as of December 2003 and 2009; Source:
<http://www.stat.gov.pl/bdl/app/portret.dims> (13.02.2011).

Variable consisting in amount of unemployed in the total number of population at productive age provides us with significant information concerning socio-economic situation. The highest level concerning this variable was registered in Deszczno municipality – 16.8% and Słupsk – 16.7%, whereas the lowest level was registered in Czerwonak municipality with 5.5%. When we compare 2003 to 2009, the situational improvement on labour market becomes evident in all of the analysed municipal units, with Deszczno (over 11 percentage point), Słupsk (over 9 percentage point) and Andrespol (almost 9 percentage point) municipalities at the top.

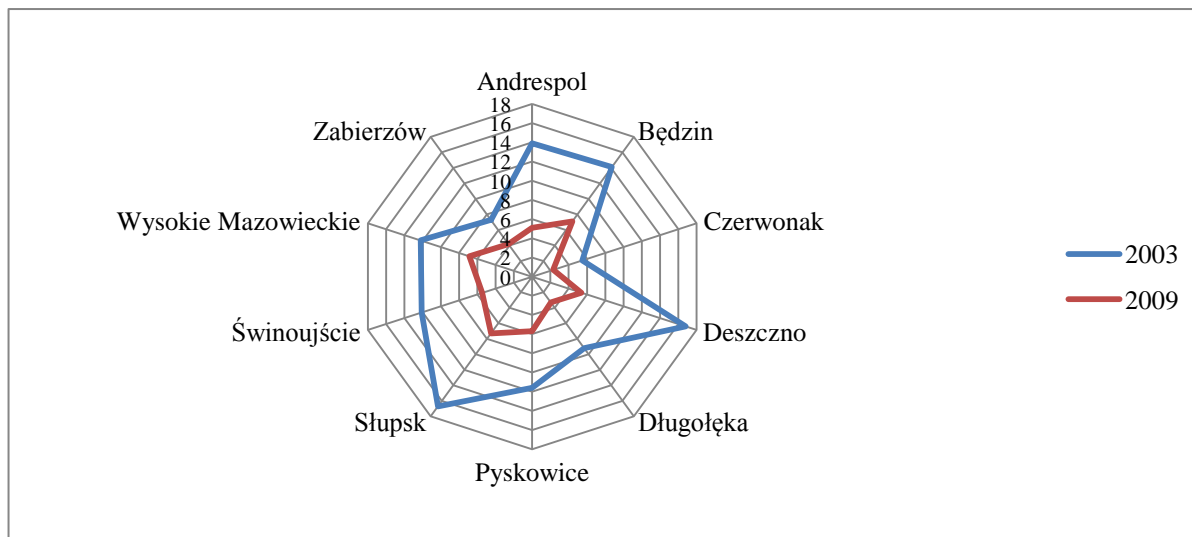


Figure 1: Amount of unemployed in the total number of population at productive age in 2003 and 2009, in %;
Source: based on data obtained from the Central Statistical Office, <http://www.stat.gov.pl/bdl/app/portret.dims> (13.02.2011).

Taking into consideration the number of business entities per 10k citizens, which indicates growth or decrease in regional business activity, it should be noted that there were no significant changes in the analysed municipalities between 2003 and 2009. Most municipalities registered insignificant increase in number of business entities, with Długołęka, Deszczyn and Zabierzów at the top. The decrease was reported in Słupsk, Andrespol and Wysokie Mazowieckie.

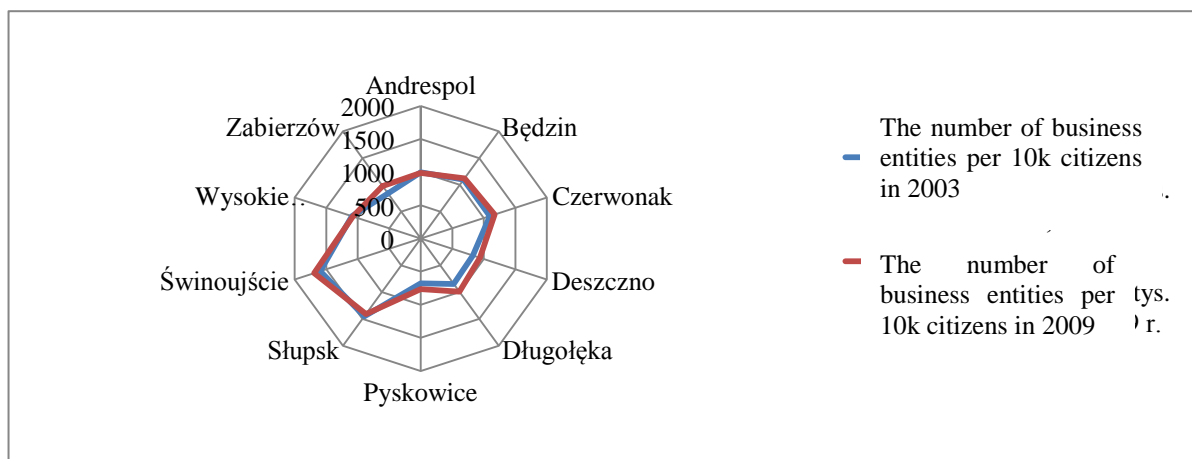


Figure 2: The number of business entities per 10k citizens in 2003 and 2009, according to municipalities; Source: based on data obtained from the Central Statistical Office, <http://www.stat.gov.pl/bdl/app/portret.dims> (13.02.2011).

4. Results

When asked about the general evaluation of a military unit located in a given municipality, 44% of the respondents estimated it as positive or rather positive. However, almost the same amount of respondents (42%) declared a neutral opinion as regards the military presence in their municipalities. Negative evaluation was expressed by 3% of the respondents.

In order to identify interrelations between a military unit and its surroundings, the citizens were asked to elaborate on the areas that are beneficial to local development due to the military presence. Over 50% of the citizens claimed that the units stationed within their municipalities facilitate creation of new jobs and influx of citizens, as well as limit the emigration of population to other municipalities. It is worth stressing that the location of a military unit within a given municipality is not only a number of soldiers in a garrison, but also members of their families who work, learn, use culture institutions, healthcare establishments, etc – which influences the creation of new job places in service sector. It is also indicated in answers provided by 46% of the respondents, who claimed that the army stabilises the level of demand in their municipalities. Micro entrepreneurs, who run retail establishments, are in most of the cases the first ones to experience increase in sales due to the military presence and decrease in sales when the army retires a given unit. Interestingly, almost 49% answered that the military presence facilitates increase in educational level; the highest percentage of such answers was recorded in Słupsk and Świnoujście – over 60%.

About 29% of the respondents underlined the fact that the army is the major, or one of the major, employers, thus being crucial to municipal development. Almost the same amount replied that the units are important as far as fiscal reasons are concerned – as municipal budget is aided with incomes from real estate tax, which was mostly stressed by the citizens of Słupsk, Świnoujście and Deszczno.

Over 80% of the respondents stated that the army as an institution does not exert any influence on development of local companies as it restrains from establishing direct economic relations (units do not order products from local companies). It probably derives from the fact that the process of purchase in the army is centralised so the suppliers are not chosen on the basis of close vicinity, but according to the lowest offer pertaining to substantial batches of products delivered to the army.

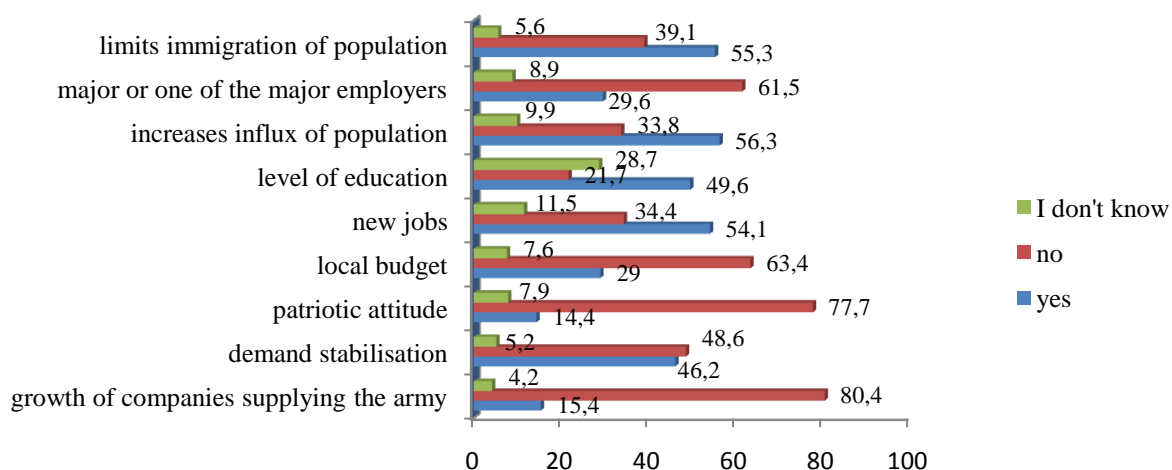


Figure 3: Influence of the army on socio-economic situation according to the respondents, in %; Source: own analysis based on data supplied by MillwardBrown SMG/KRC.

It might be a bit surprising that less than 20% of the respondents stated that a unit shapes patriotic attitude and over 70% expressed contrary opinion. On the one hand, it might suggest changes in societal system of values. On the other hand, analyses by CBOS (Centre for Public Opinion Research) indicate that the army is one of the very few institutions of the country that are highly trusted by the society (Felixiak, Warsaw 2010).

In reference to statements pertaining to facilitating local companies' sales by the army, it should be noted that most of the beneficiaries were: bakeries (19.8%), groceries (9.3%), transport companies

(7.1%). Respondents found it difficult to enumerate these entities, which is proven by the fact that as much as 51% of them could not identify any.

34% of the respondents had their own business. In this group, only 21% considered the army's presence while making business decisions. The answers provided to this query correspond to the above-mentioned, indicating that the army's presence is rather not conducive to development of local companies as connections between them are centrally limited. The reasons for establishing such a model are elimination of corruptive actions and striving for cost reduction through the use of scale advantage offered by centralised model of purchasing.

Influence of the army on local labour market varies depending on size and profile of the towns where military units are stationed and also on size of the unit itself. The amount of the respondents who claimed that liquidation of the unit in their municipality would have decisively negative or rather negative influence on local labour market was nearly the same as the amount of the respondents who claimed that it would rather not or would decisively not influence local labour market, 46% and 48% respectively.

