



Department of System Analysis
University of Economics, Prague



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Systems thinking
and global problems of the world

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and global problems of the world

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PREFACE

Motto:

But only thinking and perceiving will wake us up, only it will shake off the heavy sleep.

Seneca, Epistulae ad Lucilium Ep. LIII

System thinking developed as a reaction to the inability of strictly defined disciplines to answer complex questions. In the dawning of system science the idea still prevailed that we need to combine some scientific disciplines only to obtain usable instructions that would enable us to achieve our aims. However in the course of time it turned out that these combinations of various scientific approaches and ideas are in spite of their prevalence over unilateral thinking unable to eliminate all problems. Some obstacles are too difficult, some are not predictable and worst of all we very often don't even know what our goals are as they differ both between individuals and in the course of one's life. How can we deal with it? To recall the ideas and examples of A. Rosický who criticised the illusion that soft systems can be neglected and pointed out to the financial crisis as one of the proofs that human perceptions of the world is substantial for our understanding it we shouldn't be blind, one-sided and biased. As soft system thinking is based on the respect for human individuality and freedom it opposes every type of totalitarianism.

In many previous years of the conference we were looking for such a respectful thinking that would allow us to cope with the challenges of our world. I appreciate that we developed many types of thinking which showed the problems from various perspectives. No perspective was excluded if it was fair and true. Our task in the discussion was always to find connections, relations and bonds among the perspectives. It is a difficult work, but represents the essence of system thinking.

I am glad that this year's conference was no exception. All the papers attempted to address the problem from a system perspective and the discussion deepened and broadened every paper's conclusions. The participants tried to find a system, to unify the perspectives.

It may seem useless to attempt to unify the perspectives, to look for compromises for so many years without tangible results. But that is the substance of thinking – to look for relations and respect differences. To give up that, to come to a final result or System would mean to give up thinking which makes us what we are – humans.

TOMÁŠ SIGMUND

ICT DEVELOPMENT PROCESS ROLES IN CONTEXT OF SCIENTIFIC/SYSTEM/CRITICAL THINKING

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ABSTRACT

This article investigates the added value of scientific/system/critical thinking application in the context of ICT development. On the basis of development processes specifics (such as the achievable level of standardization) and analysis of involvement of common roles that take part in these processes, sample practical benefits and other implications of these concepts are identified.

KEY WORDS

ICT development, project management, system thinking, scientific thinking, critical thinking, SiRUP, RACI

INTRODUCTION

The goal of this article is to investigate the importance, added value and potential benefits of scientific/system/critical thinking (“ways of thinking”) application in the context of ICT development process with respect to the roles that are assigned to individuals in a particular development project, governed using a given project management methodology.

The following questions are elaborated in more detail:

- What are the possible benefits of “ways of thinking” application in ICT development projects or ICT development process in general?
- Should different roles (that are commonly acknowledged as part of the development process) take advantage of exercising the various “ways of thinking”?

Note: due to the very limited extent, the article does not aim at delivering some truly significant new theoretical findings; it rather tries to bring attention to practically utilizable implications.

TERMINOLOGY AND APPROACH

The following approach to *scientific* and *critical thinking*, presented for example by Schafersman (1997), is applied within this article: „scientific (and critical) thinking is based on three things: using empirical evidence (empiricism), practicing logical reasoning (rationalism), and possessing a skeptical attitude (skepticism) about presumed knowledge that leads to self-questioning, holding tentative conclusions, and being undogmatic (willingness to change one's beliefs).“ The boundary between scientific and critical thinking is in practice very thin – they can be even considered as the same thing. But whereas scientific thinking is always exercised by “scientists” (and therefore also judged for correctness, completeness and applicability in given field by the relevant scientific community), critical thinking can be used by anyone capable of appropriate methods’ application as it provides individual understanding of some subject. As stated by Gingras (2006), the individuality and personal background is also very important – “critical thinking is thinking correctly for oneself that successfully

leads to the most reliable answers to questions and solutions to problems; it is a conscious and deliberate process used to interpret or evaluate information and experiences using a set of reflective skills and dispositions that guide thoughtful beliefs and actions... When exercised in professional settings, critical thinking is referred to as professional judgment.”

The understanding of *system thinking* is mostly built on the foundation created by Peter Senge in the latter part of the 20th century; an example of its' suitable definition can be quoted from Casey (2006), who describes it as follows: “System thinking is viewing a given situation for the purposes of decision-making as the conjunction of numerous interdependent components, sub-systems, processes, or activities that taken together serve to inform behaviors, alternatives, implications, and consequences in the situation. System thinking does not attempt to deconstruct a situation into the component parts; rather, the individual views the total interaction of the system.” The clear implication is that system thinking application requires good understanding of the issue that is being resolved, including its' internal structure(s), external dependencies, and resilience to change.

In order to discuss the various “ways of thinking” in the field of ICT development, other specific terms must be also pre-discussed. As for the *ICT development*, we can easily define it as “a group of people working together to specify, design, develop, test and implement a new system for ‘customer’ (either internal or external).” (Cadle, 2008) This definition might seem a bit informal, but it can be readily used to elaborate on the broader research context. It is important to acknowledge that the people (individuals) on ICT development projects perform the necessary actions (specify, design, etc.) while representing a specific *role*, i.e. they carry out their tasks in accordance with a valid “definition of capability, competence and responsibility of a team member.” (Oškrdal, 2012) With respect to the fact that majority of ICT development results are nowadays delivered in form of a *project*, i.e. as a “managed process initiated in order to acquire or adapt (change) IS/ICT, aimed at achievement of preset goals; project ends by handing its' product to common usage” (Chlapek, 2008), the roles that individual team members represent are based on some applied project management *methodology* that “assist in the sharing of information across a virtual project enterprise... Projects have significant components that require management through their lifecycle, therefore they must comply with the correct standards and guidelines to protect the users' investment in such systems.” (Charvat, 2003) It is beyond doubt that correct and thorough application of methodologies is closely related to instantiation of roles that they prescribe (among other elements, of course – such as Disciplines, Activities, Artifacts and Workflows as in the popular Rational Unified Process methodology described by Krutchen (2004)). In the next chapter, we will look closely on the basic characteristics of important roles and the relation they might have to effective exercise of scientific/system/critical thinking in ICT development.

ROLES, PROCESSES AND VARIOUS “WAYS OF THINKING” UTILIZATION

As briefly stated in the previous chapter, roles are typically defined in context of some company standards – in the area of ICT development projects, these standards are in most cases represented by a project management methodology. In this article, the example of roles definition and further discussion will be based on the Simplified Rational Unified Process methodology (SiRUP), described in detail by Oškrdal (2012). The basic set of roles that will be described is as follows – Architect, Analyst, Developer, Tester, Integrator (note: the role of Project Manager is deliberately omitted in order to put focus on the development team). Such team setup represents a very intuitive split of self-contained areas of expertise with well defined interfaces. The capabilities, competences and responsibilities of the different roles can be defined for example on the basis of RACI matrix that describes the roles in relation to important development processes. The following table is an example of such RACI matrix.

Role Process Level of Commitment (R-responsible A-accountable C-consulted I-informed)	Initial requirements gathering	Architecture draft	Requirements analysis	Architecture definition	User interface prototyping	Requirements revision	Architecture revision	Users and administrators	Documentation update	Components research	Components documentation	Technical research	Components validation	Development	Unit testing	Defects testing	Test resolution	Test model preparation	Test planning	Testing	Documentation revision	Planning releases	Deployment releases	Beta version plan preparation	Trainings preparation	Product release	Users and administrators	Fixpacks deployment	Configuration and change management
Architect	I	AR	C	AR		I	A	I		C	A	C	C			C	I		I	C	I								
Analyst	AR	C	AR	C	AR	A	I	AR	AR	I	I	I	C		C	R	R	R	R	R	I	R	I	AR	R	AR	I		
Developer		R	C	R	C	I	I	R	R	AR	R	AR	AR	AR	AR	C	C	C		R	R	R		R		C	C		
Tester	C	C	C	C	I	R	R	C	C				I	C	R	AR	AR	AR	AR	I	R	C	C	C	I	I	I		
Integrator		I	I	I						C	I	I	I	C	I		C	R	I	I	AR	AR	AR		AR		AR	AR	

Fig. 1 - Roles and development processes RACI matrix; source: author, simplification based on Oškrdal (2012)

But how can exercise of scientific/system/critical thinking help achieve higher efficiency of the listed processes? Should individuals with different “ways of thinking” attitude be activated to act in these specific roles? The minimalist definition of roles that is defined by the RACI is just a first step in such exploration; in order to answer the research questions it is necessary to identify, if there are important differences between the processes “nature” that imply that a different set of methods should be used by different roles/individuals.

There are several important aspects of any process that can help resolve the issue described in previous paragraph, especially it’s level of standardization, maturity and description detail. Starting from the latter, i.e. the description detail – Voříšek (2008) described an interesting method, called Knowledge Based Process Reengineering (KPBR) that defines four levels of description detail that can be applied to any process; more important than the definition of individual levels (that range from “basic” to “complete”) is the fact that the levels have to vary due to different degree of knowledge and expertise of the workers that take part in their realization. Also, “it is the task of the process ‘creators’ to identify the appropriate level of description detail that best suits the process.” (Voříšek, 2008) Appropriate level of description seem to be closely related to level of current (or target – as it can be changed during some time period) maturity of the process. The maturity levels set by CMMI (2009) that apply in this area are commonly known (classis six-step range from “non-existent” to “optimal”) – but what is unfortunately missed by most rigid interpretations is that higher maturity levels are not always and necessarily based on exhaustive description of the process. As Voříšek (2008) also notes, “higher maturity level can be reached under the assumption of sufficient workers knowledge... the knowledge and discipline that would have to be otherwise set by detailed process description is in some cases embedded in minds and acts of individual workers”. This is especially important if we take into account a creative and complex nature of some processes – which finally brings us to the ultimate aspect represented by the level of standardization that can be achieved. Standardization levels were set for example by NATO (2007) and are as follows (list based on more exhaustive research and updates to the concept described in Oškrdal (2012)):

- Incompatibility – processes with unique instances that can’t be standardized
- Compatibility – creative, knowledge intensive processes; “specific conditions must be met in order to fulfill relevant requirements without causing unacceptable interactions” (NATO, 2007)
- Interchangeability – repeated and repeatable processes with low volatility of parameters
- Commonality – routine, repeated processes with easily swappable executive parts

There is obviously a strong correlation between the standardization levels and the importance of various “ways of thinking” exercise. A swift examination of the first parts of the previous paragraph (that are related to description detail and maturity) also uncover some valid hints about the scientific/system/critical thinking utilization in different parts of ICT development (if we describe testing process in sufficient detail, we do not need that “educated” testers etc...), but the coherence between the level of standardization a process can achieve and the roles that take important part in such process is striking. Further focus on this aspect can bring some interesting findings, therefore it will be elaborated in more detail – the following table determines the level of standardization for the set of processes already listed in this chapter.

Process \ Level of Standardization (0- Incompatibility 1-Compatibility 2-Interchangeability 3- Commonality)	Initial requirements gathering	Architecture draft	Requirements analysis	Architecture definition	User interface prototyping	Requirements revision	Architecture revision	Users and administrators revision	Documentation update	Components research	Technical components prototyping	Development	Unit testing	Defects resolution	Test model preparation	Test planning	Testing	Documentation revision	Planning releases	Deployment releases	Beta version plan preparation	Trainings preparation	Product release	Users and administrators training	Fixes deployment	Configuration and change management	
	1	1	2	2	2	2	2	2	3	3	2	2	2	3	3	2	3	3	2	2	2	2	3	3	2	3	2

Fig. 2 - Levels of process standardization; source: author, simplification based on Oškrdal (2012)

By taking into account the RACI matrix and the levels of process standardization, we can observe among others the following:

- Architects are only accountable or responsible for processes that have low level of standardization; they are at least consulted or informed on all processes that define core functionality of the system.
- Analysts have a broad field of responsibility, with full coverage of processes standardization levels; they participate on processes that bring added value and require thorough understanding of issues.
- Developers are accountable only for processes with high level of standardization, but participate also on creative architectural tasks.
- Testers have majority of outcomes based on repetitive, well-defined processes, but have to understand and revise also sophisticated outputs of other roles.
- Integrators have a limited area of responsibility, focused on stable, repetitive delivery, usable on various types of projects with only minor alterations.

There are hardly any surprises in the findings – but when we take into account the purpose of this article (and the fact that they are based on a reference process model for software development), they are quite substantial.

(Note: whereas ICT development can be hardly considered a “hard scientific” discipline, the before described approach of Schafersman (1997) that unifies scientific and critical thinking is applied hereinafter.)

Application of system thinking seems to be of utmost importance at least for the Architects, whereas as it can significantly improve the quality of achieved results – the already mentioned “understanding of components, sub-systems, processes, or activities that taken together serve to inform behaviors, alternatives, implications, and consequences in the situation” (Casey, 2006) represent an excellent contribution to architectural tasks. Likewise, exploitation of critical thinking by Analysts can bring more than promising results as it stimulates early resolution of otherwise disguised problems; also the independent and open opinion exchange as well as proposal of creative solutions enhance customer experience and raise trust in achieving common goals – which can prove even more important (especially in troubled times) than actually gained results. For the other roles that are discussed, the benefits of critical or system thinking applications seem to be a bit limited (especially for the Testers,

where the benefits can be marginal in form of better subjective understanding), but can not be in any case brushed aside as unimportant as they stimulate general ability to creatively resolve issues and understand broader context of system setup. And at last but not at least, all of the roles have some clear overlaps to “general” topics that require both understanding of interactions (that require system thinking) and positive attitude to change incorporation (that is supported by critical thinking).

CONCLUSION

In the limited scope prescribed for this article, the intention was not to discuss general approach and various aspects of scientific/system/critical thinking. The article is based on simple empirical assumption that today's understanding of the “ways of thinking” importance in ICT development field is very inadequate – and therefore the article tries to contribute to changing this situation by presenting a clearly derived benefits of the scientific/system/critical thinking application by different roles commonly found in ICT development teams. Such benefits were proven on the basis of identification of processes that the individual roles are responsible for and their specific characteristics (such as low level of achievable standardization and necessity to understand broader context of resolved issues) that require scientific/system/critical thinking exercise.

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ENTERPRISE ARCHITECTURE: BUSINESS & ICT ARCHITECTURE TOGETHER

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ABSTRACT

Enterprise architecture is a complex discipline comprises a broader range of areas. Together they help to find an answer how to best implement a corporate strategy. Different architectural domains, business and ICT, are very often evaluated separately to each other. This can tend to the situation that a proposed solution is not optimal in whole context, although it is preferred from perspectives of separated domains. This article is focused on architectural solutions as the whole. The first part determines the basic terminology and describes consequences which highlight some possible troubles caused by separate perspectives. The second part presents architectural domains in detail and some crucial interdependencies between them. The article also includes some examples which illustrates why it is necessary to create architecture solution always as the whole.

KEY WORDS

Enterprise architecture, architecture domains, solution.

INTRODUCTION

The first part introduces the basic terminology which is used through the following text. It is very important to avoid different interpretation by various sources or authors. Highlighted consequences may cause misunderstanding while using separated perspective approach. This also corresponds to the motivation for the article.

BASIC TERMINOLOGY

The definition of enterprise architecture is very broad and usually related to an original source – there can be differences either in small details or in general understanding. This article is based on the framework TOGAF¹ (Open Group, 2011) which is definitely one of the most popular methodologies for enterprise architecture. Before we focus on the relative complex term enterprise architecture, it will be helpful to describe the both terms separately.

TOGAF characterises enterprise as: “*The highest level (typically) of description of an organization and typically covers all missions and functions. An enterprise will often span multiple organizations.*” With respect to a context this can mean an organization unit (e.g. department, division), a whole corporation or the previous including relationships to external subjects (e.g. partners, suppliers, customers). As explained above the term enterprise can have different meaning.

Architecture is defined in TOGAF as: “*Architecture has two meanings depending upon its contextual usage: (1) A formal description of a system, or a detailed plan of the system at component level to guide its implementation; (2) The structure of components, their interrelationships, and the principles*

¹ The Open Group Architecture Framework

and guidelines governing their design and evolution over time.” This highlights that the term architecture is not focused only on a structure of artefacts and their interrelationship, but also describes process level. It includes an architecture compliance to company specific principles/guidelines and evolution of systems/components at an architecturally significant point in time (represents as architecture roadmaps). From the perspective of domains, architecture can be focused on business, information systems (data, applications) and technology.

Finally the term enterprise architecture is described in TOGAF as: “The purpose of enterprise architecture is to optimize across the enterprise the often fragmented legacy of processes (both manual and automated) into an integrated environment that is responsive to change and supportive of the delivery of the business strategy.” It is crucial that enterprise architecture is focused on implementation of specific business goals supported by business strategy which can consist of various subjects. Therefore sometimes different strategies of various subjects (esp. partners) have to be taken into account as strategies.

CONSEQUENCES

Based on the description above is foreseen that enterprise architecture covers a broader range of aspects. Some of them are related to business and other rather to ICT² – however, they have to be managed together. Without this approach there is a risk to have ambiguity which can potentially cause many troubles. They can arise during implementation or when a solution is enhanced in future.

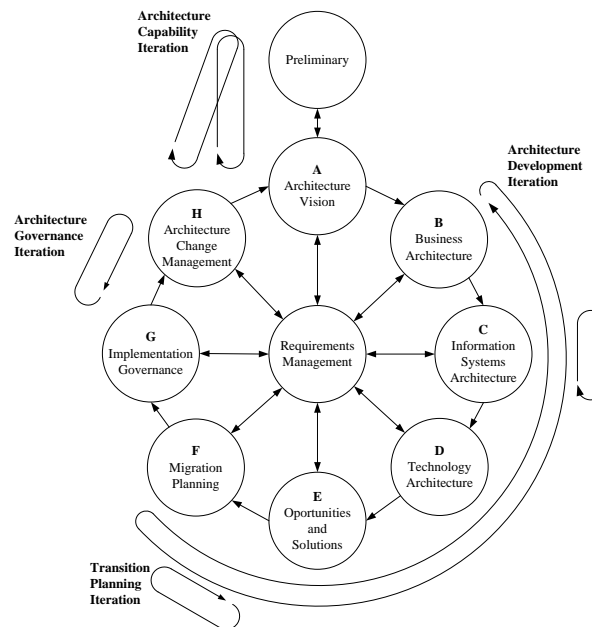


Fig. 1 – Iteration cycles (Open Group, 2011)

TOGAF uses ADM³ as a method for developing and managing enterprise architecture for a whole lifecycle. One of a key success factor is mentioned an iterative approach (Open Group, 2011). Leaving out an iterative approach may lead to create architecture for each domain (business, information systems, technology) independently on a whole. It may tend to an optimal solution on domain`s level, however a whole may not be the best match (more expensive, higher complexity, etc.).

ARCHITECTURE DOMAINS

The previous section outlines a basic terminology and points out to possible issues which can appear when architecture is created independently for each domain. The following part explains several

² Information and Communication Technologies

³ Architecture Development Method

interdependencies between domains which should be taken into account. However, it is not a full description.

Note: The following text will use the term ICT as a synonym for the domains information systems and technology. This simplification has a minor impact on the article, because it is primary focused on a higher level of abstraction.

BUSINESS ARCHITECTURE

Business architecture (ADM phase B) is used to plan how to fulfil business goals which support a corporate strategy. In this phase are described impacts to (business) components affecting particular (business) processes. Outcome of this phase is usually roadmap with baseline and target architecture including one or more transitional ones.

ROI⁴ and TCO⁵ are key performance indicators that are being used to make decision. Both KPIs⁶ should contain not only business parts, however also ICT parts:

- Costs – Investments to change processes and to create the solution (e.g. development, software/hardware). Future maintenance costs should be included as well.
- Incomes – The proposed solution can simplify existing architecture landscape (de-commissioning of a system/component). This is often not included, although it has usually a positive impact to a business case due to decrease of maintenance costs (resources, software/hardware) and possible future upgrades (migration to a new version of technology platform).

In some cases the mentioned economic indicators have only secondary aspects:

- Calculation for legislative or regulatory cases doesn't make sense as an implementation of changes is mandatory.
- Calculation of acquisition or retention is very difficult due to numbers are usually based only on expert estimations.

ICT ARCHITECTURE

ICT (ADM phase C and D) provides inputs for calculation of a business case involved in overall architecture. Based on incomes/costs a decision is taken when automation makes sense and it is input for ICT architecture. Sometimes total costs (business and ICT) are not adequate to expected incomes and therefore it is suitable to propose other alternatives without direct impact to ICT infrastructure (e.g. process re-engineering, operate via SaaS⁷).

MULTI-LAYER ARCHITECTURE

The crucial aspect for ICT architecture is where a system/component is placed from the view of multi-layer architecture. This layering approach is important, because each layer contains different type of logic and has a different technology lifecycle.

There are commonly used the following definitions – illustrated on III-RM⁸ (Open Group, 2011):

- Information consumer application (also known as front-end) represents an application primary used for interactions with a user. Complex business logic shouldn't be in this layer, because a

⁴ Return on Investment

⁵ Total Cost of Ownership

⁶ Key Performance Indicator

⁷ Software as a Service

⁸ Integrated Information Infrastructure Reference Model

consumer is specific for a concrete channel (a portal for a web, a smart-application for a mobile device, etc.) and managing of business logic across different channels is difficult (duplication) and expensive (costs). Technologies for consumer applications are changing very quickly and also there can appear new devices (e.g. two decade ago a web application, recently year's a smartphone application). Therefore companies want to re-design their consumer application available for customers relative quickly (approx. 3-5 years), because keeping them for longer time probably to tend to competitive disadvantage.

- Information provider application (also known as back-end) holds business logic provided to a consumer where one back-end can ensure services to one or more consumers. This helps to avoid (or at least decrease) duplicity in business logic, because it is managed on one place and provided to different channels (portal, mobile device, etc.) via consumer applications. It improves re-usability and saves costs. Technologies for providing applications are relative stable in time (approx. 5-10 years) and some are being used for many years (especially mainframe platforms).
- Brokering application (also known as middle-tier or middleware) is optional and connects consumers and providers together. There is usually integration logic which ensures connectivity, transformation and orchestration from providers. This logic is used by consumers. Using the approach explained above helps to avoid developing integration logic for each front-end separately. Technologies for a broker application have the similar stability in time as providers.

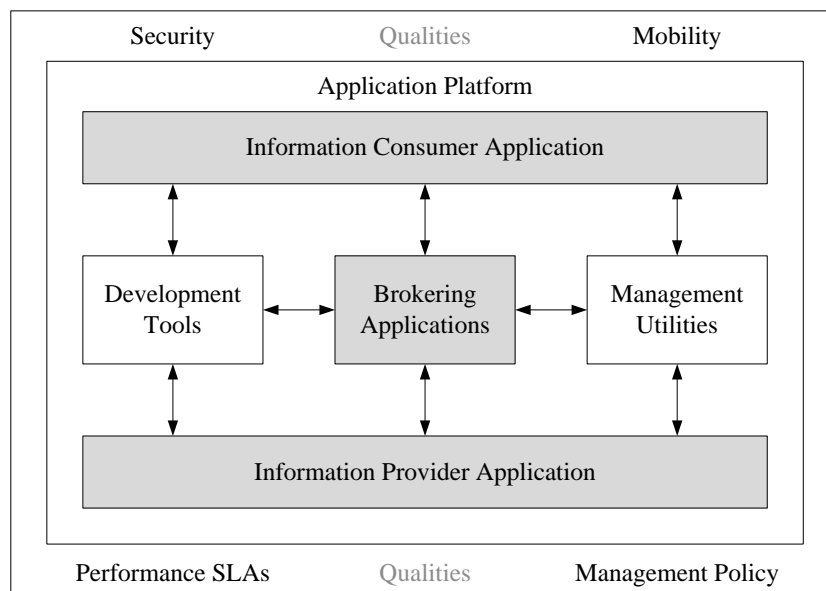


Fig 2 – III-RM high-level (Open Group, 2011)

ARCHITECTURE PLANNING

Previous text gives a short introduction to multi-layer approach which helps to classify systems/components. It sets basis ground for placing application logic in ICT infrastructure to improve re-usability (decrease costs) and keep in mind technology life-cycle. All these aspects are very important, however only ICT driven. Following description explains that architecture should be created as whole context and not only based on business requirements (which required creating specific application logic).

Management disciplines distinguish three basic types of planning (Fotr, 2012): operative, tactical and strategic. Each type is focused on different period and detail.

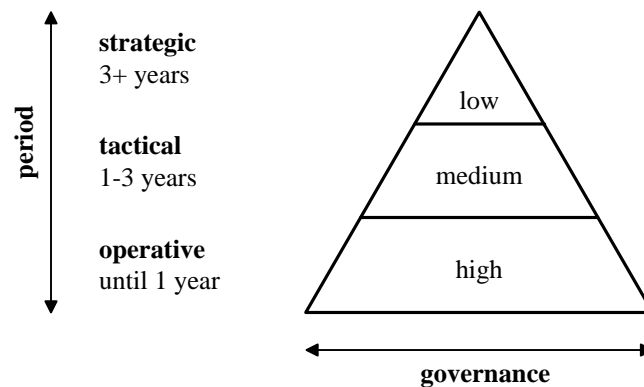


Fig 3 – Management planning (Fotr, 2012)

The similar approach can be used for architecture planning where specific solution will be created based on its perspective:

- Operative planning – covers only specific development which is required to be done quickly and sometimes not in line with corporate governance (e.g. bug-fixing). In this case should start an initiative to clear the solution in compliance with governance which will be delivered later. As the example can be presented implementation of limited amount of business logic on consumer's side (e.g. calculation, transformation), although according multi-layer approach this should be on provider's side (back-end). A provider is based on a robust technology platform time to deliver is usually longer.
- Tactical planning (1-3 years) – focuses on a temporary solution with a limited lifecycle. For example a company plans strategic initiatives to replace existing application, however time to deliver is relative long and a company needs to fulfil customer requirements – therefore decides to implement new features to existing application as fast as possible with minimum costs. Although it's foreseen that a solution will be de-commissioned. This approach creates redundancy (same features in a new and existing application) and increases costs, but required functionality is delivered in expected time.
- Strategic planning (3-5 years) – a strategic solution is introduced in long-term. It should be used as standard tools/technologies adopted by a company. Also solution should be compliance with agreed principles and guidelines.

SUMMARY

This article is focused on enterprise architecture and highlights an issue that can appear if a solution is created without an iterative approach between business and ICT. A separate solution may meet business needs and expectations, but it doesn't mean that it is an optimal solution or the most feasible one as explained in the second part of the article.

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THE IMPACTS OF ICT INVESTMENTS ON ECONOMIC GROWTH IN DEVELOPED AND DEVELOPING COUNTRIES

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ABSTRACT

This paper examines the impact of ICT capital on economic growth in groups of developed and developing countries during the years 1990-2011. The Cobb-Douglas production function with three inputs (ICT capital, non-ICT capital, total hours worked) is estimated using panel least squares method. The fixed effects model in the first absolute differences was used. The estimated panel production functions confirmed the positive impact of ICT capital on economic growth with higher intensity for developed countries compared with group of developing economies. The growth of ICT capital was statistically significant as an explanatory variable and also as a part of the total productivity factor. The research also discovered the impact of global economic crisis: in 2008 and 2009 the total factor productivity had negative values. The obtained results of the study are comparable with similar empirical studies (Dedrick et al., 2011), but this study concluded, that ICT capital has higher elasticity of the growth of ICT capital in comparison with the above study.

KEY WORDS

ICT Capital; Economic Growth; Cobb-Douglas Production Function; Developed Economics, Developing Countries; Panel Data Analysis; Fixed Effects Model; First-difference Panel Estimator.

INTRODUCTION

Economic systems deal with production and consumption of goods and services and distribution of scarce resources. In this study the production process of developed and developing national economies is discussed and analysed. It is obvious, that national economies represent large and complex systems with specific structure, behaviour and interconnectivity. The process of transformation of input factors into outputs is modelled using the production functions. In our case at the country level, the analysis of this relationship is based on classical Cobb-Douglas production function, so the inputs are labour and capital (divided into non-ICT and ICT) and the output is gross domestic product. For the purpose of investigating the impact of information and communication technologies on performance of national economies capital input is divided into non-ICT and ICT. Nowadays information technologies are widely used in majority of companies and undoubtedly, many processes can be more efficient thanks to modern technologies. This study tries to quantify and confirm the positive effect of ICT on the productivity of economic systems, respectively national economies.

The impact of ICT capital on economic growth has been already examined in many empirical studies. The authors of this papers conducted research of national economies, different sectors within one economy and companies. Studies from 1980s focused on USA and didn't confirm any significant impact of ICT investments on economic growth. In 1987 an American economist Robert Solow formulated the so-called productivity paradox. It is an observation, that as more investment is made in information technology, labour productivity goes down instead of up. Further studies performed at the

state and corporate level rebutted productivity paradox and confirmed a positive impact of ICT capital on economic growth. At the firm level, ICT investments are linked with other investments in logistics, employee training etc. Therefore it is difficult to identify all impacts of usage of ICT capital. After the year of 2000, in many developed countries the growth of ICT capital was slower and it led to a short slump of economic growth and labour productivity. Following recovery lasted to July of 2007, when the mortgage crisis in USA started. Relaxed credit policy of banks was a reason of economic crisis and caused problems with public finances. As a consequence of economic crisis investments in ICT were lower. Current empirical studies implies that national economies are now in slow sector growth and the impact of crisis to ICT sector strongly depends on economic situation and a phase of economic development in given country.

The goal of the paper is to analyse and model impact of especially ICT capital, but also of non-ICT capital and labour on economic growth for groups of developed and developing countries in the years 1990-2011. Following hypotheses are verified: How large is the contribution of ICT capital to economic growth? How large is this contribution in comparison with other inputs of production function, with non-ICT capital and labour? Is the contribution higher in developed or in developing countries? What is the development of this contribution in time?

The structure of the paper is as follows: In the introduction the focus of existing studies analysing the impact of ICT on economic growth is briefly described. Section 1 presents a methodological framework of the production function and the panel data model. In the Section 2 economic indicators chosen as a measures of output and inputs of production function are characterized. In 3rd Section the results of econometric estimation of production functions for developed and developing countries are listed. The obtained results are compared and the key conclusions of the study are summarized in the Section 4.

THE PANEL PRODUCTION FUNCTION INCLUDING ICT CAPITAL

For the investigation of impact of ICT on economic growth Cobb-Douglas production function characterized by Hicks-neutral technology is used (Hančlová et al., 2013). Capital input is decomposed into ICT and non-ICT assets. The exponential production function takes the following form:

$$GDP_{it} = a_{it} \cdot THW_{it}^{\beta_1} \cdot NICT_{it}^{\beta_2} \cdot ICT_{it}^{\beta_3} \cdot e^{u_{it}}, \quad (1)$$

where GDP_{it} is the gross domestic product for country i for year t , input factors are the total hours worked THW_{it} , non-ICT capital services $NICT_{it}$ and ICT capital services ICT_{it} . Hick's neutral total factor productivity is denoted by a_{it} and u_{it} denotes stationary errors.

The above Cobb-Douglas production function (1) can be transformed using the natural logarithms and first absolute differences into:

$$\Delta \ln GDP_{it} = \Delta \ln a_{it} + \beta_1 \Delta \ln THW_{it} + \beta_2 \Delta \ln NICT_{it} + \beta_3 \Delta \ln ICT_{it} + \Delta u_{it}. \quad (2)$$

Under the assumption, that the relation $\Delta \ln X_t = \ln X_t - \ln X_{t-1} = \ln(X_t / X_{t-1})$ expresses the growth rate of variable X among time periods t and $t-1$, equation (2) can be modified into:

$$gGDP_{it} = \Delta \mu_{it} + \beta_1 gTHW_{it} + \beta_2 gNICT_{it} + \beta_3 gICT_{it} + \Delta u_{it}, \quad (3)$$

where $gGDP_{it}$ denotes growth of GDP_{it} . Constant returns to scale of the production function mean that for all regression coefficients it holds that

$$0 < \beta_k < 1 \quad (k = 1,2,3) \wedge \beta_1 + \beta_2 + \beta_3 = 1. \quad (4)$$

Regression parameter β_k represents the partial elasticity of output growth in relation to the growth of the input factor k , ceteris paribus.

In the study the fixed effects model with a first difference transformation is used. The first difference equation is somewhat limiting, because individual effects for countries are eliminated and only time-specific effects could be estimated. In this model explanatory variables and the stationary errors should not be correlated (Verbeek, 2008, p. 362), (Liker et al., 1985) or (Wooldridge, 2002, p. 279). In practice, the first difference estimator is easy to implement without special software, as the only transformation required is to first difference.

CHARACTERISTICS OF DATA AND USED ECONOMIC INDICATORS

This study is based on data from the *Total Economy Database* (The Conference Board, 2011). This database consists of annual data covering indicators of output, input and productivity for 123 countries around

the world since 1950. The aim of this database is to simplify international comparison of productivity performance at the macroeconomic level based on consistent and reliable data.

Gross Domestic Product (GDP) expressed in U. S. dollars market prices for 2010 (in millions) is selected as a measure of output. Data of GDP are obtained from national accounts of *OECD* and *Eurostat* and re-counted using 2005 purchasing power parity due to cross-country differences of relative prices of goods. **Total Hours Worked** (in thousands) is recommended as a most adequate measure of labour input (Fischer and Sixta, 2009). This indicator is defined as a sum of hours worked by employees or tradesmen during one year. Time series of total hours worked are available for 51 countries, main data sources are *OECD* and *Eurostat*. The capital input is divided into non-ICT capital and ICT capital. **NICT capital** includes non-residential construction, transport equipment and machinery. The sources of NICT capital data are national accounts of *OECD* extended by data from the *Penn World Tables*. **ICT capital** consists of computer hardware, software and telecommunications equipment and the data with the original source in *EU KLEMS* and *WITSA Digital Planet Report*. Data of ICT and non-ICT capital are available only in growth values, the data of GDP and THW are therefore transformed by the following relation:

$$\Delta \ln X_t = \ln X_t - \ln X_{t-1} = \ln(X_t / X_{t-1}). \quad (5)$$

The production functions are estimated for 2 groups of developed and developing countries. Methodology of *International Monetary Fund* (IMF, 2010) was adopted to determine whether a given country belongs to the group of developed or developing countries (Dedrick et al., 2011). The group of developed countries is represented by 26 countries and the group of developing countries is represented by 12 countries.

Figure 1 shows the growth of gross domestic product, total hours worked, ICT capital and non-ICT capital. The growth of GDP in developed countries fluctuated around 3 % in whole period. The GDP in developing countries first went up to 4.2 % until 1995, than oscillated around 2 % until 2002 and after that started to grow again to 6.3 % in 2004. The GDP was strongly affected by the economic crisis in 2008 – in both groups GDP slumped by 3 %. The non-ICT capital in the whole period grew up by 2.9 % in developed countries and by 2.8 % in developing countries in average per year. The average annual growth of total hours worked was smallest from all watching indicators – in developed countries 0.7 % per year and in developing countries 0.9 % per year. The total hours worked also went down by 2.7 % per year in developed countries in the period of economic crisis in 2008. The fact that the growth of ICT capital was the highest from all indicators should be pointed out. In the developed countries it went up by 11.8 % per year and in the developing countries it went up by 15.8 %.