Negative effects of the military presence on the environment were not mentioned very often. They were indicated by 20% of the respondents, whereas 60% claimed that military units rather help protect the environment. For example, the training grounds in Drawsk Pomorski and Orzysz are inhabited by protected species of birds and animals that are difficult to come by in other places.

Municipalities	growth of local companies supplying the army	demand stabilization	strengthening of patriotic attitude among youth	incomes to local budget	new jobs	increase in level of education	population influx	major or one of the major employers
Pyskowice	3,0	12,0	3,6	6,0	16,2	13,1	20,3	9,6
Zabierzów	4,1	18,2	2,7	8,2	12,8	14,7	16,9	8,2
Wysokie Mazowieckie	3,2	12,8	2,4	7,2	13,6	13,6	19,2	7,2
Andrespol	4,5	13,3	4,5	5,1	16,4	16,4	16,4	7,0
Czerwonak	1,5	10,5	2,3	9,0	14,3	19,5	19,5	8,3
Słupsk	3,5	13,6	4,4	10,1	17,3	13,2	16,7	7,6
Świnoujście	7,6	11,7	6,0	10,0	17,0	13,0	11,3	8,8
Długoleśka	4,4	15,1	1,9	6,3	17,0	17,0	15,1	7,5
Deszczno	6,1	13,1	6,1	10,9	13,5	10,0	13,5	10,5
Będzin	3,4	12,4	4,5	7,3	14,7	14,7	16,4	9,0

Table 2: Influence of the army on socio-economic situation according to the respondents, in %; Source: own analysis based on data supplied by MillwardBrown SMG/KRC.

Influence of the army on local development according to the inhabitants of given municipalities is presented in Table 2. The data suggest that in Pyskowice, Wysokie Mazowieckie, Andrespol, Czerwonak, Deszczno and Będzin municipalities most of the respondents declared that the army facilitates influx of population. Similar responds were received in Zabierzów, though the respondents in this region pointed to the fact that a unit performs a function of municipal demand

stabiliser slightly more often. New job places were most often mentioned by the citizens of Słupsk, Świnoujście, Długołęka and Andrespol. Furthermore, the respondents of Czerwonak, Długołęka i Andrespol municipalities underlined the importance of military presence in raising the level of citizens' education. The role of the army in shaping patriotic attitude (merely 1.9% in Długołęka municipality) and development of local companies resulting from cooperation with the army (mentioned earlier in the article) were the most infrequent aspects underlined by the respondents. Importance of the army for local budget was most often indicated in Deszczno, Słupsk and Świnoujście municipalities.

Over 60% of the respondents shared the opinion that the army's presence does not limit the use of land for services, housing and tourism. The opposite opinion was expressed by 3.1% in reference to services and 6.9 in reference to tourism. It might be assumed that the profile of municipal economy determines attitude towards the army. In Drawsko Pomorskie and Hel municipalities – not included in the poll – where large areas belong to the army and which would like to promote tourism, slightly more critical opinions on the army's presence prevail.

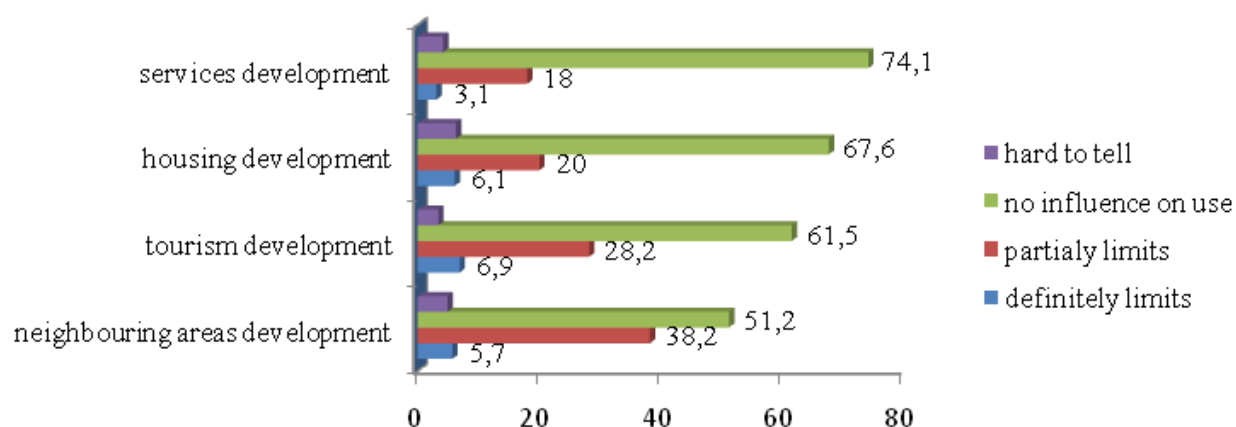


Figure 4: Influence of the army on the use of municipal terrains for particular purposes according to the respondents, in %; Source: own analysis based on data supplied by MillwardBrown SMG/KRC.

The most frequent answer given by the respondent was that the army's presence within their municipalities limits the scope of use of the areas in the vicinity of the units. A definite "yes" was the response provided by 5.7% and 38% pointed to the partial limitation. Municipal governments of the territories where military units are stationed are obliged to provide access to areas and equipment, as well as cooperate with the army in particular situations, thus limiting their independence as regards the use of municipal terrains. Military authorities put forward the motions for spatial municipal development, they are also authorized to give their opinion on study projects and participate in the process of approval for local spatial development plans together with voivodeship projects for spatial development. Military units cooperate with municipal schools. 39% of the respondents said that the army is engaged in such cooperation in their municipality, 25% claimed the opposite and 34% had no knowledge of this issue. When asked about the means of cooperation, the informants enumerated educational and informational meetings in schools – 37%, support in organizing student's free time activities – 36%, works on behalf of schools – 7%, patronage over ceremonies and events – 3% and visits to units' premises – 3% as the most frequent ones.

5. Summary

One of the foremost goals of the EU is limiting the diversification of socio-economic development between the member states. Such phrasing expresses economic, social and territorial cohesion, as well as solidarity among the member states. Analysis of socio-economic diversification leads to the conclusion that they become more prominent at local rather than regional level.

Among the local development factors we can distinguish: economic, competence-related, social, infrastructural, environmental-areal and actions by local authorities. These factors vary in quantity, quality, space and time. Nowadays, metropolisation processes play an important role in dynamiting socio-economic development and servicisation of economies. Basing on socio-economic indicators of the municipalities subject to the poll we can assume that close vicinity of a large city is mostly positive for local development.

Military units are specific local entities as the decisions concerning their positioning are made at the central level. Results of the poll indicated that the opinions on the military presence in the respondents' municipalities were mostly neutral. The respondents noticed that the military units influence: influx of population and reduction of immigration, stabilisation of municipal demand, creation of new job places and raising the educational level of inhabitants. The least frequent answers as regards the army's influence were: shaping patriotic attitude and development of local companies deriving from cooperation with the army.

On the one hand, the army as a public institution does not influence the development of local companies, which stems from the high level of centralisation concerning purchases for the army. On the other hand, individual incomes of soldiers and military employees are important for the level of local demand.

According to the respondents, the military presence did not limit the use of areas for services, housing and tourism. However, it might be assumed that generalisation with reference to this aspect could cause undue simplifications. Situational analysis of the municipalities other than the ones mentioned in this article indicates that the army's presence is sometimes detrimental to tourism-based municipalities. The respondents underlined that the units stationed in their municipalities limit the use of the terrains within the military unit's vicinity.

On balance, it should be stressed that the army is an important entity on local labour market. It is beneficial to the creation of new job places, influences the competence level in local environment and stabilizes the level of demand. Whereas, centralized procedures prevent the establishing of relations with local companies. Thus it seems that pros and cons balance is not easy to determine and needs further comprehensive study.

Acknowledgement

This scientific work was financed by the resources for education in 2010-2013 as a research project of Ministry of Science and Higher Education No O N115 311238, Local and regional conditions for the functioning of military units situated within the territory of the country.

6. References

- Bagdziński S.L., *Lokalna polityka gospodarcza (w okresie transformacji systemowej)*, (Local economic politics [in transformation period]) Wyd. Uniwersytetu Mikołaja Kopernika, 1994.
- Feliksiak M., *Oceny instytucji publicznych*, (Evaluation of public institutions) CBOS, Warsaw 2010.

- Gorzelak G., Społeczno-ekonomiczne regionalne zróżnicowanie Polski (Socio-economic regional diversification in Poland), in: Zagórski K., Gorzelak G., Jałowiecki B. (ed.), Zróżnicowania warunków życia. Polskie rodziny i społeczności lokalne (Quality of living diversification. Polish families and local communities), Wyd. Naukowe SCHOLAR, Warsaw 2009.
- Gorzelak G., Miasta lokomotywy (Locomotive towns), „Newsweek”, 11.07.2010.
- Ignasiak-Szulc A., Piotrowska-Trybull M., Przedsiębiorczość w rozwoju regionów (Entrepreneurship in regional development), Wyd. AON, Warsaw 2009.
- Jewtuchowicz A., Terytorium i współczesne dylematy jego rozwoju (Territory and its modern development dilemmas), Wyd. Uniwersytetu Łódzkiego, Łódź, 2005.
- Kolipińska E., Opinie mieszkańców na temat obecności jednostek wojskowych w gminach, (Opinion of Inhabitants Regarding to Presence of Military Units In the Commune), MillwardBrown SMG/KRC, Warsaw 2011.
- Piotrowska-Trybull M., Strzoda M., Influence of Professionalization Process of Polish Armed on the Regional Development, in: The role of human capital In the development of the countries and regions of central and eastern Europe, ed. A. Ignasiak-Szulc, Wyd. Dom Organizatora TNOiK, Toruń 2010.

Information & Communication Technology – Trends, Scenarios, Impact

ICT TRENDS, SCENARIOS IN MICROELECTRONICS AND THEIR IMPACT

Christian W. Loesch

CWL001@gmx.net

Abstract

Reviewing the state of the ICT industry and its impressive capability to overcome economic turbulences will lead us to investigate trends, scenarios and R&D strategies for the medium and long term. In the 90s two inventions rescued Moore's law shifting the final goalposts further away, but the end of the CMOS evolutionary path comes nearer, and thus a plethora of alternatives is being proposed for the MtM (more than Moore) era. We are witnessing the transition from classical to equivalent scaling. The long-range quest is to replace charge by other variables as polarization, spin, phase etc.

We will discuss some of these options and some emerging developments ranging from the interdependence of technological and social development to an increased emphasis on memory as well as some newly emerging technologies as photonics, nanotechnology or plasmonics and their potential contributions.

Continuing the central theme of focusing on future scenarios, we will peruse how the ICT Industry is extending its footprint to new opportunities. Some of the most exciting trends in electronics today are not defined by computers but by macroelectronics as flat panel displays, solar cells or bioelectronic sensors or three-dimensional printing technology, broadening the reach of electronics in life further. For such systems: Big is beautiful!

On the other end of the scale, we find Exascale Systems as RSFQ systems (rapid single flux quantum circuit technology) or Terascale Computing, a development noteworthy by the capability of the devices and applications it could enable.

Keywords

ICT, Information Communication Technology, Microelectronics, Future trends.

1. State of Microelectronics industry

Based on current technology trends, the scaling limits to planar CMOS are clear. Though simple scaling of planar CMOS is ending, the technology will continue approximately on Moore's historical performance trend for another decade.

Moore's law is not a physical law but a law about economics. Consumer products and emerging markets have become the dominate end markets for semiconductors and will continue to be so for the next decade. A key attribute in these markets is price. Silicium technology is on course to offer a billion transistor chips for less than \$1, which will be very difficult to displace. (Thompson, 2010)

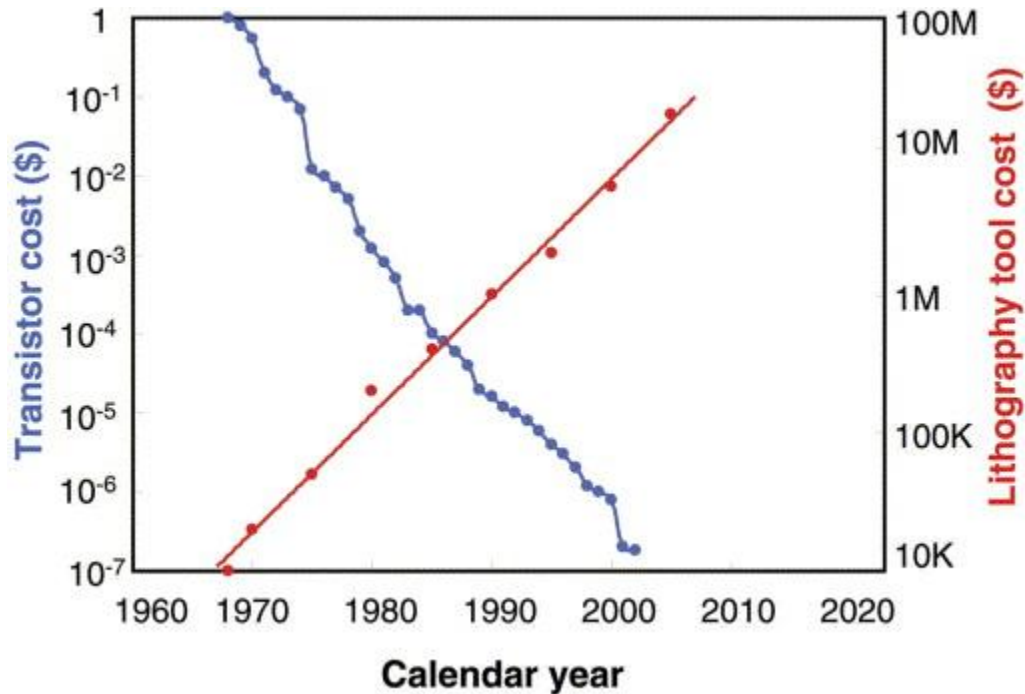


Figure 1: Moore's law and the future of Silicon microelectronics (Thompson, 2010)

2. The future of Si-Microelectronics – Beyond Si CMOS

Technologies are developed in response to economic drivers and technological requirements arise for given product classes application driven.

Semiconductor industry has become more complex each decade, having been driven by the mainframe, then the PC, expanding to portable devices, microprocessors and memory business, gradually stretching out its application footprint and hence its technology footprint. Processing complexity, applications as networking are likely to feature larger number of cores earlier in the technology cycle. Power consumption has become the quintessential requirement for all applications, first for wired but now for wireless as well.

2.1. From classical to equivalent scaling

In the 90s two inventions came to rescue to prolong the development along Moore's logarithmic scale: Strained silicon and high-k metal gate replacement of conventional gate dielectric by Hf-compounds.

Scaling for frequency and power efficiency will unfortunately not keep up, in part due to the limitations of interconnect materials and the lack of scaling advantages in packing technology.

Since speed and clock frequency increases become less feasible, power and thermal requirements begin to outstrip the benefits, reorienting the thrust towards parallel execution in multicore designs.

As the end of the Silicon evolutionary path nears, paradigm changes are proposed as Ge, carbon, III-V semiconductors etc, as well as different geometries as nanotubes, nanowires, grapheniod sheets and different operating principles.

However, new paradigms create new challenges as for example nanotechnological challenges as to grow semiconductor CNTs in desired location in a defined direction or to deposit graphene on desirable surfaces (Dorojevets, 2009; ERM's Future Fab).

Growing nanowires on both III/V and silicon substrates may allow future integration of optoelectronics on Silicon as well as beyond CMOS devices exploring spin as fundamental carrier of logic information.

Emerging research devices encompass a large variety of potential devices ranging from Ferroelectric gate FET (FeFET), STT MRAM (Spin transfer torque memory) Resistive random access memory (RRAM), Phase change RRAM to polymer and molecular memory devices. (ITRS, 2009)

This weird device menagerie needs some sorting/weeding out.

A medium to long-range objective appears to replace charge by other variables as polarization, spin, phase etc. leading to smaller switching energies (avoidance of charging the gate capacitance of an FET). As we see spintronic features prominently, setting aside QC (quantum computing), the proposed solutions fit poorly into the Neumann type architecture, thus research in compatible architectures will be integral to future developments. (Salomon, 2010)

2.2. Nanowire-based one-dimensional electronics

The roadmap for downscaling and introducing new technologies in the semiconductor industry is well laid out for the next ten years, one-dimensional structures, such as carbon nanotubes and semiconductor nanowires, are explicitly mentioned as realistic additions. Devices based on such materials are, however, still in an embryonic stage from an industrial point of view. Whether they will have an impact on future post-CMOS technology depends on more factors than just superior single-device performance.

The history of the semiconductor industry shows that only those technologies will survive and have impact that can be integrated and scaled up for large hierarchical systems.

2.3. Graphene single-electron transistors

Research on graphene nanostructures started a few years ago, but it seems to be only the very beginning of research of quantum transport in graphene, and of graphene electronics for applications. Graphene, a single layer of carbon atoms forming a perfectly stable and clean two-dimensional crystal with very few defects, has been proclaimed a new revolutionary material for electronics. These hopes rest mainly on the unique band structure properties of graphene. Although living essentially on the surface, electron mobility in this material does not suffer extensively from surface contaminations and is surprisingly high even at room temperature even in comparison to high quality semiconducting materials such as silicon. The understanding of electronic transport in graphene is still in its infancy. (Mynbaev, 2010)

Two daunting problems preventing significant increases in processor speed are thermal and signal delay issues associated with electronic interconnection. Optical interconnects, on the other hand, possess an extremely large data carrying capacity, and may offer new solutions for circumventing these problems. Optical alternatives may be particularly attractive for future chips with more distributed architectures in which a multitude of fast electronic computing units (cores) need to be connected by high-speed links. Unfortunately, the large size mismatch between electronic and dielectric photonic components of at least one or two orders of magnitude is hampering their implementation.

2.4. Photonics

Modern photonics will potentially contribute significantly to optical communication technology. The performance of CPUs increases much faster than the transmission speed of the links between of the links between the modules. Leading to interconnects problems as delay, crosstalk, general noise, high power consumption i.e. heat dissipation. With data rate changes from 10 Gb/s to 40 Gb/s and to 100Gb/s technology changes will become inevitable. Future architecture and the transition from multicore to many-core architectures will require bandwidth of 200GB/s to 1TB/s. (Luryi, 2010, Mynbaev)

Main advantage of optical communication is speed, i.e. greater bandwidth (transmission capacity).

Photonic crystals consist of thin layers of two dielectric materials with different refraction indices; these layers reflect radiation within a resonant band and transmit other wavelengths. A main application for photonic crystals in optical communication is associated with photonic crystal fibres which can be used as amplifiers, building fibre lasers etc. and could lead to integrated optical devices on the silicon-on isolator platform (Hutchby, 2010, Mynbaev)

Engineers growing lasers on Silicon pave way for on-chip-photonics overcoming the communication bottleneck between computer chips marrying III-V with Silicon forcing two incongruent puzzle pieces together. There is still the temperature problem that III-V growth at high temperatures 700°C destroys the electronics, but now the possibility to grow nanopillars of indium gallium arsenide on a Silicon surface at 400°C has been developed (a system already used to produce thin solar cells and LEDs). (Berkley, 2011)

2.5. Plasmonics: the next chip-scale technology

An exciting new device technology that has recently emerged is Plasmonics. It exploits the unique optical properties of metallic nanostructures to enable routing and manipulation of light at the nanoscale. Plasmonics may bridge microscale photonics and nanoscale electronics A tremendous synergy can be attained by integrating plasmonics, electronic, and conventional dielectric photonic devices on the same chip and taking advantage of the strengths of each technology.