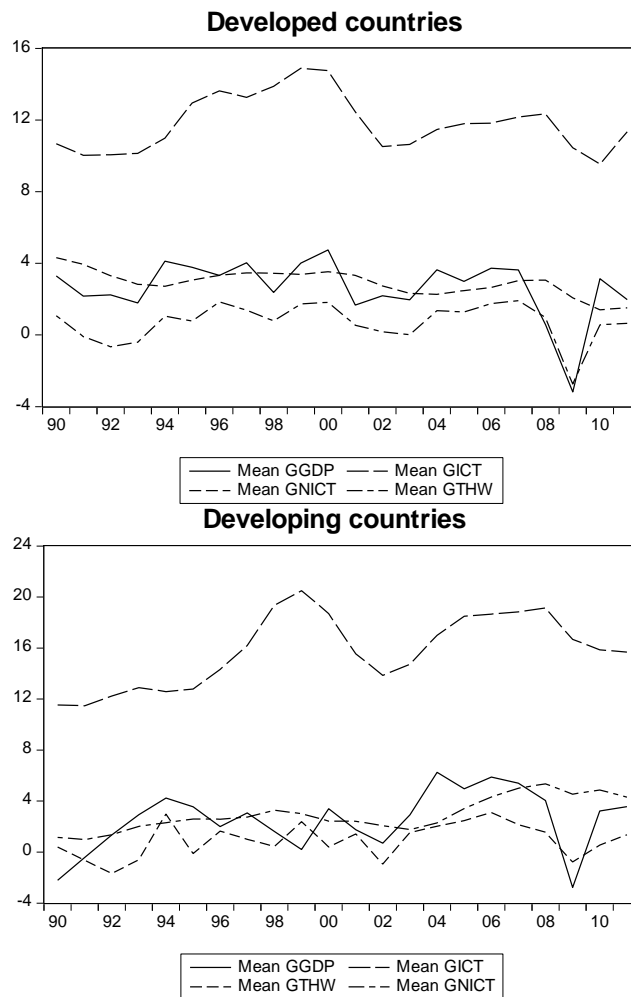


Fig. 4 – The mean of the growth of input and output factors of the production function

ECONOMETRIC ESTIMATION OF PRODUCTION FUNCTIONS

Three models of production functions are estimated for the analysis of impact of ICT capital on economic growth in developed and developing countries. The first model is the model (3), which was described above. The second modified model

$$gGDP_{it} = \Delta\mu_t + \beta_1 gTHW_{it} + \beta_2 gNICT_{it} + \Delta u_{it} \quad (6)$$

doesn't include variable $gICT$, because in the first model it was statistically insignificant. The effects of the ICT capital are captured in the total factor productivity (Hájek and Mihola, 2009). The last possibility of modification of the initial model (3) is the model (7) without time-specific effects

$$gGDP_{it} = \beta_1 gTHW_{it} + \beta_2 gNICT_{it} + \beta_3 gICT_{it} + \Delta u_{it} \quad (7)$$

For the verification of estimated models the statistical significance of regression parameters, adjusted coefficient of determination and Durbin-Watson statistics are monitored. Statistical significance of time-specific effects and the assumption of constant returns to scale are tested using Wald test. The Wald statistics measures whether the unrestricted estimates correspond to the restrictions under null hypothesis

(Baum, 2006, p. 92). The panel regression models of the production functions for both groups of countries were estimated using panel least squares method in EViews 7 software for the time period of 1990-2011.

ESTIMATION RESULTS FOR DEVELOPED COUNTRIES

The results of the estimated models of production functions of the developed countries are summarized in Table 1. The estimated regression parameters proved that the economic growth in the developed countries is positively affected by the quantity of hours worked (0.503% – 0.635%), *non-ICT capital* (0.345% – 0.48%) and *ICT capital* (0.086%). These results are statistically significant at 1 % level of significance. The only estimated variable, which is statistically insignificant, is the growth of ICT capital $gICT$ in the first model. This fact is probably caused by including ICT effects in the total factor productivity, as mentioned above. Constant returns to scale are tested using *Wald-test* with null hypothesis $H_0 : \beta_1 + \beta_2 + \beta_3 = 1$ and alternative hypothesis $H_A : \beta_1 + \beta_2 + \beta_3 \neq 1$. The assumption of constant returns to scale is confirmed in the model without time-specific effects (column CRS). According to the sum of the estimated regression coefficients 0.853, resp. 0.850 the returns to scale are rather decreasing. The adjusted coefficient of determination is relatively high (0.443 – 0.606), because it is clear that between countries may exist substantial differences.

Model	$gICT$	$gNICT$	$gTHW$	$R_{adj.}^2$	dw_p	$\sum \beta$	CRS	μ_t
Initial	0.005	0.345***	0.503***	0.606	1.406	0.853	NO	YES
without $gICT$		0.346***	0.504***	0.606	1.408	0.850	NO	YES
without μ_t	0.086***	0.348***	0.635***	0.443	1.551	1.069	YES	
Developed countries: 566 observations - 26 countries, 22 years								

Tab. 5 – Estimation Results for Developed Countries

The time-specific effects, which are representing the total factor productivity, are in the whole time period statistically significant (it was tested using *Wald-test* – column μ_t). The values of the total factor productivity fluctuated in the interval from 0.179 to 2.571 with an exception in 2008, when the value was negative due to global economic crisis.

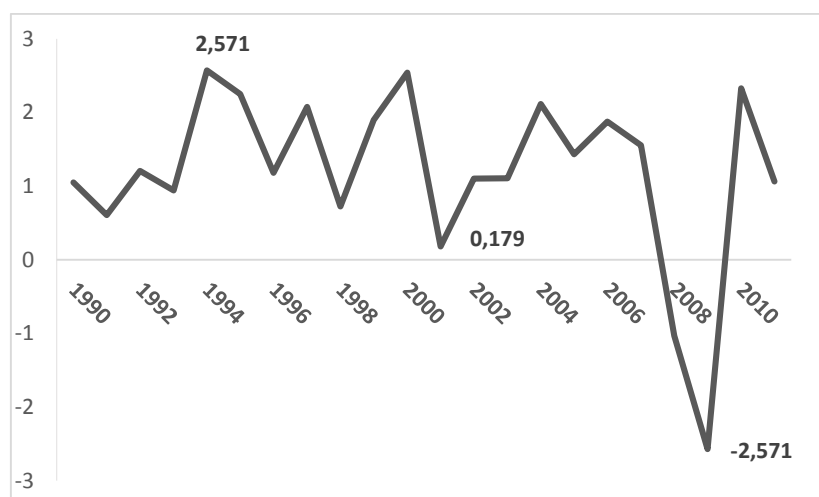


Fig. 2 – The Total Factor Productivity in Developed Countries

ESTIMATION RESULTS FOR DEVELOPING COUNTRIES

The estimation results for the group of developing countries are shown in Table 2. The estimated regression parameters proved that the economic growth in the developed countries is positively influenced by *the quantity of hours worked* (0.503% – 0.635%), *non-ICT capital* (0.345% – 0.48%)

and *ICT capital* (0.086%). These results are statistically significant at 1 % level of significance. Only the growth of ICT capital in the first model is statistically insignificant. This fact is probably caused by including ICT effects in the total factor productivity, as mentioned above. Constant returns to scale are tested using *Wald-test* with null hypothesis $H_0 : \beta_1 + \beta_2 + \beta_3 = 1$ and alternative hypothesis $H_A : \beta_1 + \beta_2 + \beta_3 \neq 1$. The assumption of constant returns to scale is confirmed in the model without time-specific effects, as for the group of developed countries. With respect to the sum of the estimated regression coefficients 0.704, resp. 0.680 the returns to scale are rather decreasing. The adjusted coefficient of determination is lower than in the group of developed countries (0.161 – 0.308), which is likely due to higher heterogeneity among the developing countries.

Model	<i>gICT</i>	<i>gNICT</i>	<i>gTHW</i>	$R_{adj.}^2$	dw_p	$\sum \beta$	CRS	μ_t
Initial	0.023	0.375***	0.306***	0.306	1.201	0.704	NO	YES
without <i>gICT</i>		0.383***	0.297***	0.308	1.196	0.680	NO	YES
without μ_t	0.062***	0.383***	0.387***	0.161	1.217	0.832	YES	
Developing countries: 238 observations - 12 countries, 22 years								

Tab. 2 – Estimation Results for Developing Countries

The values of the statistically significant total factor productivity varied from 0.061 to 4.39. The total factor productivity was negative in the years 1990, 1991, 1999 and 2009. This corresponds to the economic development in the developing countries; when the values of total factor productivity were negative, the growth of GDP slumped substantially.

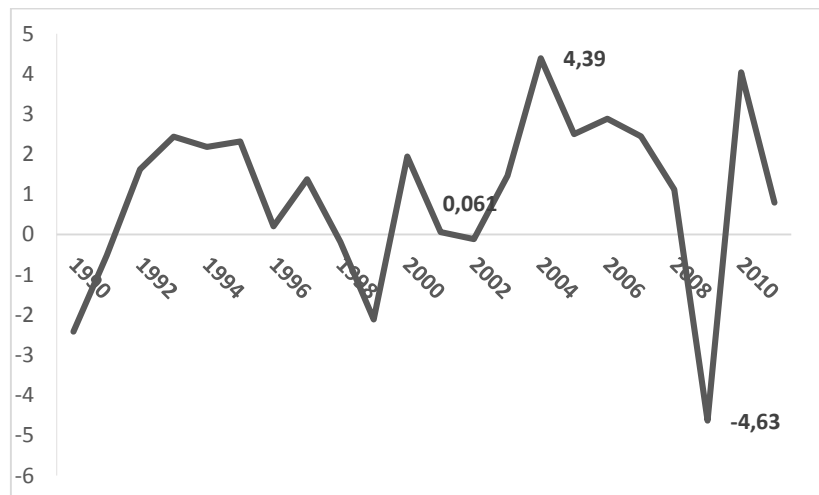


Fig. 3 – The Total Factor Productivity in Developed Countries

COMPARISON OF RESULTS AND CONCLUSIONS

At the end of the study obtained results are compared between developed and developing countries and also with current empirical study (Dedrick et al., 2011). The estimated production function models provide in particular following conclusions:

- The estimated models in the group of developed countries reached better values of the determination coefficient and also of the Durbin-Watson coefficient. It might have been caused by the lower heterogeneity between developed countries.

- The elasticity of labour input was substantially higher in the group of developed countries (0.635% vs. 0.387%). It could indicate higher labour productivity as a consequence of better ICT equipment.
- NICT capital (0.383%) was the most elastic input factor in the group of developing countries, in the group of developed countries the quantity of hours worked (0.635%) had the biggest impact on economic growth.
- The impact of ICT capital on economic growth was proven in both groups of countries, whereas elasticity of the growth of ICT capital in the group of developed countries (0.086%) was higher than in the group of developing countries (0.062%).
- The total factor productivity (including the effects of ICT) was statistically significant in both groups of countries, in the group of developed countries the average annual growth was 1.28 % and in the group of developing countries was 1.34 %.
- The research also discovered the impact of global economic crisis: in 2008 and 2009 the total factor productivity had negative values and all factors of the production function slumped.

The obtained results are comparable with similar empirical studies concerning the impact of ICT capital on economic growth. In the study (Dedrick et al., 2011) the impact of ICT on economic growth and labour productivity in developed and developing countries in the years 1985 – 2007 was analysed using panel data within estimator. Both studies concluded that ICT capital has a statistically significant positive impact on economic growth, but this study proves higher elasticity of the growth of ICT capital in comparison with the above study (Dedrick et al., 2011).

The goal of the study was to analyse and quantify the production process of complex economic systems - national economies. One of the key objectives of an economy is efficiency - each economy has only limited amount of resources so it is important to dispose with them effectively. Contribution of ICT to performance of production process was higher in developed countries, but developing countries face the challenge of increasing productivity using new technologies, because prices of ICT are decreasing. Each economy is a specific system with different characteristics and cooperation among economies could have synergistic effect. This cooperation could also cause the convergence effect - differences in productivity decrease between developing and developed countries.

Further research should focus on the impact of ICT on labour productivity in the different sectors within one national economy. It could be also interesting to measure the effectiveness of national economies using the *DEA method* or the *Malmquist index*. An analysis of convergence can discover whether intensive utilization of ICT helps to reduce the differences among national economies. Last but not least the determinants of different contribution of ICT to economic growth could be identified. These topics will be researched in the author's dissertation thesis.

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TIME BANKS AS A SYSTEMATIC APPROACH TO SOLUTION OF ECONOMIC PROBLEMS IN A LOCAL SCALE: SITUATION IN THE CZECH REPUBLIC

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ABSTRACT

Although time banks exist more than thirty years, their spreading is limited by many factors. Time banks are in the essence systems of community exchange, which brings many more in the social areas. This paper aims to point out and show the economical elements which are ordinary part of human life, but they are not enough underlined in economy driven only by financial resources. From holistic point of view to ensure long-term sustainability of the economic system, there is necessary to include also humane values to it, the ones which brings also the time bank. In this paper it is briefly shown situation of time banks in the Czech Republic, effects of time banks on sustainability, tax issues and systematic dimensions of inclusion of time bank systems to an economy. Evaluation and discussion of results shows, that inclusion of time bank systems to an economy would be advisable.

KEY WORDS

Time bank, alternative currencies, community currencies, local economies.

INTRODUCTION

Time banks are not very common in the Czech Republic even though they are widely spread throughout the world. Simply said they are community systems of sharing of knowledge and services. They originated by idea of American economist Edgar S. Cahn. Instead of a currency a time unit is used. By that one person invests own time into service for other person and gains value exactly in the amount of the time invested. Later it is possible to select a service or knowledge sharing from another person within the system. Time banks are worldwide spread phenomena, nevertheless not as wide spread as they would deserve to be. Wider spread is obstructed by many issues. Among others there are cultural conditions, lack of understanding by governmental institutions, financial problems and others. Even though time bank is focused mainly on community exchange and small communities, where there is not necessary support of governmental organizations, when time bank reaches certain higher point of development and spread, it might start to collide with law framework, than it depends what position would take government and if it would support time bank development or not.

Nowadays in the times of various economical crises it seems that there is need to look for various alternatives, which often and unfortunately have only form of non-systematic solutions, which are only curing consequences not the origin of problems. During its three decades of existence time bank shown not only that it is able to survive, but also that it can be worthy contribution to economy, especially in social spheres and in support of local economies. In current economical situation problems are often presented on the base of causality between economical events and on financial basis, only in mechanistic manner, without noticing other aspects of human life including non-financial utility of citizens.

This document is, in its first part, dealing with analysis of current situation of time banks and similar systems in the Czech Republic. In following part is going to be underlined which dimensions and which forms of utility time bank brings when implemented to economy and how it contributes to its sustainability. Next we are going to go through the issues of taxation of time banks, than systematic connotations of inclusion of time bank to economy will be uncovered followed by discussion and conclusion.

CURRENT SITUATION OF TIME BANKS IN THE CZECH REPUBLIC

As it was already mentioned, time banks are systems of community exchange, which are carrying also certain social dimensions. Time banks are based on few certain elements (Ozzane 2010, Nastolnaya kniga 2011):

- We are all assets – every human being has something to contribute
- Redefining work – rewarding the real work in our society by creating a currency which pays people for helping each other and creating better places to live
- Reciprocity – giving and receiving are basic human needs which help to build relationships and trust with others
- Social Networks – building people's social capital is very important, belonging to a social network gives our lives more meaning
- Respect- encouraging people to respect others in their community

In the case of time bank it is not only system of a complementary currency, it is mainly system of social community support and special kind of non-financial exchange between time bank users, which brings also other positives in the form of creation of social capital.

Because time banks usually originate in communities, they are not anywhere registered and their name does not always contain the expression “time bank”, or from other side, it contains the expression, but it is not a time bank, it is very hard to track time banks down. This is global issue, where there are initiatives for time bank and complementary currencies research. It is for example Time 4 Research or Complementary Currency Resource Center. Nevertheless none of sources shows any indication about time banks on territory of the Czech Republic. For this reason a research was conducted. Its results are in separate document (Valek 2013). On this place it is enough to point out following rough result (source – own research):

- **Banka casu Hradec Kralove (Bank of time Hradec Kralove)**, was founded few years ago, but with time bank it is connected only by name and philanthropic philosophy. System of exchange is not using any time units. In reality it is only a Facebook group which consists of about 150 members which enjoy exchanging services and various things. Always when a request is placed on Facebook, it also contains the way of offered or required compensation. That means there are no “hours” to collect for exchange and therefore it is not a time bank in the right sense, rather than a virtual barter marketplace.
- Only fragmented information are available about time bank on the old web pages of family centre “Lednacek”. Anyway, it seems all activities here ceased already in year 2006.
- Sources of VIA foundation are also describing a grant for development of a time bank for a south Bohemian non-profit, non-governmental organization (NGO) “Rosa”. Grant was given in the year 2004, but web of the NGO is not signalling any signs of time bank or any information.
- **Hearth.net** is platform founded by NGO “Adato Paradigma” from Prague. Even though it resembles a time bank at the first glance its development went even further. “Hours” are not used again and key role is played by a donation. To make an exchange, user expresses on their website what he/she needs and other user donates a service. Donor donates the service mostly, because he/she enjoys it and he/she does not expect compensation. In case if he/she would need something he/she just advertises the need and will expect that someone would satisfy the need in the same as he/she did before for others.

The description above is probably incomplete, but at the present time it is widest Czech time bank or similar systems list there is.