Imagine a cube of metal placed in an external electric field pointing to the right. Electrons will move to the left side (uncovering positive ions on the right side) until they cancel the field inside the metal. If we switch the electric field off, the electrons move to the right, repelled by each other and attracted to the positive ions left bare on the right side. They oscillate back and forth at the plasma frequency until the energy is lost. Plasmons are a quantization of this kind of oscillation. (Wikipedia, 2011)

Plasmonics has the potential to play a unique and important role in enhancing the processing speed of future integrated circuits. The semiconductor industry has performed an incredible job in scaling electronic devices to nanoscale dimensions. Interconnect delay time issues provide significant challenges toward the realization of purely electronic circuits operating above ~10 GHz. Photonic devices have an enormous data-carrying capacity (bandwidth). Nevertheless dielectric photonic components are limited in their size by the laws of diffraction, preventing the same scaling as in electronics. Plasmonics offers precisely what electronics and photonics do not have: the size of electronics and the speed of photonics. Plasmonics may well serve as the missing link between the two device technologies that currently have a difficult time communicating. By the synergy between these technologies, plasmonics may be able to unleash the full potential of nanoscale functionality and become the next wave of chip-scale technology. (Rashid, 2011)

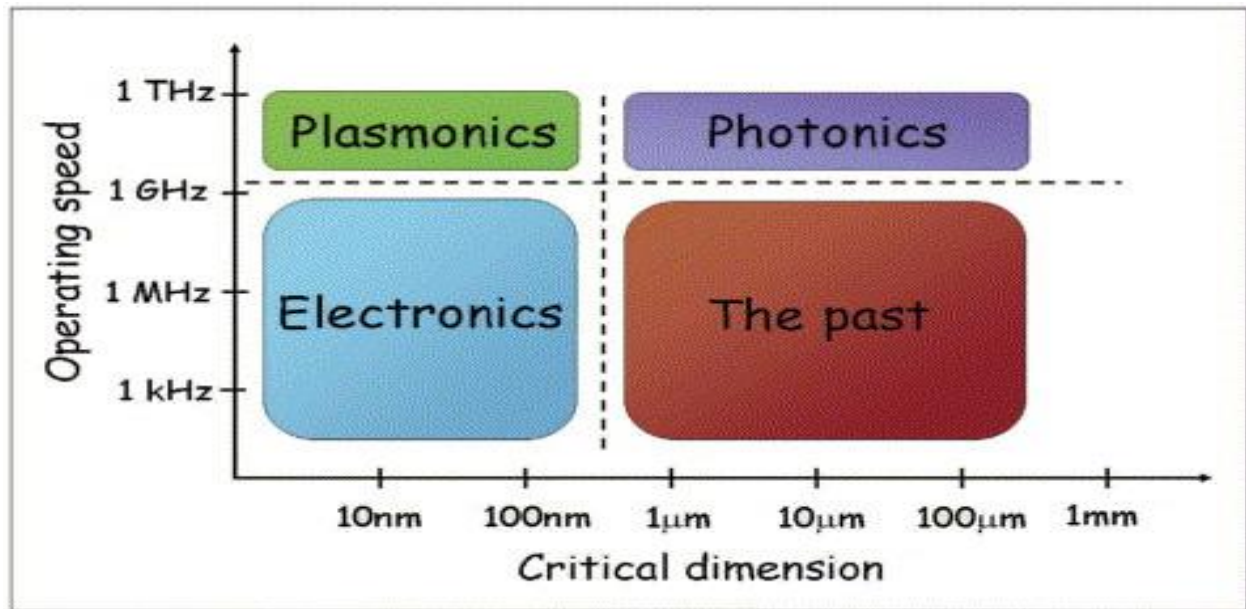


Figure 2: Plasmonics: the next chip-scale technology (Rashid, 2011)

2.6. Exascale Systems, Terascale Computing, RSFQ.

2.6.1. Terascale computing.

"Tera" means 1 trillion, or 1,000,000,000,000. Intel's vision is to create platforms capable of performing trillions of calculations per second (teraflops) on trillions of bytes of data (terabytes). By scaling multi-core architectures from 10s to 100s of cores and embracing a shift to parallel programming, R&D aims to improve performance and increase energy-efficiency. Terascale computing is a twofold revolution through the capability of devices and application it facilitates. Terabytes of data must be handled by platforms capable of teraflops to handle applications like AI, virtual reality, modelling, visualization, physics simulation, training, studio quality photorealistic graphics in real time or even Supercomputing for everyday devices. (Intel, 2011)

2.6.2. RSFQ

Another high performance technology is RFSQ based on Rapid Single Flux Quantum circuits' technology exceed 100 GHz while keeping processor power consumption low. Investment in R&D has increased sharply and produced result as FLUX-1 (2002), based on chips with 63107 Josephson junctions (JJs) on a 10x10 mm die with a power consumption of only 9,5 mW at 4,5°K or in 2009 several bit serial floating point units with up to 11k JJs operating at 22-25 GHz clock frequency in Japan . However, there are many challenges ranging from design and synchronization at 50-100 GHz wide data path RSFQ processors, latency tolerance, memory, CAD tools for VLSI superconductor circuit design, cooling costs from room temperature to the lack of a cryogenic RAM. The new 1,0μm 10kA/cm² eight metal layer technology developed in Japan chips with 10⁵ JJs may become competitors for CMOS.

The technological success has been notably for the working RSFQ prototypes but the commercial market has not materialized up to now. (Dorojevets, 2009, Luryi, 2010)

3. Technological and Social Interdependence

The push-pull effect of technology. Modern technologies have strong interactions and with many domains of the human society. After initially pushing technology into a human domain, the perceived advantages and the newly created need and market demand an even more advanced technology. After a short delay with respect to technology adoption, these domains will create a pull-situation for more technology to fulfill even better the promises made by technology.

The classical old approach was based on technology deployment by separate disciplines developing their own approaches and solutions, interfaces between technologies not lending themselves for integration or synergy.

To overcome this system development should become more interdisciplinary and integrative, calling for holistic approaches to new systems, especially for embedded system encompassing all aspects of life and society in an ubiquitous and pervasive way.

The development of memory technology would be an example of the above. (Chroust, 2005)

4. Memory

In a world overflowing with increasing amounts of data, memory performance is becoming a key bottleneck limiting overall system performance. The lack of instant-on capability is a hindrance for many users, and in data centre applications, the time to read and write large sets of data is becoming more of an issue than raw processor speed. Critical applications become more data-centric and less compute-centric, and as power consumption becomes an ever-more-important factor in all systems, existing memory technologies cannot deliver the performance required in the future.

The exponential market growth of the ubiquitous portable and mobile electronics, USB, Memory cards etc. push the need for non-volatile memory (NVM). In the latter half of 90s, mobile devices as MP3 players, digital still cameras, PDA, cell phones were making flash memory the most widely used form of memory. Market acceptance and its integration into daily life, made memory a key technology driver.

Present technology largely depends on lithography, but in spite of the fact that optical lithography has surpassed all expectations it will reach its limits. Therefore, intensive research for alternatives is ongoing. The recent ITRS study has identified eight candidates to review in depth. (ITRS, 2009)

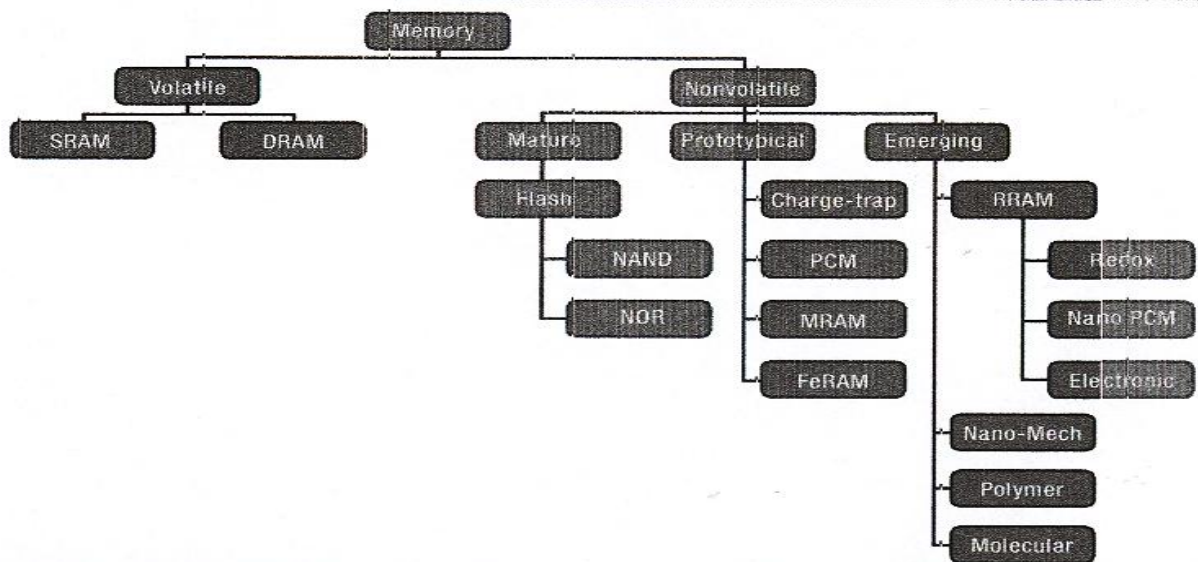


Figure 3: Memory technology review (Chen, 2009)

Out of the plethora of options, let us review some selected technologies:

4.1. STT-RAM

STT-RAM (spin-transfer torque random access memory) is a new memory technology offering a solution to many critical issues. Of all the major existing and prototype memory technologies, it is unique in capacity, endurance, and speed of working memory in addition to being non-volatile and requiring low write-power. As a magnetic random access memory (MRAM) technology that is scalable to future technology nodes, it offers the perspective to develop new products with new architectures, high performance, and low power consumption. It has the potential to revolutionize the performance of electronic products in many areas, and to give rise to entirely new products not yet envisaged.

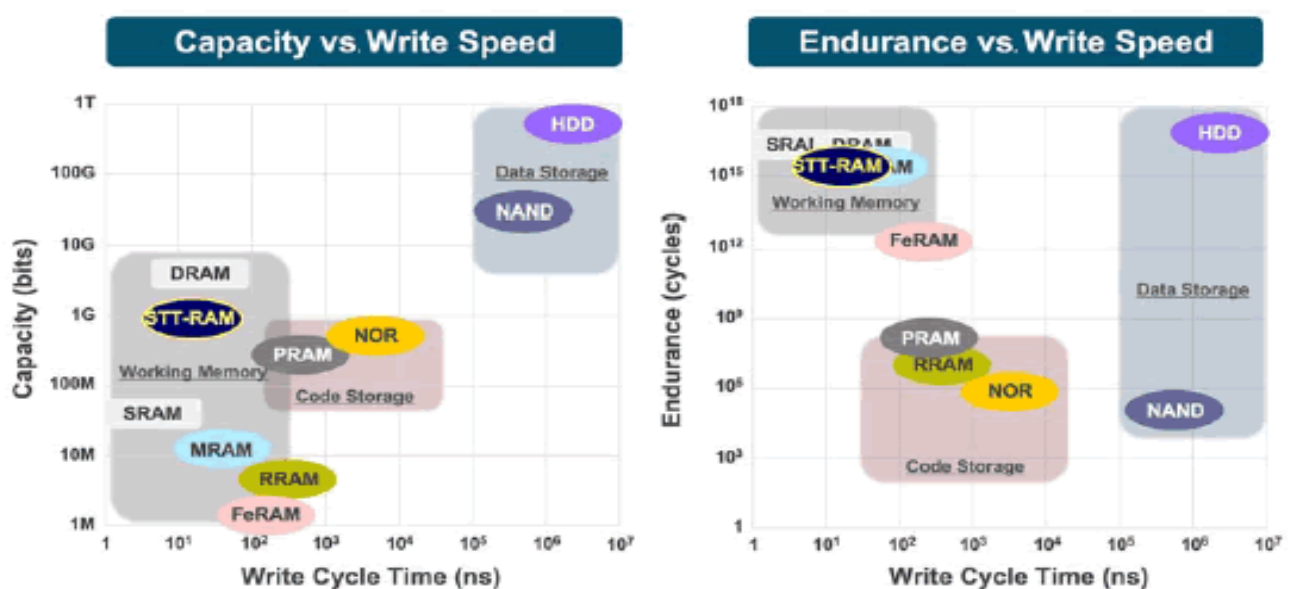


Figure 4: Comparison of Selected Storage Technologies (Grandis, Flash Memory Summit 2010)

An STT-RAM memory cell consists of an access transistor and a magnetic tunnel junction (MTJ) storage element). Unlike most other memory technologies, STT-RAM can be easily embedded in the standard CMOS processes with the addition of just two extra masks. It is worth emphasizing that, the extra cost associated with adding the STT-RAM process and equipment to a standard DRAM process is estimated to be minimal. Furthermore, STT-RAM write energy scales down with the technology node, and it requests less write energy than other non-volatile memory technologies.

Major semiconductor manufacturers accept STT-RAM as the leading next-generation memory solution. As STT-RAM chips begin to become available in the next years, they will enable revolutionary advances in latency, bandwidth, reliability and power efficiency, and its wide range of applicability and will usher in a new era of instant-on computers and high-speed portable devices with extended battery life.

4.2. Phase-change random access memory (PRAM)

Phase change memory based on the crystal-glass phase transition is known since the mid 60s, discovered 1955 at Ioffe Institute (UdSSR). Phase-change random access memory (PRAM) is a nonvolatile memory technology that has a number of advantages over flash memory technology. PRAM uses heat-induced changes of state (between crystalline and amorphous) in a chalcogenide glass to store information. The state changes accompany changes in resistivity, which provide the electrical mechanism for data storage and retrieval. Chalcogenide glass is already found in optical storage media (CD/DVD), though in these applications changes in refractive index are used to store information. Recent developments have demonstrated the ability to double PRAM storage density by incorporating two additional intermediate states (for a total of four) to store two bits of information per cell. The most commonly used Chalcogenide glass, known as GST, is composed of germanium, antimony and tellurium ($\text{Ge}_2\text{Sb}_2\text{Te}_5$). Modern cell $\text{Ge}_2\text{Sb}_2\text{Te}_5$ feature attractive properties as 10^{12} cycles endurance, simple production, and fast set and reset times. (Luryi, 2010, Tsedin)

4.3. Racetrack memories

IBM's racetrack technology is based on using the boundaries of magnetic domains a information carrier. Single domains are only 10-100 bits small, with high speed movable domain boundaries, this means no moving parts and a high density of data even compared to flash memories (100x data on same surface i.e. 500000 music titles or 3500 films) combined with low power consumption (MP3 player several weeks with one battery). (IBM, 2008)

4.4. Memristance

As the name "memory resistor" implies, it is a type of non-volatile random access memory. Such a memory would have useful properties, as it would not 'forget' the data it stored when the power is turned off.

Memristance is a property of an electronic component known at least since the early 1960's. If charge flows in one direction through a circuit, the resistance of that component of the circuit will increase, and if charge flows in the opposite direction in the circuit, the resistance will decrease. If the flow of charge is stopped, the component will 'remember' the last resistance that it had, and when the flow of charge starts again the resistance of the circuit will be what it was when it was last active. Various metal oxides that have been identified which are highly compatible with present chip fabrication facilities, so they can be made in existing foundries without requiring major changes. (HP, 2010)

4.5. Holographics

Holographic storage is already around for some decennia but still holding promises in applications as versatile disc HVD, with transfer rates of one Gbit/sec and 3,9 TB vs. blue ray disc with 200 GB storage capacity. In 2004 of 20 companies HVD Alliance was founded a cooperation to instigate further R&D.

Photopolymer material changes under laser light in direction. Radiated locations change direction of light stronger than unradiated spots. A special feature of high attraction would be that it could enhance single bit read to bit-pattern reading meaning reading with one light flash up to several hundred thousands of bits.

5. The future of microelectronics is macroelectronics

Even as the microelectronics technology slides into a more mature phase it continues to impress and amaze. However, some of the most exciting trends in electronics today are not defined by computers but by flat panel displays solar cells, bioelectronic sensors aso. (Economist, 2011)

Macroelectronics encompasses large area devices with low to moderate performance as polysilicon transistors for displays, carbon nanonets for TFTs, mesoporous electrodes for supercapacitors, donor-acceptor blends for solar cells. A distinguishing attribute of macroelectronics is that the economics of material/energy dictate that these devices use thin films processed at the lowest possible temperature, and the optimization of amorphous/roughened/gyriod materials (solar cells and thermoelectric) and mesoporous structures.(Alam, Pimparak and Purdue, 2010)

For such systems the bigger the better!

The materials should not be considered as the poor cousin of the single crystalline silicon but rather a new system with unique properties that can broaden the reach of electronics in life. It is a different new dimension; Ohms law does not apply here but nonlinear percolation theory.

The malleability of many macroelectronic devices offers new opportunities of device optimization i.e. improvement of material performance through application specific tailoring of the nanomaterial. In this sense macroelectronic material is biometric.

Continuing the central theme of focusing on future trends, but venturing beyond the current main path of the ICT to other fields of microelectronics that may affect the future.

5.1. The printed world

The development of three dimensional printer technologies enables the building complex structures at costs never achieved before, and may lead to a plethora of applications and the digital production plant with potentially less capital tied up, less work in progress and less material wasted. The race for this cheaper and less risky way to the market success has already started and it is no preserve of west. It would enable building prototypes at costs never achieved before: small and medium sized components from computer design to produce metal parts in hours or days, and easily changed. Concept to production time will drop by 50-80%.

The production process would be reduced to powder being spread onto tray and solidified with a squirt or liquid binder or by sintering it with electron beam or deposit of filaments of molten plastic.

Already today applications range from aerospace companies (EADS) producing parts lighter but as sturdy as machined parts to medical-implants made to measure with features that resemble bone

strong lattice structure to encourage growth of bone to implant or made to measure dental crowns at a rate of 450 per day on a single machine. Since there are only few limits in sight for application and complexity the well renowned Economist called the technology “Print your Stradivarius”. (Economist, 2011)

5.2. Biosensing

Acquiring information is an essential part of ICT. The development of microelectronics has extended the acquisition of information to new fields. By combining the unique electrical properties of nanoscale gaps, electrical detection systems supply excellent prospects for the design of biomolecular detection devices.

A major goal is the efficient detection of molecular binding events of very small quantities of biomolecules, such as the binding (hybridization) between two strands of DNA. Many other kinds of molecules, including antibodies, enzymes, or proteins, can be identified by specific binding reactions. When many different events occurring in a single sample, distinguishing between them becomes crucial. The combination with advanced nanotechnology such as dip-pen nanolithography or barcoded molecules offers a label-free alternative for biosensing. Finally, the ‘lab-on-a-chip’ community is constantly progressing towards the development of fully electronic multifunctional devices that can channel fluids, and sort and detect cells or biomolecules. (Chen, 2010)

5.3. Third-generation photovoltaics (PV)

Classical solar cells are made of simple single crystalline junctions in which the incident sunlight separates the electron-hole pair to drive an output load. The efficiency limit of ca. 30% and the high cost of the single crystalline silicon and the high installation cost of bulky panels make them still significant more expensive than competing sources. The alternative technologies offer lower efficiency of polymer cells (typically PCBM and P3HT dual polymer structures) but these disadvantages are counterbalanced by low-cost production and ease of installation of lightweight panels.

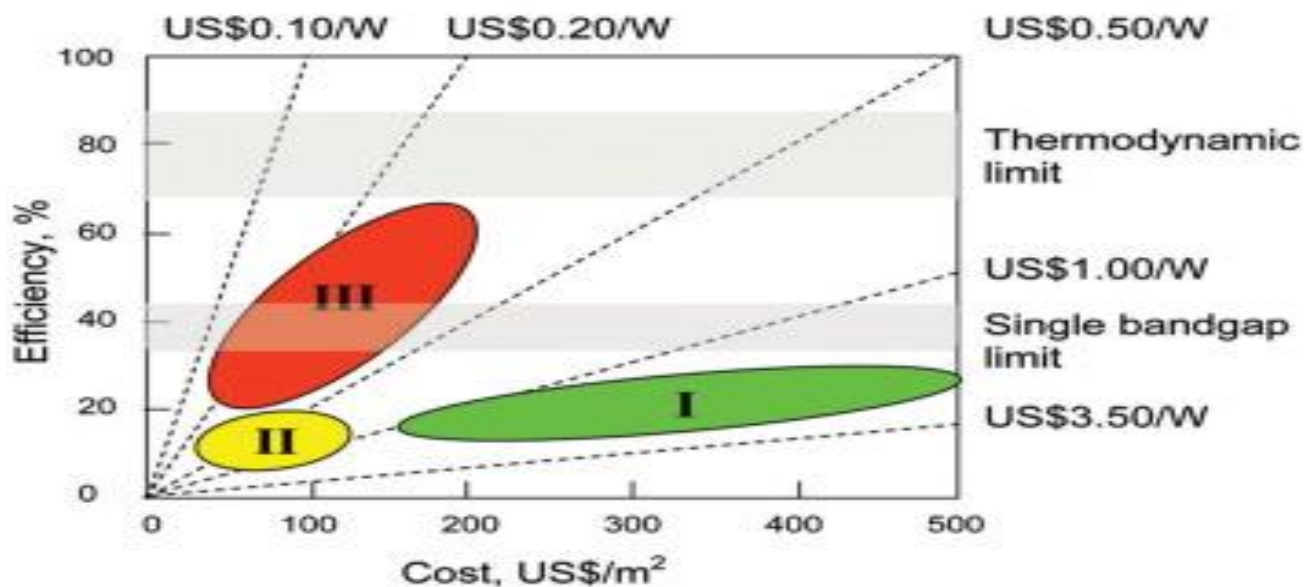


Figure 5: Efficiency and cost projections for PV technologies. (Conibeer, 2010)

Third-generation approaches to PV aim to decrease costs to below the \$1/W level of second-generation PV to \$0.50/W or even to \$0.20/W or better, by increasing efficiencies but maintaining the cost advantages of thin-film deposition techniques. Increasing efficiency means smaller areas required for a given power; such that efficiency values above 30% could decrease these costs per Watt. Several approaches to achieve such multiple energy threshold devices are under development.