BENEFITS FOR ECONOMY AND SUSTAINABILITY

Based on previous researches it was determined, that there are several reasons, why a time bank systems should be officially included into everyday economy of a country. The main reasons are sustainability and a systematic point of view to economy as a network of mutually interacting individuals or groups. Time bank is able to help in development of many fields including commercial and governmental sphere. List of benefits follows (Valek, Jasikova, 2013):

Time bank benefits which could interest both spheres are:

Commercial sphere

- Skill and knowledge development of potential employees
- Building social capital
- Deepening the communication skills
- Professional development
- If included into TB – exchange of services
- More efficient use of capacities (lowering transactional costs, time economy)
- Making the offer of resources more broad
- Lowering of the entrepreneurship risks
- Lowering the consumption by sharing
- As system is interest less, its use generates no more costs for its users
- Innovative approaches in the labor organization

Governmental sphere:

- Employment of structurally unemployed
- Solving problems with solitude
- Lowering investment costs to some social issues which requires support as they tend to solve themselves
- Youth participation on citizen life
- Inclusion of seniors
- Lowering the social pressure
- Creation of the new bonds in a community and strengthening of the existing ones
- Possibility for better life and dignity for “overdebted” people
- Regional dimension of services
- Preserving of skills and knowledge
- Limitation of individual demand
- Building of new social structures

TAXATION

Time bank is not only a modification of the market, but offers other benefits in social areas and that is also reason why taxation is arguable. A government which itself invests money to social areas might make better use of independently working and sustainable time bank system, rather than sucking money out of it, actually the same money which government would return back to the social system. It is also very probable, that taxation would neutralize benefits of a time bank or even destroy it. Some people might object, that time bank is ideal tool for tax avoidance, but true is otherwise. The system can work and it already legally works in many countries. Answer is openness of a government to needs of its citizens. Government which understands, that advantages which time bank brings are non-financial, therefore it is impossible to tax them by traditional financial way. Instead of taxing it, it is necessary to exploit its social benefits.

SYSTEMATIC APPROACH

From aforementioned information follows that inclusion of a time bank system to economy would be very wise and beneficial, but in the Czech Republic often reaction of both amateurs and experts is negative. One of possible explanations is that it brings to the mechanistic understanding of economy new, so far unpredictable, elements and by that it breaks chain of causally interacting mechanical processes (Zelenka, Paskova, 2005) and the most comfortable and safest approach is to rely on a presumption, that everything can be completely explained by causes (Bures 2010). Nevertheless, even from this point of view we would never be able to track and try to predict future development of causality without complex knowledge of the causes. Inclusion of a new element like time bank, to current supposedly predictable economical system, seems to be too tough, but it is possible to track down from three decades of history of time banks in various countries, that there is no need to worry and benefits outweigh possible risks. Time banks do not pose threat to function of current economic system. On contrary they move it further by adding functional and often forgotten elements which already worked under other names in the past and by that they are completing the circle.

DISCUSSION AND CONCLUSION

On the basis of information described above, it is possible to say, that time banks definitely have own place in economics. That has already been proven in many countries. Unfortunately in the Czech Republic there is still not much of an understanding for them. However there are initiatives arising which aim to bring life to projects closely related to time banks. Time banks and similar systems often suffer by lack of institutional support and understanding from the side of a government. What obstruct the support is not clear enough. It might be lack of information about activities and benefits of time banks or just prejudices. In any case, while we look at economy and society in broader scope, there is not a reason why time banks should not be included and supported. If we go even further, we can think about sustainability of our economic system which main imperative is growth. If we consider that our planet is a system with its borders and limited resources within, than economy is a subsystem included and operating inside. This leads to ultimate question: How long can subsystem grow within a closed system with finite resources before it touches its outer limits (Seyfang, Longhurst, 2012)? As it was already written above, time banks contribute to sustainability and it is question if sustainability and indefinite growth are consistent. Maybe fear from slowing down economic growth is one of the reasons for refusal of large scale inclusion of time banks. At local level, the influence of time banks on economy would be marginal, but if we consider massive implementation, than it would probably slow down the economic growth, but accordingly it should have positive effect on sustainability. There are already societies where it works and where a change matures slowly; a change in direction from purely financial values and profit turns to humanization and broader view on human values. Slowing down the growth is nothing which should cause panic, it is rather natural development in situation when system reaches its outer limits and it would be advisable not to obstruct it by sticking to old structures which seems to be working less and less.

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PROPOSED SOCIAL REFORM OF 2000, AS INSTRUMENT SYSTEM OF SOCIAL POLICY IN SLOVAKIA

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ABSTRACT

A key factor that affects the existence of the individual and society, especially in the current crisis, the State in managing the company plays a vital role. The phenomenon of economic and financial crisis brought many developed economies to reducing public expenditure. The investigation primarily affected social systems states continued to invest in the development of society, influenced the development of employment and thus the standard of living of citizens. Society is seeking a system utility to optimize expenditure and revenue. A serious problem is the demographic structure of the population and labor market developments. In addition to government incentives to address the problem of measuring of unemployment the government must guarantee every citizen agreed and socially acceptable minimum standard of living. That's what the state's social policy. One suggestion, which wants to reconcile social policy with present-trend in the labor market and demographic trends is the reform suggested by R. Sulik. Is based on princioch negative incomen tax and redistribution contribution. Failed to practice due to a change of political orientation and economic values of the new government in Slovakia since 2011.

KEY WORDS

Social policy, accountability, reform, redistribution levy contribution bonus, solidarity.

1 STATE SOCIAL POLICY

Social systems as we know them today in the form undergone a long evolution, reflecting political power, economic opportunities, but also the historical background of the establishment and functioning of society. Tool of the state, by means of which help create the right conditions for the development of the individual and the whole society is social policy.

There are various definitions of social policy, we mention those that can be applied to the current Slovak social policy:

1 The notion of social policy understand what falls within the competence of the institutions responsible for implementing social policy. The Slovak republic is the institution ministry of labour, social affairs and family. Social policy and the social security system and labor market policy.

2 Another option is theoretical, technical definition of social policy as a policy to meet certain necessities of life and the creation of living conditions for meeting the needs of special populations. In that case, here we include in addition to social security and labor market policy and health policy and housing policy. The aim of all social policy is a State guarantee limit social and economic rights (Radičova, 1998).

The concept of Social transformation Slovak republic from year 1996 defines social policy as the application of practical measures in the economic activities of citizens relating to labor relations, labor

market, income and corporate social policy and social security concerning social insurance, state social support and social assistance (Vorobel, 2005).

This results in the core areas of contemporary social policy of the Slovak republic :

- employment policy.
- politics of social security.
- health policy.
- education policy.
- housing policy.
- family policy.
- environmental policy (Tokárová, 2003).

These areas of social policy in Slovakia is proof that social policy affects every individual and also society as a whole. All citizens are involved as her work - in the form of taxes and contributions, and the use of its activities and operations - through benefits and contributions. Finding new security options available resources for social policy should be to the discretion of each government policy. Yet it is not possible to forget and to cooperate with businesses to effectively engage in the process of development of individual regions (Mihalčová et al., 2009).

Depending on the time and the socio - economic situation of the company have developed a tool of social policy :

Preventive function - implies taking measures conducive to the prevention of adverse social situation and also to the elimination of the causes of such a situation. Coverage of preventive function is applied to the prevention of social phenomena that cause damage to the health and lives of individuals.

Protective function - is the product of a humanitarian effort and on the other hand, needed the protection of man as labor. This function is considered as the oldest historically gradually profiled on a stable element in the implementation of socio - political action. The protective function solves the already existing social event and its aim is to reduce and eliminate the consequences of social events related to the labor market or with family and life events.

The function of distribution and redistribution - which is most pronounced principle of justice, is considered the most important and also most difficult feature that ensures proper content of social policy measures mainly related state and its citizens, as it determines the proportion of the wealth of the individual, it is addresses how, to whom, for what and how we distribute. This function includes two parameters: the first heads redistribution of income, wages and pensions. The second parameter includes distributed life chances that occur through social policy - it is the distribution of resources, conditions and assumptions assisting in the development of each individual (Dřízová, 2001) .

Pacing function - supports the general economic prosperity and influence the development of social processes and relations in order to achieve socially desirable behavior of individuals and groups , which is a prerequisite for the effective use of social policy. The aim of pacing function is to promote citizen contained in unfavorable social situation in his attempt to resolve the situation using its own resources. Are incorporated measures of educational polic, employment policy, health policy, and so on.

Homogenising function - to provide homogeneous society is closely linked to the distribution and redistribution function, although socially homogeneous society is impossible and undesirable and should preserve natural differences between people. Each individual must seek their own to ensure a certain level of social and homogenising function is intended only to prevent fall below a specified limit state revenue. Some recent studies describe additional features, for example cultivation and control (Jusko, 2005).

Based on the nature, focus and social policy objectives is evident that cover all the areas puts great demands on public finances. The ongoing financial and economic crisis requires taking measures to reduce spending in the social sphere. One possibility comprehensive solution to the issue of public finances in the Slovak Republic was welfare reform, which proposed in 2002, Richard Sulik. When in 2010 it became a party R. Sulik parliamentary party, tried about putting reforms into practice,

however, was to early parliamentary elections and reform has not been implemented because of the change of social and economic policy.

2 NEGATIVE INCOMEN TAX - BASIC FEATURE DRAFT OF WELFARE REFORM IN SLOVAKIA IN 2002

The philosophy of the reform is based on the theory of negative incommen tax, which was presented in 1962 by Milton Friedman and James Tobin in 1967. Negative incommen tax was introduced in the 60th the last century in the United States as a means to combat poverty. Philosophy negative tax consists in determining the income limits citizens. Every citizen whose income would be below the established threshold would receive from the state contribution from the state (negative tax). This system is a mirror image of the normal tax system. Every citizen who is above the threshold would pay tax on the base, which would calculate a deduction using the prescribed limit of wages. Friedman and Tobin wanted to seduce a negative tax for all citizens of the state. Thus, each citizen of the state is protected against poverty from birth to natural death (Sulík, 2005). Author reform in Slovakia Richard Sulík it was applied by introducing the contribution bonus.

The reform of public finance management reform themselves contained in health financing, the introduction of 2 pillar, tax reform and decentralization of tax and finally the introduction of contribution bonus as compensation contributions, especially contributions to social insurance and social payments .

Some reform proposals have been put into practice - introduction of tax reforms (decentralization and the introduction of a flat 19 % tax), creating 2 pension pillar and the introduction of co-payments for treatment as the beginning of reforms in the health sector. But thanks to the policy of the ruling garnitures reform, although the total ready, did not get to experience a lift to the flat tax. The only thing that remained of theory contribution bonus child tax credit working parent

REDISTRIBUTION CONTRIBUTION

The reform envisaged the introduction of redistribution contribution to be paid by the state. The employer moved by the whole labor costs per employee and should be freed from paying contributions. The employee would receive the entire value of the work. This means that the gross salary would be the same as the foundations for today's wages.

Under current law on social insurance contributions are paid for sickness insurance, old age insurance, disability insurance, unemployment insurance, guarantee insurance, accident insurance and a reserve fund. The current high rates are excused by the social insurance system is merit. The reform proposed to consolidate all charges into one called heat redistribution. Overall, eight and five employer's employee contributions would be replaced by one levy Redistribution levy would be paid as state tax of 20 % of the total income of the employee. Determined by the maximum assessment base for the levy of 10 times the subsistence minimum. When the taxpayer has more revenue than 10 times the subsistence minimum contribution amount would be more than 20 % of 10 - times the subsistence minimum (double the subsistence minimum). This prevents the rich contribution bonus has been paid.

Amount of social security contributions will be determined as a certain percentage of the total income of the employee (interest income, dividends, rent ...), thus not only the payroll. Neutrality is achieved by paying the levies on income. This approach is applied today in Germany and Switzerland .

Redistribution levy would be with diverting tax to the tax office, which implies a higher percentage in the selection. This would reduce the contribution burden, because it would be financed redistribution of income from rich to poor (Sulík, 2005). Compulsory levy system no longer merit and will be fully sympathetic vice versa.

CONTRIBUTION BONUS

Existing benefits from Social security would replace the state social benefit of a maximum amount of subsistence for people who do not work and have no other income. If a person works, he received the contribution bonus. Special benefit received by mothers with young children (replace today's maternity benefits and parental benefits) and citizens who due to long term ill health has been reduced earning capacity, and who are currently receiving disability pension (Mihál, 2010).

Every citizen of the Slovak Republic should thanks to secure a living wage throughout their lives, regardless of the reason for his lack of income. The state would guarantee even basic health care.

Height contribution bonus living wage reduced by 10 % of all other income citizens. Contribution bonus along with other taxable income is the basis for taxation and redistribution contribution.

Contribution bonus per child under 18 years would be in the amount of 1/3 of subsistence (from 1.7.2013 the amount of subsistence € 189.09, so after paying 19 % tax and 20 % levy is € 38.45). This will replace child benefit and child tax credit. After the age of 18 years should a student who does not work, the right to a living wage in full, you can replace the scholarship. If it worked, he is entitled to contribution bonus .

Entitled to contribution bonus there is an employment relationship. Citizen jobless and any other income can apply for social assistance in the amount of the subsistence minimum (and 1/3 of the subsistence minimum for each child). The dose would have to ask every week, which would reduce the risk of „black“ labor. The introduction of the contribution bonus would not be affected the 2 nd. pillar of the pension reform.

CHANGES IN TAXES

Currently, the tax base of the employee gross income, net of employee contributions. The taxable self-employment income is reduced by the tax deductible expenses, including charges. It is calculated from the tax base, reduced the non-taxable portion. Non-taxable items are three: the taxpayer, the husband / wife (if not income) and finally the amount of contributions paid on life insurance, supplemental retirement savings or targeted savings under the conditions of the law.

After the reform, the tax base of the employee's gross income - extra charges for the previous employer. The tax base self-employment accounted for by income net of tax deductible expenses, and charges are not tax deductible expenses. The tax base should be added an amount of contribution bonus, if necessary. State social benefits belonging to the taxpayer and his family. From the citizen 's income tax done at the rate of 19 % of the tax base.

Abolish the tax-free part, employee bonus and tax credits for children. Their function (tax reduction for people with lower incomes, benefit families) took over the contribution bonus paid to the taxpayer and his family.

The introduction of the contribution bonus should calculate the tax simplify and clarify, the amount of tax collected would be doubled. This would not reduce the net income of citizens, because the other side would be reduced to about half the amount of contributions and the contribution bonus would be introduced as the new system, transparent and fair social benefits.

The indisputable advantage would be significant administrative simplification. Payments for employees by counting and distract along with the income tax to employers reformed tax - tax offices, which would reallocate premiums collected and transmitted to the relevant health insurance. Agenda of the unemployed would assume municipalities, tax - tax offices for retirement social insurance (Mihál, 2010).

EFFECTS

- Eliminates the incentive to be sick, unemployed and socially disadvantaged, since the State will provide all the subsistence minimum.
- New jobs, since the introduction of the contribution bonus would work as a money job with low pay.
- Will be canceled retirement age, will depend on the decisions employed citizen, when he wants to retire.
- Dissolution of the administrative apparatus, since payment of benefits will be centralized in one Office.
- Increasing the number of employed will change the social situation, because less free time means greater respect for the values .
- Unification of base salary and gross pay, every worker will know exactly how much money pays the social system.
- The one on which level wage falls, no one will earn less than the minimum subsistence (losing the concept of minimum wage).
- The tax system being introduced social aspects, benefits will be replaced by the contribution bonus, abolished the various tax exemptions, are taxed as income housing savings etc.
- The first pension pillar will be part of the tax credit and people over 65 receive a contribution bonus or if you do not work, social benefits as everyone else. This retains the character of solidarity.
- Waste state payments for " their " insured.
- It is possible to 100 % participation in the 2nd pension pillar.
- Contribution bonus, the maximum amount of the subsistence minimum, decreases with increasing income taxpayer, which means that more state support those who have less, while maintaining support for directness (Sulik, 2005).
- Would increase temporarily the number of unemployed who are released from authorities after the reform and this will have an impact on the state budget.
- Following the introduction of the reform would be necessary to deal with a significant restriction of freedom for people who are unemployed and receive only the grant by the government of subsistence, they are expected to have an office visit and report to the 2 times a week.
- The reform also assumed that the contribution of only limited use for food and vital commodities, while money will not be paid, but will be sent to a special account and paid at weekly intervals.

The results, impacts and system evaluation studies can be found in the publication of Richard Sulik redistribution contribution and contribution bonus. (Sulik, 2005)

CONCLUSION

Any social reform and public finance reform, although it has its pitfalls, should lead to improved quality of life throughout society. It should in itself to preserve and protect the intrinsic value and there is a significant reason why the company and state - solidarity. Would eliminate various forms of discrimination and reinforce individual responsibility. These measures would lead to the efficiency of the management of public finances and at the same time protecting those who need help from the state. Should increase the freedom and built by the personal responsibility and thus personality and independence of the citizen. This would achieve the side-effects than purely economic and political. Systematism approach consists in setting long-term independent mechanism to fiscal surplus, ensuring a higher quality of living and active citizens will respond to economic developments, demographic composition of the population, developments in unemployment. In addition to these effects is an indispensable factor for educational and self-regulatory function of the system , which is the most important effects reformy. As the first social system creates the preconditions and the emerging automatic functions that date and address, without the need for external intervention , or respond to

changes in the economic development of the economy and the state economy. He is still learning how this reform, it failed to implement the system state is unique in Europe, but nevertheless fills a strategy of social and economic policy. These days, a similar proposal to the Welfare Reform vote in Switzerland, where the government has proposed a modified proposal Sulik's reform as systemic solution to the current situation in Switzerland. This systematic approach should also ensure stability and long-term welfare performance automatically respond to changes in society, taking into account demographic trends and the state of public finances.

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THE PARAMETERS OF THE INTENSIVE DEVELOPMENT OF THE TRAJECTORIES OF THE KNOWLEDGE SOCIETY

(ANALYSIS OF INNOVATIVE COMPANIES IN THE USA USING A DYNAMIC PARAMETER, INTENSITY)

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ABSTRACT

The back ground of the knowledge economy is the innovational process and implementation of intensive development factors. It is thus useless to dispose of universal, practicable, and well-interpretable quality analysis how successfu an innovation is. The paper suggests the methodology for evaluating process and organizational innovation that does not require great amount of information and as the output gives the value of dynamic intensity and extensity parameter. The proposed methodology has been applied to the development analysis of the company Nike and comparison of 7 prominent companies of the United States. Our analysis, however, shows that most of them are developing extensively.