5.4. Silicon based Solid Ox Fuel Cell (SOFCs)

Fuel cells convert chemical energy from hydrogen or hydrocarbons into electrical energy with high power density high-energy efficiency and low carbon footprint- Potential applications reach from large-scale power plants to portable electronics.

The primary physical structure of a TF (thin film) SOFC is a membrane consisting at least three layers cathode, electrolyte and anode. During operation, oxygen molecules are reduced to ions on cathode surface or triple phase boundaries. The O-ions are then transported through electrolyte to combine with hydrogen. (Lai, 2010)

5.5. Semiconductors for organic transistors

Organic molecules/polymers with a π -conjugated (hetero)-aromatic backbones are capable of transporting charge and interact efficiently with light. Therefore, these systems can act as semiconductors in opto-electronic devices similar to inorganic materials. However, organic chemistry offers tools for tailoring materials' functional properties via modifications of the molecular/monomeric units, opening new possibilities for inexpensive device manufacturing.

Although organic semiconductors offer significant potential for inexpensive electronic device fabrication, there are key requirements where existing materials fall short. These include realization of high carrier mobility and environmentally stable semiconductors; if the above conditions are met, they will offer significant promise for the establishment of a new electronic technology. (Lai, 2010)

6. Summary

Implementing the shift from classical to equivalent scaling the exponential development with MtM will continue successfully for the near future.

Furthermore, radically new device types will require changes along many R&D levels from materials to software. Since the timeframe to implement a radically new device is estimated to be about 30 years Si-CMOS will remain the dominant form of technology for the near and medium term future.

The trend in the industry to migrate to tertiary areas of higher profitability and extending its application footprint will expand the reliance of the economy and especially an increasing number of industries on microelectronic technologies.

Important obstacles have still to be overcome and improvements in several orders of magnitude to be achieved but the creativity and genius of physicists and engineers have proven in the past to overcome apparently insurmountable barriers, giving us at the perspective of a scenario of fascinating developments and opportunities.

7. References

- Alam M.A., Pimparak N., and Ray B. Purdue (2010). Elec. Nanogap devices for Biosensing, Materials today Univ. West Lafayette IN USA
- Berkley UC (2011). eureka Alert! 6.2.11
- Chen An (2009). Global Foundries Memory taxonomy, Memory technology review
- Chen Xing, Zheng Guo, Gui-Mei Yang, Jie Li, Min-Qiang Li, Jin-Huai Liu and Xing-Jiu Huang The future of Microelectronics is... ,MatScience Kyushu Univ, Japan
- Chroust G., (2005)., Mutually Reinforcing Innovations in ICT, Business and Society, IFSR, J. Kepler Univ. Linz
- Chroust G. (2005) Mutual Influences of Society's Paradigm and Information and Communication Technologies, J. Kepler Univ. Linz
- Conibeer Gavin, Third-generation Photovoltaics, ARC Photovoltaics Ctre of Excellence, School of Photovoltaic & Renewable Energy Engineering, University of New South Wales, Sydney NSW 2052, Australia
- Dorojevets M. (2009), Current Status and Recent Dev. In RSFQ Processor Design SUNY, NY, USA
- Economist, (Feb.2011), Printing a Stradivary,
- Grützmacher D.et alii (2010), Nanowires Technology, Physics and Perspectives. Institute for Semiconductor Nanoelectronics Jülich, Germany.
- HP, (April / June 2010). HP Labs News
- Hutchby J.A., Garne C. Michael (2010). Emerging Research Devices Technology overview INTEL Corp.
- IBM, IBM Research Almaden Lab, (2008). Spintronic Devices Research,
- INTEL Corp. (2011)..From a few cores to many more, White paper 2005 and Terascale Computing
- ITRS (2009 Edition). Executive Summary and 2010 Update.
- Lai B., Johnson A., Xiong H.,KO C., Ramanathan S.(2010). Exploratory Studies on SOFCs Harv. Univ. Cambridge USA
- Loesch Chr. W., (2010), Some eco-technological aspects of the future of Information Technology, IDIMT 2010.
- Luryi S., Xu J. Zaslavsky, (2010). Future Trends in Microelectronics, Wiley IEEE Press.
- Mynbaev Djafar, Moore's law: the future of Si microelectronics CUNY, NY USA
- Salomon P.M., (2010). Device Proposals Beyond Silicon CMOS IBM T-J. Watson Research CENTER, NY
- Thompson Scott E., Parthasarathy [a](#) Srivatsan, SWAMP Centre, the future of Si microelectronics, University of Florida, Gainesville, FL USA.
- Tsedin K.D., Chalconide glassy semiconductors, Ioffe Inst. Russian Acad. of Sc., St. Petersburg Russia.
- Wikipedia
- Zia Rashid, Schuller Jon A, Chandran Anu and Brongersma Mark L., Geballe Laboratory for Advanced Materials, Stanford University, Stanford, CA.

Poster Session – Abstracts

AFTER GRADUATE EDUCATION FOR ENTERPRISE ARCHITECTS

Libor Gála, Jaroslav Jandoš

The Department of Information Technologies

The Faculty of Informatics and Statistics

The University of Economics, Prague

gala@vse.cz, jandos@vse.cz

1. Introduction

In accord with evolution of given enterprise, also its architecture – i.e. Enterprise architecture, which represents *“the inherent design and management approach essential for organizational coherence leading to alignment, agility and assurance”* (Doucet et al., 2009) – should absorb changes in number of directions including management methods, fast development of information technologies and strategic intentions.

Enterprise architect, who is responsible for truthfulness of enterprise architecture, should understand and be able to react on all changes inside and outside of the given enterprise. Therefore his capabilities should improve in defined competencies continuously.

Basics of these capabilities in all significant enterprise architects' competencies may be acquired in tertiary education (Gála & Jandoš, 2010). This proposed ongoing research is (therefore) oriented towards analysis of offering in lifelong education, which may be taken by enterprise architect after tertiary education. It is likely that, similarly as in tertiary education, also in further lifelong learning the education offer will not be broad.

By identification of “weak spots” in enterprise architect's lifelong learning it would be possible to react timely on possible increased demand, which could be caused by wider application of enterprise architecture procedures by Czech enterprises as well as by public administration, as is the case in number of other countries.

In order to reach this goal the following methodology, comprising three steps, is selected: Research conceptual model definition (S1), Data collection (S2, concrete providers identification, collection of these providers' data), Data analysis (S3). Research model is proposed in section 2 below. After validating model, steps S2 and S3 will follow.

2. Results – Conceptual Model of Research

The first part of conceptual model is capability model. It includes four types of capabilities - *expert, strategist, politician, and leader* (Bredemeyer & Malan, 2004). These capabilities are in line with Enterprise architects' key activities, i.e., *“Strategize, Architect, Lead, Govern, and Communicate”* (Lapkin, 2006), by which the significant architects' competencies are formulated. But expert's part of capabilities is technologically neutral and from the point of view of enterprise architect's practice is not suitable. Therefore we specify these capabilities in the following areas:

1. Enterprise architecture framework and its IT support. That is because various frameworks (e.g., TOGAF, Zachman, PEAR, LEA, etc.) and various IT tools (e.g. System Architect Family, Trous, ARIS Business Performance Edition, Protégé, etc.) exist, but enterprise uses concrete framework and IT tool in enterprise architecture management and governance.
2. Industry-specific business capabilities, because enterprise architect must know not only principle but really enterprise operation.

Second part of conceptual model is model of education provisioning. Based on classification of Institute for Information Education (2009) and in compliance with goal of our research we distinguish two types of lifelong education providers - *higher educational institutions and profit and non-profit non-school institutions*, i.e., enterprises, institutions, state administration bodies, non-profit organizations.

These providers can provide *study programs* (accredited distance learning, accredited combined distance learning and special non-accredited programs, i.e., MBA study) or *lifelong learning courses*.

From the point of view of employed enterprise architect are significant not only content and quality of education but also additional attributes. These attributes are *duration of education* and distance from architect workplace. According to Annual Report of Tertiary Education (Johánek, 2010) can be duration of education defined in following scale - max 15 hours, max 100 hours and more than 100 hours. Although we accept this definition of education duration, from the point of view of employed people (educated for EA) we specify only two partitions in our research - max 15 hours of education (i.e., short term education programs or courses) and more than 15 hours of education (i.e., long term education programs or courses). And because the distance attribute depends on position of architect's workplace, we use rather *region* where education is provided as the attribute.

Whole conceptual model of our research is presented in fig. 1.