KEY WORDS

Company productivity, efficiency, process and organizational innovation, intensity, extensity.

INTRODUCTION

The paper concentrates especially on the process innovation and partially on the organizational innovation on the enterprise level, which aim to increase the growth rate of a firm's output more than the growth rate of its inputs, (OECD, 2005) defines product innovation as: "a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software." Organizational innovation is defined as "a new organizational method in business practices, workplace organization or external relations." We suggest simply mathematic method how to measure success of innovation in terms intensity and extensity. Real development usually contains some combination of extensive and intensive growth. Firms can also compensate extensive factors for intensive or, alternatively, intensive factors for extensive without change of its production. In the case of firm's output decline, a firm should know whether this only occurs due to the fall of extensive or intensive factors or if falls of both factors contribute to output decline and how much.

The method presenting in the paper deals with all possible combinations of extensive and intensive changes and so it differs from the growth accounting equation that may only be used in case of output growth. For growth accounting, see e.g. (Solow, 1957). The paper is organized as follows: The first chapter introduces the method; the second one applies the methods to the company Nike that was announced as the most innovative company of 2013 by the business journal Fast Company. The chapter investigates whether the performance of Nike really relies on intensive factors. The chapter

also compares the performance of Nike with the performance of some other companies that are, from the point of view of Fast Company journal, among the first thirty most innovative companies of 2013.

1 METHODOLOGY OF THE ANALYSIS OF THE INTENSIVE AND EXTENSIVE DEVELOPMENT

One of the most elementary methods of describing the behavior of any system is the monitoring of its output and corresponding inputs. This cybernetic perspective may be carried out for companies as follows: we select total revenue TR_0 as the output for the given base period ($_0$), with total costs TC_0 corresponding to inputs. (The following applies to both values: $TR \geq 0$ and $TC \geq 0$. In case $TR \leq TC$, profit will be less than or equal to zero $EP \leq 0$.) The difference of the two values represents economic profit:

$$EP_0 = TR_0 - TC_0$$

(1)

The quotient of TR_0 and TC_0 equals to efficiency Ef_0 , which represents the share of total revenue derived from each unit of invested costs.

$$Ef_0 = TR_0 / TC_0$$

(2)

In order to monitor the development of a company in time, it is necessary to apply dynamic characteristics, (for the total revenue TR):

- Absolute increment $\Delta(TR) = TR_1 - TR_0$

(3)

- Growth rate $G(TR) = (\Delta(TR))/TR_0$

(4)

- Change coefficient $I(TR) = TR_1/TR_0 = G(TR) + 1$

Statement (2) may be used to derive a dynamic statement for the development of total revenue:

$$I(TR) = I(Ef) \cdot I(TC)$$

(6)

If we wish to calculate how the development of intensive factors represented by $I(Ef)$ and extensive factors represented by $I(TC)$ shares on the development of total revenue $I(TR)$, it is first necessary to use logarithmic calculation for statement (6).

$$\ln I(TR) = \ln I(Ef) + \ln I(TC)$$

(7)

Statement (7) is the initial statement for deriving dynamic intensity and extensity parameters. These parameters have the following form. The properties of these parameters are examined in detail in (Hájek, Mihola, 2009) or in (Cyhelský, Mihola, Wawrosz, 2012). Dynamic intensity parameter:

$$i = \frac{\ln I(Ef)}{|\ln I(Ef)| + |\ln I(TC)|}$$

(8)

And supplementary dynamic extensity parameter:

$$e = \frac{\ln I(TC)}{|\ln I(Ef)| + |\ln I(TC)|}$$

(9)

Statements (9) and (10) respect all possible developments of the share of extensive and intensive factors Mihola (2007, p. 125):

- Change in the extensive factors only, without any change in the intensive factors;
- Change in the intensive factors only, without any change in the extensive factors;
- Simultaneous growth of both extensive and intensive factors;
- Simultaneous decline of both extensive and intensive factors;

- Compensation of extensive factors for intensive factors;
- Compensation of intensive factors for extensive factors;
- Stagnation of both extensive and intensive factors.

2 ANALYSIS OF DEVELOPMENT OF INTENSIVE AND EXTENSIVE FACTORS FOR NIKE

Each year, the American journal Fast Company announces the ranking of the most innovative companies in the world – the results are published on the magazine website www.fastcompany.com. The presence of intensive factors may be assumed for innovative companies. To find out whether this is in fact true, we applied the methods described in Chapter 1 to the most innovative company of 2013, Nike. Moreover, the results for Nike were compared with the results of 6 other companies (Amazon, Apple, Coca Cola, Google, Ford Motor, and Target), which ranked by Fast Company journal in the top 30 of the most innovative companies of 2013. Input data, i.e. total revenue (TR), total costs (TC), and economic profit (EP), for Apple, Coca Cola, Ford, Nike, and Target have been taken from <http://money.cnn.com/magazines/fortune/fortune500/>. Data for Amazon have been taken from the company's annual reports available at <http://phx.corporate-ir.net>; data for Google have been taken from <http://investor.google.com/earnings.html>.

The analysis was carried out for the period of 1995-2011 (with the last known economic results available for individual companies for 2011) – the period of 17 years is long enough to make a qualified assessment whether intensive or extensive factors prevail for Nike and other compared companies. Therefore, the comparison includes companies that existed throughout the term under review. Google is the only exception, as data for the company are only available from 2001. Consequently, other innovative companies (e.g. those that ranked in the Top 10 of the most innovative companies in 2013 according to the Fast Company journal) were not included in the comparison due to their short-term existence. The values of the intensity/extensity parameters for those companies could be biased by accidental fluctuations of total revenue or costs in individual years.

Table no. 1 and chart no. 2 contains year-to-year growth rates of total revenue $G(\text{TR})$ and total costs $G(\text{TC})$ for Nike in the period of 1995 - 2011. Furthermore, we also provide the calculated values of efficiency growth rates $G(\text{Ef})$ and dynamic parameters relating to the share of influence of intensive factors i and extensive factors e for the given period.

	1996/5	1997/6	1998/7	1999/8	2000/9	2001/0	2002/1	2003/2	2004/3	2005/4	2006/5	2007/6	2008/7	2009/8	2010/9	2011/0	2011/5
G(TR)	36%	42%	4%	-8%	2%	5%	4%	8%	15%	12%	9%	9%	14%	3%	-1%	9%	9,6%
G(TC)	36%	42%	9%	-9%	1%	6%	4%	11%	11%	11%	8%	9%	13%	6%	-3%	6%	9,3%
G(Ef)	0%	0%	-5%	1%	1%	0%	1%	-2%	4%	1%	1%	0%	1%	-3%	3%	3%	0,3%
i	1%	0%	-35%	10%	56%	-4%	13%	-19%	26%	10%	6%	-2%	8%	-32%	43%	32%	3%
e	99%	100%	65%	-90%	44%	96%	87%	81%	74%	90%	94%	98%	92%	68%	-57%	68%	97%

Table 1 - Dynamic characteristics of Nike

Source: TR and TC were taken/calculated from <http://money.cnn.com/magazines/fortune/fortune500/>. Statements (5) and (6) were used to calculate $G(\text{TR})$, $G(\text{TC})$, $G(\text{Ef})$; statements (8) and (9) were used to calculate the values of the dynamic parameters intensity (i) and extensity (e).

The table no. 1 shows that Nike attained the highest TR growth rates of around 40% in the first two years of the observed period - 1996 and 1997 – as a result of a pure extensive development, when $e = 99$ and 100% , respectively. The year of crisis (1998) follows, with a weak TR growth of 4% and extensive compensation of $i = -35\%$ and $e = 65\%$. In 1999, TR declines by 8%, with significantly predominant negative extensity $e = -90\%$ and $i = 10\%$. (Fiscal year of Nike starts on 1 June and ends on 31 May. For example, the year of 1996 covers period from 1 June 1995 to 31 May 1996). In 1998, the company was affected by the Asian crisis and this was the key reason for the higher growth rate of costs compared to revenue. The company reacted to the given developments in 1999 by reducing its costs; however, the consequences of the crisis also resulted in the fall of revenue. Next year the revenue again increased; the growth resulted from and intensively-extensive growth ($i = 56\%$, $e =$

44%). During the given year, the highest share of influence of intensive factors was achieved for the entire period under review. The period of 2001 - 2008 were characterized by gradual increase in the TR growth rate to up to 15% whereas the minimal value of the TR growth rate amounted to respectable 8% (2003). The extensive development dominated in all cases, ranging from 74% to 98%. The intensity amounted to -19% to 26%. The causal analysis is based on the Nike's annual reports for the years under review. The causes for the negative value of i were as follows:

- In 2001, problems with the sale of low-price and medium-price goods in the US;
- In 2003, higher growth rate of TC compared to the TR growth rate; the higher growth of costs resulted from the USD appreciation;
- In 2007, slightly higher growth rate of costs compared to the growth rate of revenue.

In the period of 2009 – 2010, the situation of the period 1998 – 1999 virtually recurs in terms of the influence of intensive factors. In 2009, the company was affected by the global financial and economic crisis, with resulting decrease in the revenue growth rate – i.e. revenue growth lagged behind the increase in costs. The company reacted to the given situation by reducing costs; however, the consequences of the crisis still persisted, which was reflected in a slight decline of revenue. The year 2011 indicates returns to the positive development but it must be validated by results for following years.

The last column shows that the contribution of intensive factors to the average year-to-year revenue growth rate of 9.6% in the observed period only amounted to 3%, with 97% contribution arising from extensive factors for the entire period under review. In the given period, the growth of Nike was almost purely extensive. In terms of process and organizational innovations, it can be concluded that the company recorded only a minor advancement in the given field. This does not mean the company was not successful in terms of product and marketing innovations. However, it is very disputable to say whether Nike meets one of the generally characteristic properties of innovations – i.e. reduction of costs and increasing output.

Nike produces almost all of its products outside of the US, while the US market contributes to more than 40% of revenue on a long-term basis (43% in 2011). Nike can bank on the cheap and available labor force what is probably the main reason of the low value of intensity parameter (e). Present favorable condition of production could change. The analysis shows Nike as a vulnerable company. If the growth rate of Nike's cost suddenly exceeds the growth rate of its revenue due to a crisis Nike has little possibilities how to respond. Both Asian crisis (year 1998) and global financial and economic crisis (year 2009) have same pattern: unexpected growth of costs followed by company effort to reduce it. The effort was in short period only partial successful. Drop in the cost was always accompanied by decline of the revenue. Although the company performance stabilized at least two years after the start of the mentioned crisis it is not sure whether the company would be able to solve some enormous growth of cost in the case of large crisis. The development of the company's costs is now affected by the development of the USD exchange rate to the currencies of countries where Nike produces its goods. If USD appreciates for long period, reduction of the cost can be insufficient. The process and organizational innovation seems then to be the best answer how to offset the growth of cost caused by appreciation. From our point of view the company should target process and organizational innovations more.

Let us now turn our attention to the comparison of average values of growth rates $G(TR)$, $G(TC)$ and $G(Ef)$ as well as average values of the intensity parameter i and extensity parameter e for Nike with other innovative American companies. The average year-to-year growth rates and dynamic parameters for all companies and the entire period in Table no. 2 are sorted in the same manner as in Table no. 1; however, they are completed with annual average values of absolute data TR, EP, TC, and Ef.

	1995 – 2011						
Indicator	Amazon	Google	Apple	Ford Motor	Nike	Target	Coca Cola
TR (mil.\$)	13 116	13 744	21 966	154 571	12 516	47 243	24 596
EP (mil. \$)	363	5 161	3 408	2 784	1 021	1 854	4 854
TC (mil. \$)	12 752	8 583	18 558	151 786	11 495	45 389	19 742
Ef=TR/TC	1.028	1.601	1.184	1.018	1.089	1.041	1.246
G(TR)	30%	84%	20%	0,5%	10%	7%	7%
G(TC)	28%	80%	17%	-0,5%	9%	7%	6%
G(EF)	2%	2%	2%	1%	0%	0%	1%
i	8%	4%	11%	67%	3%	3%	17%
e	92%	96%	89%	-33%	97%	97%	83%

Table 2 - Base data of the comparative analysis of seven US companies

Source: TR / EP values were calculated using statements (1) and (2) from the data provided in Note 6. Statements (5) and (6) were used to calculate G(Ef); statements (8) and (9) were used to calculate the values of the dynamic parameters intensity (*i*) and extensity (*e*).

The results of the comparison are shown in Chart no. 1, with growth rate of total costs on the horizontal axis and efficiency growth rate G(Ef) on the vertical axis. The parallel isoquants G(TR), shown in a dashed line, also start from the horizontal axis for the given percentage values. The isoquants are derived on the basis of statement (6). The bundle of curves starting from the origin represents isoquants of constant values of dynamic intensity/extensity parameters – these isoquants represent all values of G(Ef) and G(TC) given by the relevant values of parameters *i* and *e* in statements (8) and (9). For example, the lowermost isoquant (*i* = 2%, *e* = 98%) shows all values of G(Ef) and G(TC), for which *i* = 2% in statement (8) and *e* = 98% in statement (9).

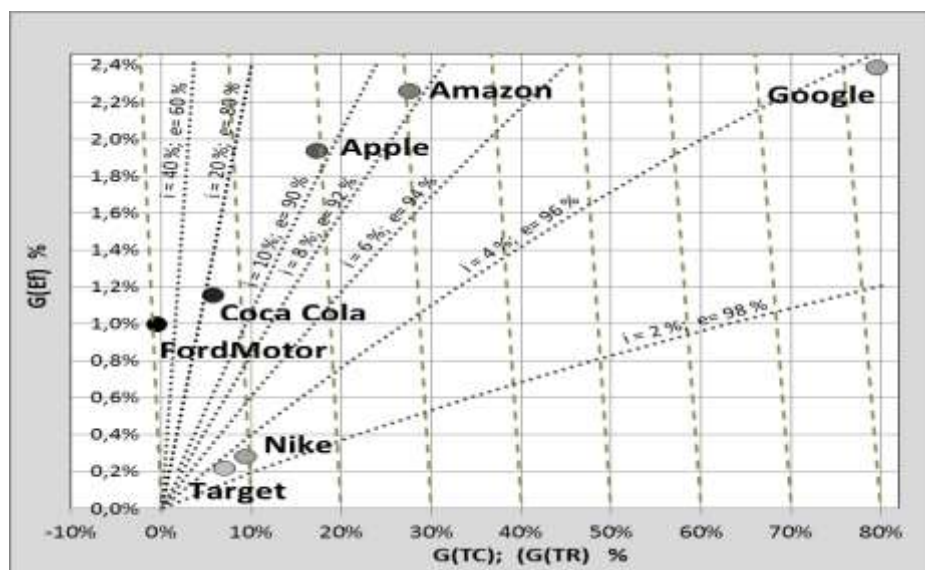


Chart no. 1: Comparison of the dynamics intensity for seven US companies

(Author, 2013)

It is apparent from the chart that the highest average growth rate $G(TR)$ of 84% is recorded by Google, followed in the distance by Amazon (30%), Apple (20%), Nike (10%), Target and Coca Cola (7%), with Ford Motor coming in last (mere 0.5%). However, the order is very different in terms of the development of the intensity and extensity parameters (value i and e in the last two rows of the table No. 2). The year-to-year growth of Ford Motor was mainly attained through intensive factors. This is an intensive compensation, where intensity of 67% compensates negative extensity of -33%. It could be written that Ford Motor must innovate. The company faces huge costs due to expensive labor force. If it reduces the number of employees with the aim to reduce costs and wants to keep or increase its production an innovation is necessary consequence. The development was mainly extensive in all the remaining companies. The second highest intensity is recorded by Coca Cola (17%), followed by Apple (11%), Amazon (8%), and Google, Nike and Target with intensity of 4% or 3%.

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CONCLUSION

The article shows how time series of the total revenue, total costs, and economic profit may be used to analyze, whether the change in such indicators in time is caused by mainly extensive factors, reflecting the change of company inputs, or by mainly intensive factors. Furthermore, the article has revealed that even the development of companies announced as the most innovative by Fast Company journal relies mainly on extensive factors – the total revenue growth rate predominantly results from increasing total costs. Even the most innovative company of 2013 according to the Fast Company journal, Nike, developed mainly extensively in the period of 1995 - 2011. Paradoxically, the highest intensive development was recorded by a member of the traditional car manufacturing sector, Ford Motor, which was able to benefit from the application of intensive factors and compensate the declining total costs. Naturally, innovative companies also innovate in the area of quality of their products, marketing, etc. Nevertheless, process and organizational innovations should not be left aside.

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BIG DATA – DOES IT MAKE OUR LIVES BETTER?

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ABSTRACT

Big Data is a term that refers to data of which the volume, variety and velocity of change are exceeding the level typical for various industries and the ICT environment designed for them. When it comes to Big Data, the risk of formulating a wrong conclusion based on the high volume of data is great.

The impact of Big Data phenomenon differs based on the subjects involved, therefore it is different for businesses, individuals or households. The motivation for businesses is to deploy new technologies and methods to gain a commercial benefit that comes from the change of observed KGIs/KPIs parameters, in addition to gaining a competitive advantage related to information or context unknown to the other subjects on the market.

Free availability of the enormous amount of data can lead to a belief that any individual can gain knowledge of and insight into complex problems of the world just by typing the key words of the problem into search engines. The danger is that Big Data make all of this possible without the need to apply a critical and system thinking.

The article is focused on the introduction of Big Data technologies and principles including several suggestions for their possible use in the business environment. The article covers several areas of which the last presents the possible impact of Big Data on the lives of individuals in today's global world.

KEY WORDS

Big Data, Cloud computing, Hadoop, Information society, Knowledge society, Predictive Analysis, Relation databases, Speech recognition, System thinking.

BIG DATA INTRODUCTION

Big Data is a term very often used only in relation to high data volume, which is not right. It does not refer to the specific volume of stored data as TeraBytes or PetaBytes but to the volume that is exceeding the level typical for the different industries and the ICT environment they were designed for (Manyika, 2011).