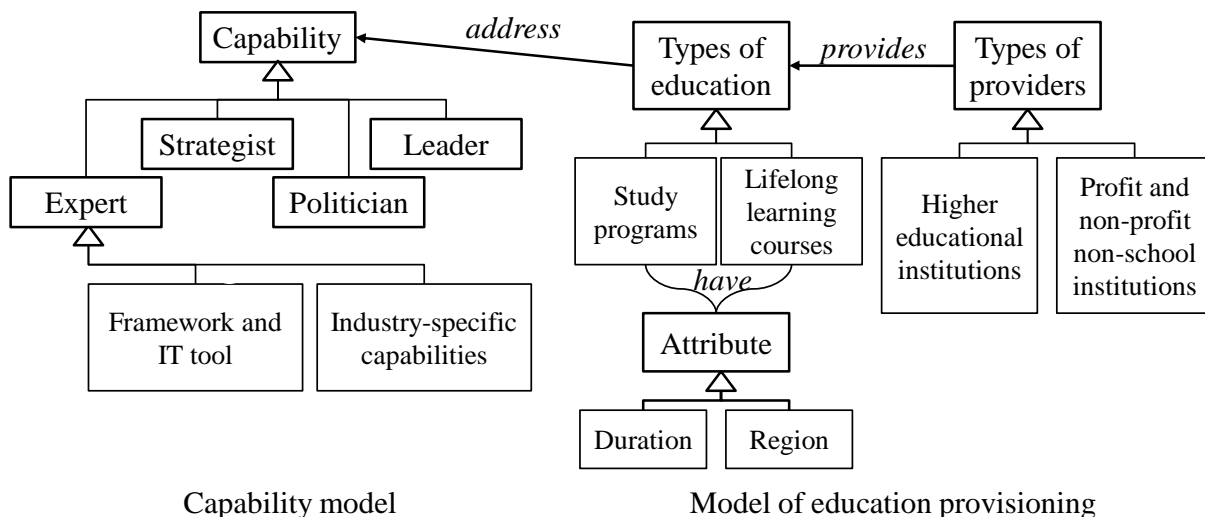


Figure 1: Conceptual model

3. Following steps of research

The conceptual model defines which data will be collected and analyzed. Based on the model of education provisioning providers in the Czech Republic will be identified. Capability model, i.e., defined capabilities is filter, which will be applied on study programs and lifelong courses. The additional attributes (duration and region) will be registered. All data will be collected from publicly available web pages only (S2).

Data retrieved in this way will then be analyzed (S3) with an aim of finding out the level of education provided for improvement of enterprise architects' capabilities in the Czech Republic, i.e. determining how individual providers provide education in required capabilities.

Acknowledgement

This paper describes the outcome of a research that has been accomplished as a part of research program funded by Grant Agency of Czech Republic grant No. P403-10-0303.

4. References

- Bredemeyer, D., & Malan, R. (2004). What It Takes to Be a Great Enterprise Architect. Cutter Consortium. [Online] 2004. [Cited: July 3, 2008.] <http://www.cutter.com/promotions/ear0408/ear0408.pdf>.
- Doucet, G., et al. 2009. Coherency Management. Architecting the Enterprise for Alignment, Agility and Assurance. Bloomington : authorHouse, 2009. ISBN: 978-1-4389-9606-6.
- Gála, L., & Jandoš, J. (2010). Enterprise Architecture University Education. New York : IBiMA, 2010. Information Management Association. ISBN: 978-0-9821489-4-5.
- Institute For Information Education. (2009). Structures of Education and Training Systems in Europe - Czech Republic 2009/2010. [Document] http://eacea.ec.europa.eu/education/eurydice/documents/eurybase/structures/041_CZ_EN.pdf
- Johánek, J. (2010). Annual Report of Tertiary Education. [Document] Prague: The Ministry of Education, Youth and Sports. http://www.msmt.cz/file/12782_1_1/
- Lapkin, A. (2006): Activity Cycle Overview: Enterprise Architect. Gartner Incorporation. ID Number: G00138081. March 22, 2006.

RECOGNITION OF DIFFERENTIATION IN UNEMPLOYMENT TRENDS AMONG REGIONS IN THE CZECH REPUBLIC

Martina Miskolczi, Jitka Langhamrová, Jana Langhamrová

Department of Demography
Faculty of Informatics and Statistics
University of Economics, Prague

martina.miskolczi@seznam.cz, langhamj@vse.cz, xlanj18@vse.cz

1. Introduction

Unemployment is very important macroeconomic indicator. In the Czech Republic, existing differences among regions remain for almost two decades already. The objective of the paper is to analyse impact of economic crisis upon regional differentiation.

2. Differentiation Among Regions

Trend in unemployment could be considered as very similar among regions: all of them have minimal value in 2007 or 2008 and maximal value in 2010 (with one exception) – “U-shape”, although level of unemployment rate is quite different (Praha and Středočeský regions are on the lowest level, Ústecký region is on the highest level).

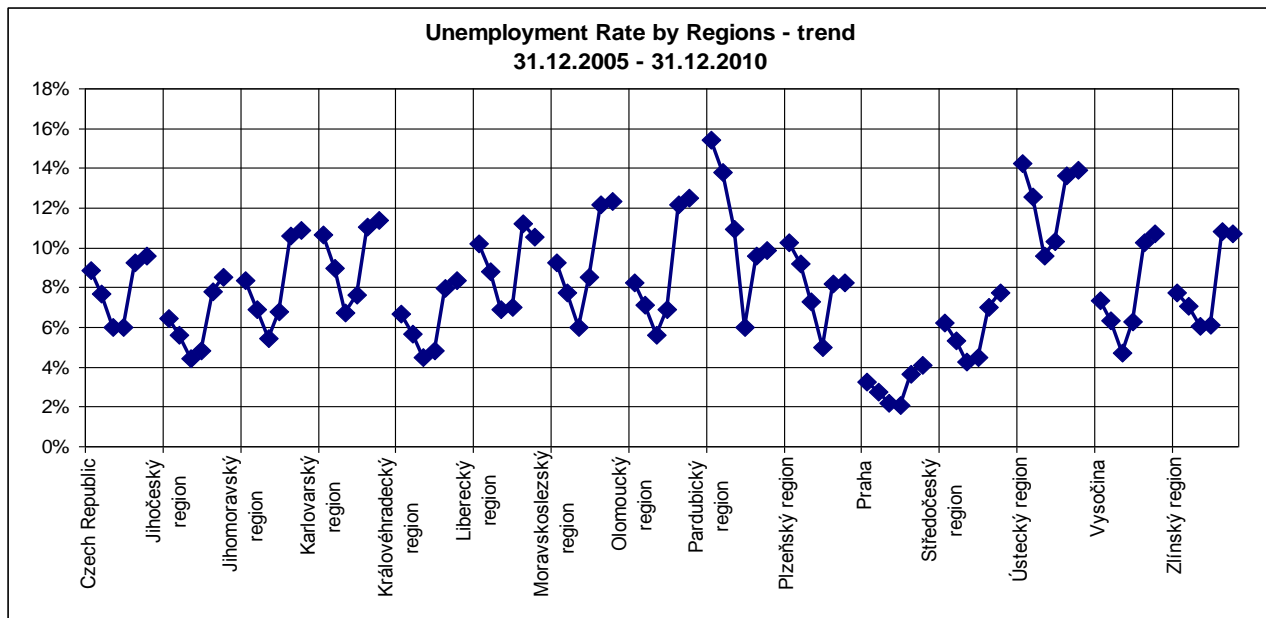


Figure 1: Unemployment rate – trend (CR and regions, 31.12.2005-31.12.2010)

- end-year unemployment rate is minimal in 2007 and 2008 in all regions;

- economical crisis affected labour market mainly during 2009, unemployment rate in 2009 compared to 2008 increased by 3.24 p.b., relatively +54.07 % in the Czech Republic, significantly responded regions Praha (+74.33 %), Olomoucký (+76.68 %) and Zlínský (+77.59 %), the weakest increase was reported in Ústecký (+32.12 %), Moravskoslezský regions (+42.85 %) and Karlovarský (+45.71 %), which are regions with highest unemployment rate;
- level of unemployment rate at the end of 2009 and 2010 did not changed very much – high level remain on similar values, the highest increased was in Prague (+0.41 p.b., +11.22 %), Středočeský (+0.72 p.b., +10.34 %) and Jihočeský regions (+0.72 p.b., +9.22 %), somewhere unemployment decreased;
- economical crisis in 2008-2010 impacted mainly industrial companies, whereas third sector of services was affected weaker. As a consequence, unemployment rate for males increased by 68.77 % and for females by 43.45 %.

3. Conclusion

Economical crisis affected all regions, unemployment rate increased mainly in 2009. But in regions with high level of unemployment rate before crisis this increase was not as dramatic as for regions with low level of unemployment. Further, unemployment rate increased again in 2010 mostly in regions that started on the lowest level.

Development in regions happened differently resulting into various effects. Regions with low level of unemployment were influenced more than regions with high level and the effect lasted longer. These regions now have to deal with higher number of unemployed individuals. Men were affected more heavily in all regions compared to women. This can be explained by the fact that crisis hit mainly industry.

Acknowledgement

Supported by research project IGA F4/29/2011 Analýza stárnutí obyvatelstva a dopad na trh práce a ekonomickou aktivitu

4. References

- Czech Statistical Office, Labor Market and Earnings, Employment and Unemployment: www.czso.cz
- Mach, M. (1998). Makroekonomie II pro magisterské (inženýrské) studium 1. a 2.část, Melandrium, Praha, 1998, ISBN 80-86175-18-9
- Mateřánková, J. (2011). Regionální rozdíly v nezaměstnanosti a dopady krize. Konference Výzvy nezaměstnanosti v kontextu krize: „sociální ochrana, zaměstnatelnost, flexibilita“. Brno: 27.1.-28.1.2011. [Online] 9.2. 2011 [Cit. 10.4.2011] Available at WWW: < <http://ivris.fss.muni.cz/konf/>>
- Ministry of Labour and Social Affairs of the Czech Republic, Integrated portal, Employment: <http://portal.mpsv.cz/sz>

THE USE OF CLOUD COMPUTING (SAAS) FOR SMALL AND MEDIUM ENTERPRISES TO IMPROVE THE QUALITY OF THEIR INFORMATION SYSTEMS

Milena Tvrdíková, Ondřej Koubek

Department of Applied Informatics

Faculty of Economics

VŠB – Technical university Ostrava

milena.tvrdikova@vsb.cz, ondrej.koubek@vsb.cz

1. Abstract

Industrial society is changing into the society, where a major role is played by information and knowledge. In these changes, information and communication technology (ICT) play a key role of providing modern infrastructure, which enables most of these changes to be implemented. Simultaneously the ICT provides tools for increasing efficiency, innovation and competitiveness in almost all areas of the economy. The future competitiveness of Czech companies and work efficiency of institutions depend on their ability to seize the opportunities that IT currently offers.