Definition of big data is indeed much broader than just a reference to the volume of stored data that is, at least for some of the scientists, less important comparing to other attributes as we can see in following definition of Gartner (Gartner, 2013):

“Big data in general is defined as high volume, velocity and variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making.”

Increasing volume of data is not a new thing in today's world; such a phenomenon has been evolving for last decades. For the first time it appeared many years ago, right after the introduction of computers and the networking that, thanks to the Internet, allowed users to share and exchange unlimited amount of information. First we called such time “the period of Information revolution” but later turned to the

term of “Information society” which is used now and expected to develop to a “Knowledge society” (Hilbert, 2013), as we should differentiate the data, the information, the knowledge and the action based on knowledge (David, Foray, 2003).

With increasing data volume and the need for its processing, new technologies, theories and also specialization of IT professionals are introduced. In 1989, Howard Dresner (later a Gartner Group analyst) proposed "business intelligence" as an umbrella term to describe "concepts and methods to improve business decision making by using fact-based support systems (Power, 2007). This approach would guarantee so called “one version of true”. It means that such approach can guarantee that each employee of the company will get the same answer to the same query.

The area of data management expanded and has split up into many specializations, such as knowledge and data discovery (KDD), data governance, data quality management, business intelligence or master data management.

An innovation of the big data concept, apart from the data volume, is the variety of data sources that are able to combine the structured data stored in relational databases and unstructured data gathered from mainly open sources, such as social media, smart devices, machine to machine communication, video or audio files, logs from systems or sensors, GPS coordinates and many others.

The fact that data variety and IT components used for generating and storing of data are relatively cheap cause that the complexity of data is nowadays so enormous that there is a constant demand for new technologies and methods for its processing. That was also the reason why the term Big Data started to be used.

However, as one of the expert on big data notes: “*We should be aware of not only positive sides of data explosion but also related negative parts as privacy impact, wrong conclusions etc.*” (Hilbert, 2013)

TECHNOLOGIES AND METHODS OF BIG DATA

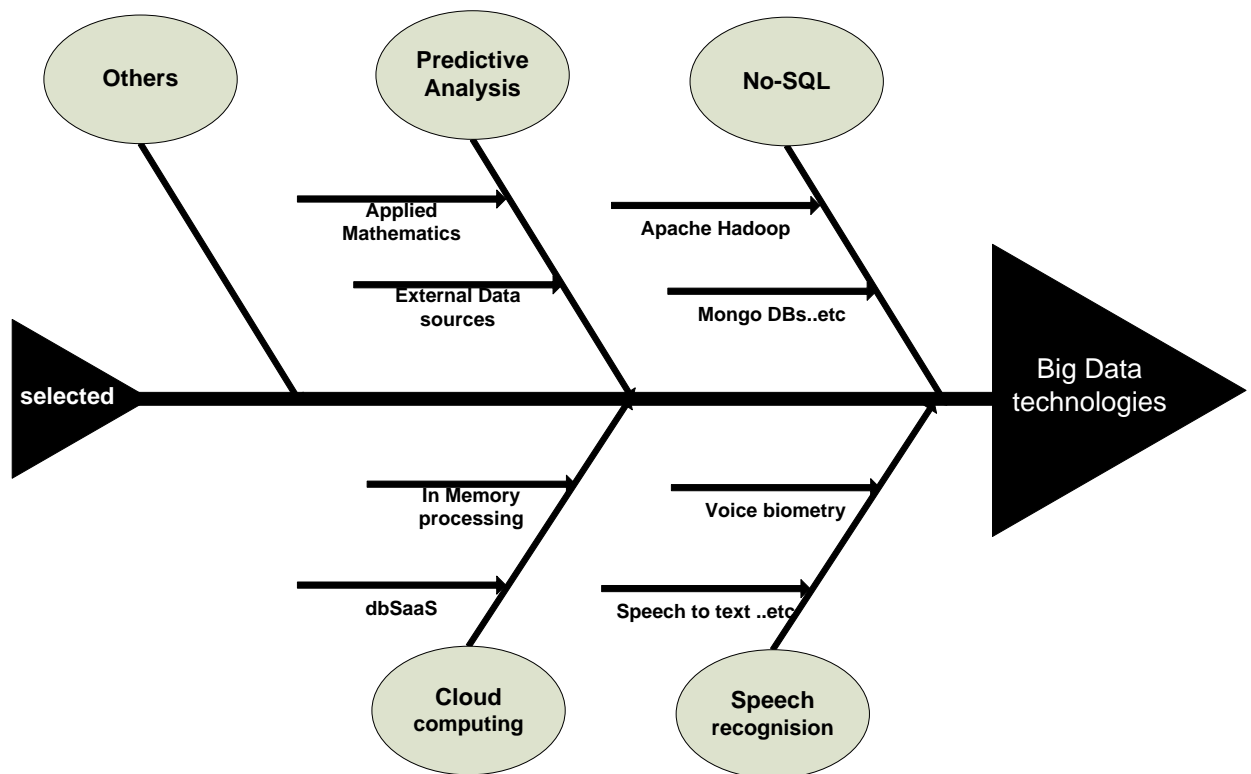
There are many technologies marked as big data. Some of them were already verified and are currently used in business areas, whereas some are still promising but not mature enough. We can find a good overview of these technologies in Gartner Hype cycle (Gartner, 2013).

Among mature and currently used technologies belongs e.g. web analytics, predictive analytics, social media monitoring or speech recognition.

On the other hand, as an example of technologies that are behind its expectation peak and are getting mature may serve: In the memory analytics, cloud computing and its special parts as database software as a service (dbSaaS) or MapReduce (Hadoop) and its alternatives as no-SQL databases (DBs).

Other examples of the technologies that are young but very promising are video search, information valuation or content analytics.

Since we are limited by the range of this article, we will describe more closely only those of the above mentioned technologies where we will be able to show also their possible commercial benefits. The overview of the chosen technologies is below:



Graph 6 – Selected Big Data technologies (author)

MAPREDUCE (HADOOP)

Hadoop is a current open source framework that was developed by the joint effort of Doug Cutting from Yahoo and Mike Cafarella from Michigan University during their joint on the search engine Nutch project (Cafarella, Cutting, 2004) inspired by previous Google works.

The keystone of this method is so called “MapReduce algorithm” where, in the Map phase, the computing tasks are divided into several commodities and cheap hardware called “slaves” and later, in the Reduce phase, the results of these tasks are consolidated in the one master server.

All this is possible thanks to Hadoop Distributed File System (HDFS) that at the same time stores the files that need to be analyzed to the computing nodes, so that it causes redundancy similar to RAID approach but less expensive. The HDFS also keeps the information about name of the data node. If the data are processed through the MapReduce algorithm, the HDFS optimize the computing tasks in a way that all computing is done on the same node where the data are stored. Thus, the usage of DAS (Direct Attached Storage) allows us to reach high throughput that is similar to big storages and its IOPS (Inputs Outputs operations Per Seconds) parameters.

Apache that currently manages this open-source Hadoop project developed as well the Apache HBase, as the extension of HSF. Apache HBase is a non-relational database used for inputs or outputs of MapReduce tasks. Apart from that the Apache Hive was also developed. The Apache Hive that is a kind of the data warehouse (DW) that consists of a relational database (RDBS) for metadata and works, with its own search language HiveQL similar to the SQL (Structure Query Language), as a combination of structured and non-structured approach of the HSF.

For better understanding of the difference between RBDS and Hadoop, the table is enclosed below. The table is based on the Teradata and Hortonworks source (Hortonworks, Teradata, 2013).

RDBS	Hadoop
Stable scheme	Evolving Scheme
Leverages Structure Data	Structure Agnostic
ANSI SQL	Flexible Programming
Iterative Analysis	Batch Analysis
Fine Grain Security	N/A
Cleansed data	Raw Data
Seeks	Scans
Updates /Deletes	Ingest
Service Level Agreement	Flexibility
Core Data	All Data
Complex Joins	Complex Processing
Efficient Use of CPU/IO	Low Cost Storage

Table 7 – Comparison of RDBS and Hadoop (Hortonworks, Teradata, 2013)

Possible deployment and benefits of hadoop can be seen for example in functional marketing units where companies communicate with their customers through different online channels and can therefore benefit either from the open sources database where social media information relating to their products or even information about customers' behavior can be found .

Another opportunity to use Hadoop is to use it in operation units where e.g. the utility industries have engaged many field equipment generating logs, statuses and GPS coordinators. All that, in combination with the relations databases such as CRM or Inventory DBs, can predict frauds or future behavior like outages or other characteristics.

In reality, the implementation of Hadoop is expected to be combined with standard RDBS and specific modules as are CRM, ERP and Inventory.

Industries with the biggest potential and the highest possible benefits from the improved KGIs, KPIs, are industries where a big number of customers or customers' data already exists, stored in CRM databases. Among these undoubtedly belongs Retail, Communication, Utility and also Media or Finance Industry.

SPEECH RECOGNITION

Human communication via speech is the most nature way how people communicate. Therefore, in case we want to use computing and digital technologies to work with the human voice, we need to be able to convert human speech into the language of computers and their algorithms. For that, we have to deploy technologies of discrete samples stored in the media memory and moreover, we have to be able to convert speech into the text and vice versa. There are many more features connected to the voice communication, such as the possibility to recognize speaker only by the help of the voice biometry, to identify the language that speaker is using, to recognize his emotions and many others. (Cenek, 2012)

The technologies related to speech recognition have been developing for the last decades so that nowadays, with the help of available computing power and applied mathematics, they seem to be close to their maturity. Nonetheless, speaking about online speech recognition and offline post-processing of the stored voice data, there is a big difference in demand of the IT support.

To name a few ways of the possible application of digitalized speech technologies in the business environment we can mention call centers and its online IVRs modules or call agents behavior evaluation based on key words or emotion. The detection of key words can be used also for the intelligence service and national security, as we could see in recent news during the affair related to PRISM program of National Security Agency in US (Marshall, Edward, 2013)

If we use such technologies in marketing functional units, we can benefit from correlation of customers emotions analyzed during customers calls and its pairing to CRM data that can be used later for targeted sales campaigns in a cross sale of new products or for churn prevention activities.

CLOUD AND DATABASE AS A SERVICE (DBSAAS)

Cloud computing in the area of Infrastructure as a Service (IaaS) enables us to dynamically allocate the operational memory, which is a very good solution for a problem how to cover computing peaks caused by analysis of the high data volume at the end of finance period or by different peak demands such are testing environment.

Database as a Service (dbSaaS) can help smaller companies to get the license for using expensive database licenses (Microsoft SQL or Oracle server in Enterprise edition) as a service. The cloud computing provider then takes care of running of such provided database engine and the customers are entitled to create and edit the DBs tables in their virtual instance.

The benefits of such cloud computing approach are cost saving, flexibility to satisfy very different computing needs, scalability of such solutions, making expensive technologies affordable to small businesses; in general benefits of outsourcing which mean that customers can focus on their core business only and do not need to be experts in specific IT areas.

PREDICTIVE ANALYSIS

The prediction of monitored business parameters is a daily job of functional units such as the finance, sales, technical and marketing unit. It is very common for companies to use for the purpose of the business planning, the extrapolation of their operational parameters together with the help of trends and seasonal effects.

Big data approach's asset consists in the fact that it combines data from external databases, such as social media or other free DBs, and internal private DBs. With such a high volume of variable data structures we have to apply also new statistics and mathematics approaches together with IT computing and self-learned algorithms, namely the decision trees, self-learning automats, and neurons networks.

There are very impressive examples, for example analysis of the key words in search engines used by Google, Yahoo and its consequent prediction of business parameters such as the revenue of newly introduced movies on a defined markets (Kumar, 2009) There was also proved (Gilbert, Karahalios, 2009) a change of Dow-Jones index related to the anxiety expressed on social media such are twitter and others.

Generally, with the combination of external data available on Internet we shall be able to predict economic values on both, macro and micro level, political movements such as election results or stability in a region as well as an unemployment, spread of the flue epidemics and other social values. (Procházka, 2012)

SYSTEM THINKING AND BIG DATA

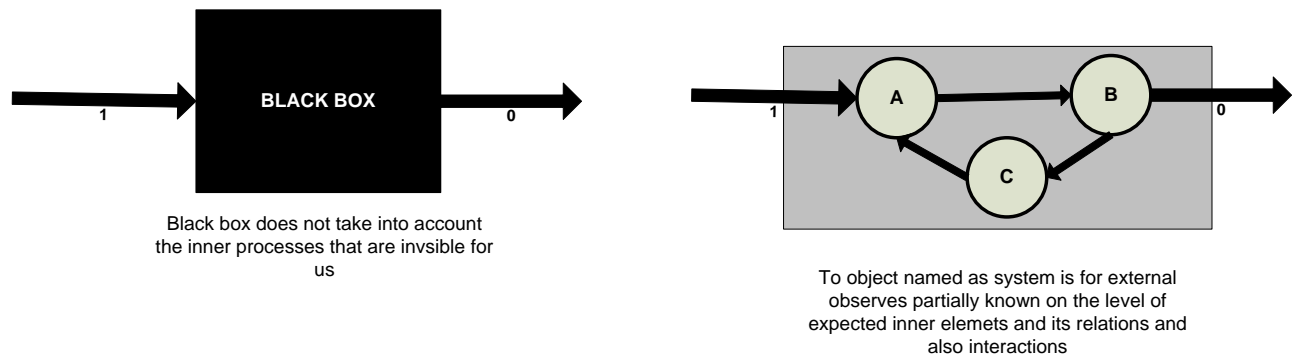
SYSTEM AND BLACK BOX APPROACH

System thinking is, according to its definition (2013, Wikipedia): *“the process of understanding how things, regarded as systems, influence one another within a whole. In nature, system thinking*

examples include ecosystems in which various elements such as air, water, movements, plants, and animals work together to survive or perish. On the contrary in organizations systems consist of people, structures, and processes that run together to make an organization "healthy" or "unhealthy".

In system science it is argued that the only way how to fully understand why a problem or element occurs and persists is to understand the parts in relation to the whole (1996, Capra).

The opposite example of the system approach is the Black box approach. The grounds of such approach consist in a fact that we are not able to see and describe the inner processes of the box that are influencing the visible effects outside the system or transformation of the inputs to the outputs from the box. The following picture (Rosický, 2011) illustrates how different these two approaches are.



Picture 2 – Difference of the Black box and System approach (Rosický, 2011)

BUSINESS LIFE AND BIG DATA

The possible deployment of big data technologies in a business life strongly depends on its commercial benefits that can be measured. The IT and its possible innovative technologies are nowadays related to a corporate performance of the whole company measured by KGIs (Key Global Indicators) and KPIs (Key Performance Indicators) contribution to functional units as IT. Improvement of KPIs may be the potential outcome from introduction of new technologies such as speech recognition, and it should contribute to a positive change of KGIs.

With respect to the above mentioned, business life manages the phenomenon of big data according to the system approach. All that means that we deploy and benefit from these technologies only if smaller elements in functional unit of IT have an effect on higher levels of the organization and causes the measurable benefits of globally observed KGIs.

When the technologies do not bring the KGIs benefits or any competitive advantage in commercial life, they are left in a lab as prototypes and they are not introduced to mass production in line with the rule above.

INDIVIDUALS LIFE AND BIG DATA

In our lives we do not act just because there may be a direct commercial benefit out of it but sometimes we also act because we want to feel good or entertain ourselves or, more generally, we want to satisfy our needs as they were defined by Adam Maslow in his theory of human motivation (Maslow, 1943).

The dissemination of the big data phenomenon in human life is nonetheless a bit viral. Since we want to satisfy our needs - and information can do that plus, information are very easy to get, because of the open databases accessible via internet and support of the search engines - today, we are facing to the information flood which is above our limit to control.

Free availability of the enormous amount of data can lead to a belief that any individual can gain knowledge of and insight into complex problems of the world just by typing the key words of the

problem into search engines. The danger in it is a fact that Big Data make all of this possible without the need to use a critical and system thinking.

The big data and its effects are undoubtedly changing the world we live in. We should be therefore aware that the satisfaction of our needs coming through the data consuming and related information produced by it works only shortly and such satisfaction will never lead us to a long term happiness. It is similar to drug addiction where the rule is: the more you take, the better you feel but only till you get exhausted and till the hangover comes.

It can be concluded that big data can definitely make our business life more efficient. However, when it comes to the life of individual, big data will not make our world better unless we start using the system approach to process them instead of simple data consumption.

Big data technologies could certainly help us develop and transform from the Information society to the Knowledge society (David, Foray, 2003) but we have to know how to use them.

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A SYSTEMS THINKING APPROACH TO STORAGE, DISTRIBUTION AND MANAGEMENT OF BUSINESS DATA IN CLOUD STORAGES

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ABSTRACT

This paper deals with the new trend in the storage, distribution, management and especially access to business data, which is the use of cloud computing technologies. Since the amount of data continues to grow, it is necessary to look for the new opportunities, approaches and thinking that will lead to cost-effectiveness of work with these types of data. One of the proposed solutions is using of cloud storages, which also offer various models for storing business data with the different priorities and characteristics.

KEY WORDS

Systems thinking, cloud computing, cloud storage, security, business model, criteria comparison.

INTRODUCTION

The amount of data produced by enterprise information systems (EIS) continues to grow, so it is necessary to look for the new ways to store this data, distribute, manage and generally provide access to them. One possibility is the use of cloud computing technologies and the principles of distributed storage and processing of the data. These new approaches to the implementation of modern information and communication technologies (ICT) generally develop one goal and that is the cost savings, which is followed by the business's profits and the competitiveness of the business. Information society nowadays requires highly efficient sharing of information. However, not all of business data are suitable for the cloud storage, especially when it comes to strategic data, know-how of business etc. It is therefore necessary to use a systems thinking approach to define what should be stored in the remote storage in the cloud and what can be provided by the business's own ICT infrastructure (local storage).