Open standards and technologies such as Java, Service-oriented architecture (SOA) and Web Services (WAS) changed the IT environment and the possibility of electronic cooperation between operators, resulting in further opportunities in the field of computer cooperation between suppliers, customers and clients - development of e-market and creating communities around products or services. The purpose of the introduction of new digital tools into business processes in companies and institutions is to take a good position in the emerging e-market and offer customers better meet their needs.

The unavailability of these ICT because of the prices of required applications and infrastructure was long-term problem of small and medium-sized companies. The situation is now changing, but awareness of current applications and possibilities of obtaining such services among the managers of these companies is very low. The authors focus on the benefits and risks, brought to companies and institutions by high-quality information system and on the possibilities which offered by cloud computing, which is a set of easily usable and easily accessible virtualized IT resources, applicable in small and medium-sized enterprises and institutions. Emphasis is placed on support for increasing their competitiveness. With cloud computing services, users need not know either the technology used to or to manage them. A web browser is used for access to applications and data hosted on a server. Cloud computing provides dynamically scalable resources as an easily available services. Cloud computing is often divided into three areas, commonly referred as distribution models. Three basic types are SaaS - Software as a Service PaaS - Platform as a Service and IaaS - Infrastructure as a Service called together XaaS. Cloud computing services provide online virtually all software products that can be placed to the cloud using virtualization. From the view of small and medium-sized companies and institutions, the use of applications allowing data collection and analysis of data from internal and external resources and their interpretation to support the business management is the most important. The aim is to increase the competitive potential of the subject on the market.

Recommendations given by the authors are based on their own experience with the use of SaaS in teaching at the Faculty of Economics, VSB-TU Ostrava, and abroad (Poland), during one and a half year. This service is used in courses the subject E-business, where students during the lessons work with the business intelligence applications. Pros of the use of SaaS in the university education are being seen in these areas:

- The possibility of teaching a wide range of students (not only informatics-oriented students, but all students of the faculty, who are interested in the subject). This increases awareness of the economic sectors students of the current possibilities of ICT. Capacity of sessions can be flexibly changed in time period.
- Access to the application from any place that offers connectivity to the Internet. Students are not dependent on access in the classroom.
- Since the data is stored at the service provider, the university servers are not burdened.
- Promoting teamwork because students assigned into user groups can share data, information and results of their work and can work on the task as a team.
- The teacher has a control over the students approach to study. The service provider, of course, keeps track of use of the service and if the teacher is assigned to appropriate roles, he or she can see how individual students were active in preparing for the lessons.

Use of new technologies does not only bring benefits but also has its downsides. Possible disadvantages of using SaaS:

- Long response time while using the substandard access to the Internet (at universities is not a problem).
- Increased costs for transfers of large amounts of data (problems can occur if a large number of students try to download the same data of a considerable size).
- Concern about the safety of sensitive data and data at all (for companies and institutions, it is not a problem in university courses).

In conclusion, the authors offer a list of the opportunities offered by the use of the existing ICT in information systems of different types of companies and institutions depending on their size (small and medium-sized firms). The contribution summarizes the possibilities of improving the quality of the information systems using contemporary ICTs, especially cloud computing applications (mainly distribution model SaaS) in the environment of small, medium enterprises and institutions in the Czech Republic.

2. References

- Doucek, P., & Novotný, O., & Pecáková, I., & Voříšek, J. (2007). *Lidské zdroje v ICT – Analýza nabídky a poptávky po IT odbornících v ČR*. Praha, Professional Publishing, ISBN 978-80-86946-51-1
- Feuerlicht, G., & Burkon, L.(2010). Towards a Unified Service Definition. In the proceedings of the International Conference on Information Systems Development, Prague, 25-27.
- Tvrđíková, M., & Koubek, O. (2010). Support of the E-business by Business Intelligence Tools and Data Quality Improvement. In the proceedings of the International Multiconference of Computer Science and Information Technology, IEEE catalog number CFP0964E, 271-278.

ICT-DRIVEN PERFORMANCE IN GLOBAL ECONOMY – A COMPARATIVE SURVEY

Václav Oškrdal, Antonín Pavlíček, Josef Hubáček

Department of System Analysis
Faculty of Informatics and Statistics
University of Economics, Prague

vaclav.oskrdal@vse.cz, antonin.pavlicek@vse.cz, josef.hubacek@vse.cz

1. Introduction

This contribution presents results of literacy research aimed at identification and comparison of ICT-driven productivity and competitiveness factors important in diverse (geographical, branch) global economy sectors. Main focus is towards innovation potential introduced by skilled ICT professionals and their contribution to both sustainability and continuous improvement of individual organization's processes as well as local economy environment. Main drivers of ICT-driven performance, valid for Czech Republic, various European Union countries and selected foreign countries are defined, compared and discussed.

2. Research Approach

The so-called “performance drivers” are used as a key reference term. On the basis of Balanced Scorecards concept, in which context they are depicted as differentiators (“their measures capture the value propositions that the company will attempt to deliver to its targeted customer and market segments... they answer the question ‘What must the company deliver to its customers to achieve high degrees of satisfaction, retention, acquisition, and, eventually, market share?’” (Kaplan, 1996)) and alternate approach defined by Grundy (2003), who uses performance driver analysis as one of the methods for implementing HR strategy (performance driver analysis “helps to diagnose organizational performance, either externally or internally (or both)... focuses on those factors that have an impact on economic value generation in a business... gives a better feel of the overall business context before addressing a specific organizational problem or bottleneck (so that we do not simply respond reactively to a problem)”, the term “performance driver” is henceforth used to mark *activities (processes) or actions (as one-run events) that increase potential to achieve higher level of corporate performance, i.e. deliver increased outcomes with available resources*.

Performance drivers can be further divided into several categories, such as:

- generic (valid for any and all enterprises with very rare exceptions) and specific (valid for given enterprise at given time and place),
- recurring (consequently applied) and non-recurring (single-use),
- dependent (with dependencies and relations to other performance drivers) and independent.

Performance drivers can be derived using process model decomposition, value-chain analysis, case study generalization etc.

In our contribution, we focus on definition of sample, generic performance drivers, derived from literature research. We are mostly concerned with generic performance drivers, connected to extensive usage of ICT. For Czech environment, the findings were confronted with results of a survey, conducted among selected Czech companies.

3. Selected Findings

In the Czech environment, the following factors were identified (and confirmed by conducted survey) among the most important performance drivers:

- simplify administrative,
- define organizational policies and procedures that serve to positively motivate workers,
- align employee activities with the needs of customers or clients,
- definite performance metrics for individual employees using clear goal and/or KPIs,
- communicate openly and swiftly, streamline communication.

In the EU environment, further factors seem to play more important role such as:

- contribution to exploit external and internal changes,
- shift to demand interacting structure instead of supply interacting structure,
- innovation generation resulting from institutional factors.

Detailed results, comparison with other environments and economics is presented in the conference poster.

Acknowledgement

This article was created thanks to the finances provided by VŠE IGA grant „IG409061“

4. References

- Ahmed, E. M. (2010). Human capital and ICT per capital contribution to East Asian productivity growth. *International Social Science Review*, 85(1), 40. Retrieved from
- Dimelis, S. P., & Papaioannou, S. K. (2010). FDI and ICT effects on productivity growth: A comparative analysis of developing and developed countries. *The European Journal of Development Research*, 22(1), 79.
- Doucek, P. Human Resources in ICT – ICT Effects on GDP, in IDIMT 2010, Trauner Verlag 2009, ISBN 978-3-85499-760-3.
- Grundy, T., Brown, L., Value-based human resource strategy: developing your consultancy role. Butterworth-Heinemann, 2003. ISBN: 978-07-506-5769-3.
- Kaplan, R. S., Norton D. P. The Balanced Scorecard. Boston: Harvard Business School Press, 1996. ISBN 0-87584-651-3.
- Mancinelli, S., & Mazzanti, M. (2009). Innovation, networking and complementarity: Evidence on SME performances for a local economic system in North-Eastern Italy. *The Annals of Regional Science*, 43(3), 567.
- Prattipati, S. N. (2010). Sustainability and the role of information and communications technologies. *Business Renaissance Quarterly*, 5(2), 23.
- Tokumasu, S., & Watanabe, C. (2008). Institutional structure leading to the similarity and disparity in innovation inducement in EU 15 countries-Finnish conspicuous achievement triggered by Nokia's IT driven global business. *Journal of Services Research*, 8(1), 5.

List of Authors

Antlová Klára	103	Langhamrová Jitka	51, 387
Belak Jernej	191	Maryška Miloš	23
Brixí Radim	157	Mavsar Robert	207
Chroust Gerhard	81	Mildeová Stanislava	157
Čapek Jan	35	Ministr Jan	299
Čančer Vesna	100, 207, 227	Miskolczi Martina	387
Dang Tran Khanh	281	Mulej Matjaž	175, 227, 233
Delina Radoslav	315	Nespěšný David	289
Doucek Petr	11, 23	Ossimitz Günther	81
Dorčák Peter	305	Oškrdal Václav	391
Dráb Radovan	329	Pavlíček Antonín	147, 215, 391
Fiala Tomáš	51	Phan Trong Nhan	281
Finardi Savina	43	Piotrowska-Trybull Marzena	357
Fischer Jakub	43, 141	Pochyla Martin	123, 273
Gála Libor	383	Pollák František	305
Gross Tom	261	Potočník Amna	175
Hauptman Lidija	191	Pucihar Andreja	59
Holá Jana	35	Ráček Jaroslav	299
Hrabě Pavel	165	Rasič Katja	227
Hubáček Josef	147, 391	Rosický Antonín	215
Jandoš Jaroslav	383	Rozehnal Petr	123
Janke František	341	Sigmund Tomáš	147, 243
Kačín Radovan	147	Skrbek Jan	111
Kašpar Petr	289	Sonntag Michael	131
Klöckner Konrad	253	Sudzina František	59
Knez-Riedl Jožica	207	Svatá Vlasta	95
Koubek Ondřej	389	Šarotar-Žižek Simona	175, 199, 233
Kozel Roman	289	Štrukelj Tjasa	233
Kunstová Renáta	71	Tkáč Michal	349
Küng Josef	281	Tschernitz Sam	261
Lenart Gregor	59	Tvrđíková Milena	389
Loesch Christian W.	369	Tvrzník Michal	103
Langhamrová Jana	387	Vltavská Kristýna	141