The aim of this paper is to use a systems thinking approach to define the advantages, disadvantages and describe the new possibilities for the storage, distribution and management of business data in the cloud storage. It will be followed by the definition of criteria and comparison of the related services in order to define the basic models for storing and managing of business data using cloud computing technologies. The analysed system for these models is a medium-sized organization using the cloud computing.

NEED OF A SYSTEMS THINKING APPROACH WHILE WORKING WITH BUSINESS DATA

Definition and classification of business data and their sources can be found in (Basl & Blažíček, 2012). The difference between information, data and knowledge is also in (Bureš, 2007), but access

and methods of their storage varies. In the business hierarchy of data sources are raw data, which are either further processed or archived directly, usually at the lowest level, whereas the knowledge, that are important for the business's strategic decisions, financial and competitive value, at the highest level. Among the current trends in the EIS is mainly an effort to centralize access to business data, to facilitate processing of data, access of regimes with personified services and thereby more efficient decision-making management (Basl & Blažíček, 2012).

Therefore, it is necessary to take into account the systems thinking approach to the selection of models solving this problem, which would cover the issues of storage, distribution and management of different types of data that business generates. These problems will also affect the structure of this paper. The first part is focused on the cloud computing technologies, as well as the definition of the cloud storage, distribution and subsequently distributed processing, with a focus on the security and data protection. The final part deals with the definition and description of criteria for the proposed cloud storage models, which are suitable for the different types of business data.

A systems thinking approach by the authors in (Janíček & Marek et al., 2013) sets out the principles, attitudes and characteristics of entities for their comprehensive analysis that identifies attributes such as system access. These include in particular the meaning and contain of the correct definitions, the definition of entities, the proper description of the problem situation associated with an entity, problem formulation and structured approach to the problem solving. The idea in systems thinking is not to drill down to a root cause or a fundamental principle, but instead to continuously expand user's knowledge about the system as a whole. The systems thinking must include the individual attributes of the system approach. The actual process of solving the problem, according to (Janíček & Marek et al., 2013) follows these stages, which are described in more detail with the topic of this paper.

- formulation of the problem situation – classification of business data and the possibility of their storage and management in the cloud computing environment for a medium-sized organization,
- analysis of the problem situation – research of the related literature and the description of applied solutions which are suitable for a medium-sized organization and its relations and borders,
- objectives for the solving of the problem situation – the design of the model using cloud computing to support the storage and management of business data, including cost savings in ICT,
- the problem formulation – tools and services of cloud storages which are suitable for the each type of business data,
- formulation of the objectives of solving the problem – the selection of a specific model for each type of business data and the suitability evaluation,
- the process of solving the problem – definition of the concrete criteria for each model and their weights in the model,
- the verification of the results of solving the problem – discussion and reviews of the solution.

CLOUD STORAGES AND DISTRIBUTED ARCHITECTURES FOR STORING AND PROCESSING OF BUSINESS DATA

Cloud computing is changing the way users access and use of resources (infrastructure, database, storage, etc.), applications, and services, as well as other technologies (mobile phones, tablets, etc.). This model is characterized primarily by the user pays only for what they actually use. There is no problem operatively to increase / reduce the use of resources and services as needed. The required contribution is generally relates to the financial aspects, e.g. reduce costs and increase profits. Cloud computing is primarily active in the area of cost savings on hardware, software (licenses, updates, etc.), human resources, time savings (there is no need to install and manage services in cloud), variability of performance and price (price depends on the leased capacity or the growth of users), and a server operation. However, some companies may have concerns about data security and availability or the reliance on a single provider. These problems can be solved by creating a private cloud.

Nowadays there are a large number of virtualization technologies, or in the case of public cloud, negotiating a service level agreement (SLA). Cloud computing and has a significant impact on traditional forms of storage, backup, and especially access to business data. More can be found in (Ahson & Ilyas, 2011), (Furht & Escalante, 2010), (Josyula et al., 2012) or (Velte et al., 2011).

The origin of cloud storages (or cloud computing) is necessary to look in the early 1990s, when it began to appear the first centralized cluster-based network client / server architectures. This was followed by the developing of distributed grids among different businesses or institutions with the same interest, which allow faster data processing and distribution of results. Nowadays are these architectures replaced by the cloud computing business model that offers these services not only for businesses, but also across the various public institutions (Shroff, 2010).

THE IMPORTANCE OF CLOUD STORAGES, THEIR CHARACTERISTICS AND SOLUTIONS

Cloud storage is a service-oriented model of distributed storage where data are stored on virtualized systems of third parties who offer free capacities for rent - usually pays for the amount of stored data (GB / month) and for incoming and outgoing data transfers. Each provider has its own SLA, including price, and of course the web interface for managing of the cloud storage. The main characteristics of that storage should include: elasticity, scalability, flexible and efficient availability of capacity, appropriate response time, data security etc. More information and solved problems can be found in (Abu-Libdeh et al., 2010), (Ruiz-Alvarez & Humphrey, 2011) or (Wu et al., 2010).

Cloud storage providers can be distinguished into two groups. The first one is focusing on users and small businesses, which generally offer storage space in the hundreds of gigabytes and a wide range of additional services. Basic version with a few GB and some services is usually free of charge, over the limit is need to pay a monthly rate. These are e.g. Dropbox, Box, Mozy, SugarSync or OpenDrive. The second group consists of providers with comprehensive services such as Amazon S3, Rackspace Cloud Files, Google Cloud Storage and Windows Azure Storage. Their services are particularly suitable for archiving business data and facilitating access to them by employees, suppliers or customers who just need an Internet connection, while maintaining safety requirements. These providers differ mainly in price and service level, although typically offer both infrastructure and tools for data processing.

COST-EFFECTIVENESS AND PERFORMANCE OF THE CLOUD STORAGE

For businesses will always be cost-effectiveness and cost savings associated with implementing a new solution the most important question. However, it is necessary to consider also the other characteristics, especially those related to the performance of the cloud storage – response time and time of uploading / downloading data, etc. More information and the case study can be found in (Lněnička et al., 2013).

Response time r_j , of a job j is the time interval between the arrival and the departure of the job (in this paper it means the time of transfer from default location to the cloud storage). Its Average Response Time (ART) is defined as (Moschakis & Karatza, 2012):

$$ART = \frac{\sum_{j=1}^N r_j}{N}$$

(1)

where N is the total number of jobs (transfers). The cost of cloud storage usage derives from the Lease Time (LT) of storage space (usually monthly) and inbound / outbound data transfer (usually per GB based on monthly usage of cloud storage) (Lněnička et al., 2013):

$$LT_{monthly} = P_U * X + P_I * Y + P_O * Z$$

(2)

where P_U is price for 1 GB of data in cloud storage per month, P_I is price for inbound data transfer, P_O is price for outbound data transfer (both for GB per month); X is size of files (GB) in cloud storage, Y

is size of transferred data (GB) to cloud storage and Z is size of transferred data (GB) from cloud storage. The final metric is Cost-Performance Efficiency (CPE), which is evaluated by combining LT with the ART and is defined as (Moschakis & Karatza, 2012):

$$CPE = (-D_{LT}) + (-D_{ART})$$

(3)

where D_{LT} is the relative difference (%) in LT between two cloud storages and D_{ART} is the relative difference (%) between their ART.

SECURITY AND DATA PROTECTION IN THE CLOUD

Business data are, in the case of public cloud, physically located on the Internet, which in some cases (various providers) may include another state or even several states. It is therefore appropriate to choose a trusted cloud storage provider, preferably with an office in the same state as a user. There are three main areas of security threats in the cloud (Kaur, 2012):

- Traditional security – these concerns involve computer and network intrusions or attacks that will be made possible or at least easier by moving to the cloud. Concerns in this category include: virtual machine level attacks, phishing cloud provider, authentication and authorization, forensics in the cloud etc.
- Availability – these concerns center on critical applications and data being available, e.g. uptime, single point of failure, assurance of computational integrity etc.
- Third-party data control – there is a potential lack of control and transparency when a third party holds the data, the provability of deleting relevant data to a business's retention policy, contractual obligations, cloud provider espionage or data lock-in (data transfer IN is usually free, but data transfer OUT of the storage can increase total cost).

It is also important to mention, that cloud storage providers continuously test the security of their services, they know the potential threats and by quantitative effect are able to provide better and safer services than they would have mastered the business itself.

A DESCRIPTION OF MODELS FOR STORING AND MANAGING OF DIFFERENT TYPES OF BUSINESS DATA

A systems thinking approach it is important to recognize all the elements that form this research area, since each of them will play different roles in the storage and manage of business data and will deal with different requirements for the proposed models.

MODEL FOR STORING OF RAW DATA

This model is based on the assumption that the data will not be further processed and used only for long-term archiving with the necessity of minimum access, e.g. disaster recovery or the data that the business has to keep under some laws, regulations, and policies. For these purposes, businesses can use the services of one of the larger cloud storage providers. The total cost usually consists of: storage pricing, request pricing and data transfer pricing. More cloud storages of this type can be found in (Lněnička et al., 2013). Their performance and cost characteristics can be also compared by using some online tool e.g. CloudHarmony.

MODEL FOR STORING OF OPERATIONAL DATA

This model is based primarily on active work with the data, particularly the possibility of cooperation and communication workers at the creating of documents or multimedia content. In this case, the most important services are synchronization or document versioning. The most suitable cloud storage will be some from smaller providers. To facilitate the control of data in multiple cloud storages can

businesses also use various tools such as Gladinet Cloud Desktop – connect various cloud storages under one virtual disk in a supported device (file system for each of the storages).

MODEL FOR STORING OF KNOWLEDGE

As a one of suitable solutions could be an implementation of the business knowledge cloud, because centralized business network can be considered as a good compromise between cloud and local storage. This research problem is described e.g. in (Furht & Escalante, 2010), where authors propose the architecture of knowledge clouds – model Knowledge-as-a-service (Kaas), who uses the architecture of cloud computing and should primarily support the process of creating, acquiring, storing and sharing of knowledge. Another idea about the importance of Kaas can be also found in (Tsui et al., 2011). The business can deploy this knowledge cloud as a model, which is represented by the current business infrastructure and the architecture of EIS, when it is purchased only by the module offering services such a Kaas, which is then integrated into the existing EIS.

CRITERIA COMPARISON AND THE SUITABILITY FOR THE PROPOSED MODELS

For the business's needs it is important to choose the right model according to the selected criteria, which are defined in the Table 1, together with their weights (importance) and suitable alternatives. Table 2 then shows the extended criteria comparison and the suitability of them for the proposed models.

Model for storing of raw data		Model for storing of operational data		Model for storing of knowledge	
Criteria	Weight	Criteria	Weight	Criteria	Weight
archive and backup	0,3	performance (response time)	0,25	security	0,3
cost effectiveness	0,2	services offered	0,25	customization	0,25
reliability	0,2	reliability	0,2	integration cost	0,2
Internet connection quality	0,15	cost effectiveness	0,2	usability	0,15
scalability	0,15	compatibility	0,1	credibility	0,1
Suitable service (alternatives)		Suitable service (alternatives)		Suitable service (alternatives)	
Amazon S3, Google Cloud Storage, Windows Azure Storage, Rackspace Cloud Storage etc.		ZipCloud, DropBox, Google Drive, SugarSync, Mozy, LiveDrive etc.		Salesforce Knowledge, Oracle RightNow Knowledge Cloud Service, SAP Cloud for Service, SpiderOak etc.	

Table 1 – Definition of criteria and their weights for the proposed models (Author,2013)

Suitability of the proposed model for the concrete criterion High / Medium / Low	Model for storing of raw data	Model for storing of operational data	Model for storing of knowledge
Large amount of data (in TB).	High	Low	Low
Maximal size of a single file.	High	Medium	Medium
Number of people with the access to data (more than 10).	Low	Medium	High
Frequency and flexibility of the access.	Low	Medium	High
Compatibility with the other services (e.g. framework OpenStack).	Medium	High	Medium
Only browser access.	High	Low	Low
Desktop application access to the cloud storage.	Low	High	High
Security (authentication, authorization, encrypted storage).	Medium	High	High
Reliability of the cloud storage services.	Medium	High	High
Focus on the performance of the cloud storage.	High	Medium	Medium
Focus on the portability – both data and services.	Medium	High	High
Procedural steps work with data - updates, backups, deleting (data from cloud storage cannot be restored).	Medium	High	High
Various restrictions in terms of the size of uploaded files or types of files that can be uploaded.	High	Medium	Low
Synchronization (with various computers, folders sync, file or folder sharing, files versioning).	Low	Medium	High
Platforms (PC compatible, Mac compatible, mobile device access, Android, iPhone).	Low	Medium	High
Customer service (live phone or live chat customer service request, email).	Low	Medium	Medium
Focus on the technical support.	Medium	High	High
Focus on the user interface and usability.	Low	High	High
Provider's country and location of virtual machines and data.	Medium	High	High

Table 2 – Criteria comparison and the suitability of them for the proposed models (Author,2013)

CONCLUSION

Since the data are the greatest asset of the business, it is required to take care of them. The aim of this paper was to propose models for the storage and management of business data using the increasingly popular cloud computing technologies. Businesses can thus build up a portfolio of different cloud storages and not build its own storage system with not exactly cheap hardware. Cloud storage could help in the reduction of IT investment budgets and more flexible services, that it incurs operating expenses rather than capital expenses.

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SYSTEMIC DECISION-MAKING ON THE CLOUD COMPUTING DEPLOYMENT

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ABSTRACT

The article presents a preliminary analysis of the parameters and options related to a specific cloud computing product selection. Presented data are based on previous research, which was conducted via questionnaires and structured interviews with economical entities. The result is a set of parameters that should be taken into consideration during the selection of cloud services. The proposed parameters have been processed into the model helping with the decision about CC services. A major issue is how to further extend this model so that its recommendations are more accurate and comprehensive.

KEY WORDS

Cloud computing, decision making, IT, services.

INTRODUCTION

The present world of information and communication technologies attempts to adapt to the requirements nowadays more and more "mobile" users. People are getting used to work not only in their offices but also on the move or from home. In addition, we cannot deny that the economic and technological reality has an impact on requirements shift of IT services. The trend of a recent decade to cost savings is also in line with the environmental protection.

For this reason, IT departments in organizations are often forced to operate their services in a way that the energy consumption and maintenance costs are decreased. Although these requirements can be implemented through savings within the information system itself, it is a rather challenging task, both in terms of management and finance. However there is cloud computing.

The term "cloud computing" began to appear over last few years rather often and time has shown that this approach to the provision of IT services is significant. It seems that the development of cloud computing is still not finished, and experts predict a bright future for it. Opportunities that cloud computing provides, are tailored to nowadays requirements. Thanks to the deployment of cloud computing services, users can get ubiquitous access to the information system (IS) while at the same time decreasing the budget and environmental burden.

However, the question remains how to get all above mentioned benefits. CC services market is growing quite rapidly, and the decision on services selection must rely on well-conducted analysis of the situation. Unfortunately the company employees are often unable to perform such analysis properly, because they do not have enough time or information on the topic.

In this article I would like to focus on a problem of decision making about cloud services selection. I'll introduce my own proposal of model that helps to make this decision.

DECISION MAKING SYSTEM

Let us make clear that the scope of this article is not sufficient for a thorough description of all of my research that has been carried through on this issue. Therefore, I will explain the main results with reasoning that led to conclusions described in this article. The rest of my research may be found in (Veber, 2013).

PROBLEM SOLVING VARIANTS

To find problem solution variants is a substantial challenge in solving any decision problem. I have limited myself to the basic classification of cloud computing, as indicated by the publicly known NIST definition (Mell and Grance, 2009) or (Feuerlicht et al., 2011). Definition divides CC as follows:

- public cloud,
 - IaaS
 - PaaS
 - SaaS
- private cloud,
- hybrid cloud.

From the reasons mentioned above, I have excluded CC in the form of hybrid cloud. This does not mean that hybrid cloud form of CC would be excluded completely, as the nature of hybrid cloud is the combination of private and public access, and as such is only a combination of other services listed. We must not forget the option of delivering IT services without the use of CC (own solution). I also broke private cloud variant into two, those depend on storage of hardware, either under customer's own roof or in facilities of a provider. These two variants, in my opinion, differ substantially. Therefore, I present these problem-solving approaches:

- public IaaS,
- public PaaS,
- public SaaS,
- private provider,
- private customer,
- own solution.

CRITERIA INCLUDED IN THE DECISION

Now let's focus on what parameters should be monitored during decision-making. Determination of these parameters preceded a study of existing procedures (to be noted that previous work (Cloud Computing Use Cases Discussion Group, 2010; IBM, 2013) suggest either quite general or restricted procedures). My research is based on a questionnaire survey and interviews with a relatively large number of cloud service providers and organizations that use cloud or plan to use it. Throughout this process have been identified a number of parameters that influence the decision or might affect the decision for most individuals.

Parameters can be divided into two classes, the first class of monitored aspects relates to the organization for which the decision making is carried out - based on the situation of the organization and its goals. The second class of decision criteria is related to the processes, for which the analysis is carried out - based on the current state of processes and their needs.

Among the basic parameters of organization assessment:

1. intensity of use of IT,
2. requirements for monitoring utilization of IT services and budgeting,
3. connectivity to the Internet,
4. start-ups (no established IS),
5. satisfaction with the current state of information services,
6. CapEx and OpEx requirements,
7. the ability of custom software development.

The essential parameters of the process (es), include:

1. availability SaaS to support the process,
2. latency requests for IS support of the process,
3. dynamics of requirements on computational resources of the process,
4. need of remote access to the IS for a significant number process users ,
5. confidentiality of data the process needs to work with.

Making recommendations for the organization is done in two stages. The first stage evaluates the parameters that apply to the entire organization. In the second phase parameters associated with the process are assessed.

The following subsections describe in brief the various parameters evaluated; how the parameters affect the decision, and explains why it is important to monitor the selected parameter.

INTENSITY OF IT SERVICES USAGE

The intensity of IT services indicates how the organization uses IT services. With knowledge about the intensity of IT services, we can deduce the basic characteristics of the organization, particularly its requirements for IT services.

This criterion can be expressed as a number of servers that the organization uses. For the organization is then easy to determine the value of this indicator. However in some cases quantification of this indicator is not this easy.

Complication in measuring appears for instance with virtualization deployment because the number of virtual servers is different than the number of physical servers. In this case, the value may be measured as the number of virtual servers.

Another complication arises when using this indicator for start-up organizations that do not own any servers. In this case, however, the company (organization) does not belong into category of 0 servers! It is necessary for the start-up to estimate the number of future servers and thus derive its needs.

Thus, if we choose as an indicator of the intensity of IT services the number of servers, it may be expected that organizations with fewer servers need to run a different kind of IT services, compared to organizations that use hundreds of servers.

This parameter affects the type of cloud services that are appropriate for the organization. However, this has no effect on whether to use the cloud or not. According to surveys, organizations with a small number of servers are less interested in cloud services.

According to the “number of servers” indicator, organizations can be classified into four classes as follows:

- Minimal IS (0 servers).
- Small IS (1-5 servers).
- Medium IS (6-50 servers).
- Large IS (more than 50 servers).

Extent of those classes has been chosen on the basis of previous research by the author mentioned in the article (Veber, 2012).

Organization that have no servers (workstations only) is referred to as an *organization with minimal information system*.

This type of information system is represented mainly by entrepreneurs or small businessmen with few employees. These are the entities outside the area of IT. Personnel of such organizations are using services of applications installed on their tablets, laptops, smart phones or personal computers.

Given that the organization previously did not use any infrastructure, it's not worth the maintenance or acquisition, and therefore opportunity of IaaS does not seem very considered. To use PaaS there are necessary some investments either in terms of internal or external development. Although there is the possibility of a development of simple application on PaaS, it is unlikely that a tradesman had a common interest, with the exception of those who are active in of IT area. This leaves two possibilities, its own of IT and SaaS. Both options can be considered suitable depending on other parameters and on available offers.

Organizations that own and use several, but not more than five servers are referred to as an *organization with a small information system*.

Small IS are using mostly small to medium sized organizations they use only some basic and common services. This type of organization often uses the IS outsourcing or IS managed by one person (it can also be external staff). For such organizations the IS is nothing you need to constantly improve. With a few exceptions, they does not create custom application and are not engaged in significant modifications to current applications that have been purchased. However, it is important for them to ensure a continual operation of basic information services.

From available solution variants to the problem, we can extract private cloud, as this may be disadvantageous from a financial point of view. This leaves only two solution variants, which are public cloud services and own operation of IS. The organization that owns a small IS will often be satisfied with the solution based on SaaS, but appropriate offer based on SaaS may not be available. SaaS is beneficial for this type of organizations, both in terms of IS maintenance and in terms of the cost of operation of IS. PaaS and IaaS can also be used in exceptional cases, however, assume that this category of organizations would prefer SaaS services.

Organizations that own and use six up to fifty servers are referred to as an *organization with a medium information system*.

Organization with medium sized IS are using standard services appropriate for the type of organization, they may also adjust the system in the way to support their business processes. This group of organizations often employ two or more employees who ensure IT operation. They use also software that supports the creation of documents, information storage, retrieval and sharing except the ERP software.

Requirements of medium-sized organizations usually cannot fully satisfy the SaaS market, as they require specific software, which is not usually available in the form of SaaS. However, if the SaaS for the process is available, it is worth considering its use.

From available solution variants of the problem we must consider all mentioned variants. Recommendations of appropriate option is a question of other criteria.

Organizations that own and use more than 50 servers are referred to as an *organization with a large information system*.

Organizations holding a large information system are often not too involved in cloud, because the development of self-IS did cost them considerable resources and information are taken as significant asset, which organizations do not want to put "out of sight". Dissatisfaction with IT in this group is often caused by high (non-transparent) IT costs, or by poor flexibility of IT department.

At the time, when these organizations change their requirements for virtual servers they (or need to improve the transparency of IT costs) often consider the adoption of private cloud. This way they can keep their IT under supervision of professional management, providing automation and monitoring.

While developing new widely available applications, they should also include the possibility of using PaaS. There is also an IaaS (or virtual private cloud), we have to consider, but large-scale IaaS prices are often similar to those of a private cloud.

The situation is similar to that of middle-IS, with the difference that large companies usually tend to choose private cloud and public cloud variants are used only for selected processes, for which is this method suitable.

REQUIREMENTS FOR MONITORING UTILIZATION OF IT SERVICES AND BUDGETING

The logical consequence of the implementation of process management in organizations should be effort to the most accurate knowledge about the cost of the process (see approaches ABC - Activity Based Costing). In order to obtain information about the financial aspects of the process as accurate as possible, it is necessary to include information on the financial aspects of IT services.

So much for the theory, in practice, these costs are monitored mostly by larger organizations. However, in the decision model, this criterion is asked generally: that is, whether the organization is following or want to track this information.

Direct question is: "Does or does not want the organization to see how much it cost the IT support of individual processes?"

The task of cloud software is automation, monitoring and management of computing resources, making it possible to efficiently retrieve information about available resources according to load requirements of each process.

This allows the organisation to specify for each server, how long and intensively it ran, and accordingly calculate the price of IT services supporting various business processes.

CONNECTIVITY TO THE INTERNET

While using public cloud services, it is necessary to have reliable and sufficiently permeable network connection in all places where such services are being used. While using the CC services the Internet connection failure also means the unavailability of IT services. Therefore, it is essential to provide uninterrupted communications services while using the CC services.

In large cities it is not a big problem to connect to the Internet through reliable fibre optic link. Most of the Czech Republic is nowadays covered with a relatively fast and reliable xDSL connection, also there are companies offering expensive, but relatively reliable microwave links. And in places where neither of these options is available, it is still possible to use satellite or cellular connections. Thus we may expect that each organization is connected to the Internet. Even through it is important to evaluate the throughput and reliability of the connection. We can't neglect the fact that in the case where the connection will be used as a single access point to IT there may arise complications associated with inadequate connection parameters (let's mention throughput, response time, stability).

In the evaluation of this parameter is appropriate to take into account the possibility of alternative Internet connections, or usage of redundant Internet connections.

The question is: "How reliably is your organization connected to the internet?"

The question, of course, indicates the usefulness of public cloud offerings. If the organization fails to provide reliable connection to the Internet it is not appropriate to use services of public cloud. Certain exception are services to customers who access the application over internet, actually in this case such services should definitely be hosted.

START-UPS

For start-up the organization, it is important to form new processes and ensure their support through the newly designed information system. This task can be relatively easy to implement thanks to cloud computing. Compared to purchase of their own computing resources, using cloud mean smaller one-off investment costs. There is also no need to address (both technically and financially) the transition from the original information system to the new "cloud".

The question is: "Are you starting an organization? (There is not an already functioning information system?) "

Start-up organization is in a slightly better position thinking of cloud services than building their own IS. Cloud services represent a relatively quick implementation in comparison with self-IS at the same time and at lower cost. For this reason, it is important to evaluate the possibility of cloud-based IS solution for start-ups positively.

SATISFACTION WITH THE CURRENT STATE OF INFORMATION SERVICES

If an organization is not a start-up, and does not fully use CC services, it uses probably its own IS or a certain way of outsourcing. In this case, we cannot ignore current satisfaction with existing services of information system. Satisfaction evaluation should be carried in relation to the objectives of the organization and considering the development needs for about three years. The result of the analysis should be the level of satisfaction with IT services, including the ability to react to changes in IS in the future.

The question is: "Are you satisfied with the way of operation of your existing information system?"

Emphasize that in the case when the organization is satisfied with operation of its own IS, is any change in the decisive moment inappropriate.

This question is mutually exclusive with the question of whether the organization is a start-up. If the organization is a start-up then it cannot be satisfied with their own IT (which it does not possess), and vice versa if the organization is satisfied with its own IT, it cannot be start-up.

CAPEX AND OPEX REQUIREMENTS

To build standard IS, it requires to buy hardware and software and other operating costs to keep the system operational. Cloud computing, as such, does mean no initial investment (excluding training) and so remain only operating costs.

Some organizations may find it advantageous to invest in hardware, since the invested money can then be reflected in the value of the company (hence be depreciated). Other organizations on the other hand prefer operating costs in order to better distribute funds within the time period and to keep better planning of future funding streams.

If there is a priority in investment costs, it is preferable to run own IT, while if the priority is rather operating costs, it will be advantageous outsourcing thus cloud computing.

THE ABILITY OF CUSTOM SOFTWARE DEVELOPMENT

Organizations sometime employ workers who are able to edit or directly write application source code. Although it may not be their primary job description, the presence of such workers opens the ability to run applications on the cloud PaaS.

An alternative is to work closely with another organization that is able to ensure application development according to the requirements for an acceptable price.

Custom PaaS application development has some positives. Applications can be always available from around the world, the development environment is provided and intended for the development of such applications and the main development environment also allows unlimited application scaling. On the other hand such an application is an important program (investment costs). Positive response to this question will affect positively an alternative of PaaS variant.

The question is: "Is the organization able to develop software?"

AVAILABILITY OF SAAS TO SUPPORT FOR THE PROCESS

When it comes to decision about a particular process it is a very important step to evaluate whether to support this process through a SaaS application. SaaS is often available for such purpose to be used by a large number of users, but in practice often the processes are so specific, that it is not suitable to develop SaaS because it would fail to repay the development of SaaS applications.

To deliver the answer to this question it requires to analyse the current offer on SaaS market, which could be used for a given process.

This parameter affects mainly alternative SaaS offerings.

The question is: "Is there a SaaS offer that could be used to support the process?"

LATENCY REQUESTS FOR IS SUPPORT TO THE PROCESS

Most information systems are processing information with a certain delay and even the users themselves do not require the processed results to be delivered immediately. The human brain hardly recognize even very short delay.

In the case when between the server and the user is a good network connection and a small number of sufficiently fast network elements, the response is approaching almost zero (in units of msec). However, if the cloud servers are placed in a large geographic distance, there is often a larger number of network elements in the path, and therefore there is a small or large delay (30 - 200 ms). It depends on the particular application, whether such delay affects negatively the quality of service. Example of such applications in which the response is important, are the systems that are working in real time (real-time systems), for example, such systems may control and monitor a production, perform a variety of transactions, including stock market or operate online games. Such systems require very low latency and therefore could nowadays hardly operate in the public cloud, where the response of individual parts of the system is not guaranteed at all.

When deciding on the process we need to evaluate whether the current process requires very low latency IT support.

The question is: "How much the process requires real-time system?"

This criterion affects primarily the usability of public cloud to support the process. Also, provider private cloud (hosted private cloud) may not be suitable for processes that require low latency, but in this case, everything depends on the parameters of the connection to the provider. Variants in-house private and self-realization are most suitable for real-time systems.

DYNAMICS OF REQUIREMENTS ON COMPUTATIONAL RESOURCES OF THE PROCESS

Dynamic requirements for IT services relate to operation of the process. Some processes are running continuously in time, and so their requirements for IS services are constant. Such processes have no dynamic requirements. Such are often communication services for example e-mail. In case of e-mail it is necessary to let the server run continuously, because when the server is down we can't receive e-mails.

However, there are processes that have dynamic IS requirements. Such processes are either not running continuously or are having resource usage spikes. Let us include among the dynamic processes even those that change requirements over time. For example, e-commerce is often experiencing these fluctuations.

Dynamic requirements criterion speaks in favour of public cloud services, public cloud supports dynamic use of the service well (in terms of both cost and delivery speed of resources) as opposed to private services and self-implementation.

The question is: "How much dynamic are requirements of the process to the information system?"

NEED OF REMOTE ACCESS TO THE IS FOR A SIGNIFICANT NUMBER OF PROCESS USERS

Some organizations offer an application to a large number of users often over the web, whether they are customers or the employees. Cloud provides an environment not only for the efficient development of such applications, but also for economic and stable operation. There should not be a problem to change the volume of requests to such a system over time.

Services offering this functionality are included under the term PaaS. Organizations should consider using PaaS for new web applications.

Let us emphasize that in this case, we speak about applications that an organization develops itself and also those which are not available as SaaS. In this case, it is advantageous to use PaaS or at least consider the operation of such an application to the virtual cloud infrastructure (IaaS).

The question is: "Do large number of remote users access the application?"

CONFIDENTIALITY OF DATA THE PROCESS NEEDS TO WORK WITH

Security is in terms of the cloud often mentioned more often in a negative sense. However, security of data centres is ensured in a much better way for most of organizations. Also, data location is not clear, and thus the likelihood of physical theft of hardware decreases. In reality, it is more likely that the organization will lose data due to practices of social engineering than by theft associated to storing data especially in the cloud. However, organizations are still reluctant to store data in public cloud. The reason is a certain distrust of new data storage procedures. First, due to partial loss of control over data movement and also due to possible legal barriers.

Therefore, there is a barrier to cloud deployment for some processes because of data security. Let's mention banks – those would hardly dare to store information about customer accounts into public cloud. However, cloud may be suitable for other processes even in banks, for example e-mail services - as mentioned in (Kohout, 2013).

The decision-making on the cloud must also evaluate whether the data of the process may be delegated to public cloud or not.

This aspect determines whether to use for process the public stores or not. In case of strictly confidential data there is eligible only the private cloud and the self-implementation.

The question is: "Could be process data entrusted to public cloud - think in terms of confidentiality and legislation?"

DISCUSSION

The above list of factors affecting decision making about what cloud computing solution to choose, is focused on the essential and indispensable factors, but the decision may affect other circumstances. Author would welcome any further suggestions of factors that should be included in the evaluation in addressing the problem of cloud computing services choice.

The above list of alternative solutions of the problem refers to each class of cloud computing services. Evaluation takes place for the specific process and specific organization. However, it is important to ask whether this structure is sufficiently beneficial to users in practice, or whether it is necessary to do evaluation on the basis of finely divided categories. However, too detailed breakdown would mean a risk of gradual obsolescence as the new offers are coming to CC market....

CONCLUSION

The entire analytical process of selecting the appropriate cloud-based offer for the particular business is quite complex and perhaps that is why nowadays there are no open tools, which would assist to address this problem. That's why I gave myself the task to design such a procedure. This article envisioned essential parameters that are important to consider when selecting CC offers. The next step is to determine precisely how these parameters affect the decisions and incorporate this into a specific evaluation tools.

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HEALTHCARE MONITORING SYSTEM BASED ON INTERNAL MOBILE PHONE SENSORS

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ABSTRACT

Architecture of monitoring system designed for continuous surveillance of person is presented in this paper. System is based on usage of large number of mobile phone sensors. Monitored person should not be bothered and limited by the system. It is necessary to monitor mainly weak signals from different sensor. These signals are often disrupted by different noise. Possibility of usage of different mobile phone sensors is discussed in the paper.

KEY WORDS

Ambient intelligence, ambient assisted living, sensors, smart phones.

INTRODUCTION

As the population is ageing new technologies are developed to provide comfort and help for elder people with their daily needs. Ambient assisted living – AAL technologies are based on idea of ambient intelligence which should provide such help to users without being noticed. The idea of M. Weiser is that The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it. (Weiser 1991) Technologies are nowadays really disappearing and there are two levels of disappearing. First level is miniaturization of the technology. Devices which you can put into your pocket have bigger computer performance than computers used in the offices few years before. Smart phones have many sensors such as GPS, accelerometer, gyro sensor and a lot of more. To use each of these sensors own separate device had to be used quite recently and nowadays all of these sensors are in one box which you can hold in your hand. Technology is disappearing on the level of mental perception as well. It is normal that doors are opening automatically, parking houses recognize car by the licence plate or you can pay in the shop by sliding your credit card near the cash register and nobody wonders about it. Across all age groups most of the people own some kind of cell phone. Number of smartphones increases each year. Possession of such smartphone gives a great computing power that can have person carry.

MONITORING SYSTEMS

Presented project is focused mainly on monitoring people with minor health issues who should be under constant control. Idea is to create such system which don't bother monitored person but still can obtain data about health status of monitored person. Designed system should be also financial unassuming. There are several projects dealing with design of smart houses which monitor current health situation of its inhabitant. Very interesting project in this field is described in (Hoof 2011). Unattended Autonomous Surveillance system was installed in homes of elder persons - volunteers and impact to quality of their life were measured for months. Some of the systems are focused on more specific problems such as people with dementia - for example (Lofti 2012).

Houses with ambient assisted living systems are composed of many hardware parts such as sensors and computers.(Cimler 2012) This solution is financially expensive not only because of price of the components but there have to be also some structural adjustment of the building where should be system installed. Our proposed system gather all necessary sensors into one device which is commonly accessible - idea of usage of the smart phone as monitoring device for needed people is presented.

SMART PHONE SENSORS

For the purpose of testing device Samsung Galaxy Ace GT-S5830 (2011) were used. Three sensors and microphone of this device were used for testing: TAOS – proximity sensor, BMA220 – digital triaxial acceleration sensor and MMC314X – triaxial magnetic sensor. Operation system was Android v. 2.3.6. Information from these sensors can give information about position and current state of the monitored person. There is a lot of noise in signals in the output from the sensors. Even if a body is quite still, there are always small movements of different muscles which we don't want to measure. Inputs from microphone are also disturbed by the noise of the environment or speech of the users. It is difficult to recognize what is calling for help and what is normal talk. One of the basic possible solutions is define threshold of noise which separates normal talk from the calling for help. More sophisticated methods should be used in our future research. Algorithms for filtering disturbance in data from gyro sensors were our research and some of the results can be seen in (Suba 2012).

What can be measured	Sensor
• Immediate acceleration	• Accelerometer
• Position of the device towards tangential of Earth's surface	• Gyro
• Position of the device towards magnetic poles	• Compass
• Position of the device within geographical co-ordinates	• GPS
• Noise level	• Microphone
• Temperature	• Thermometer
• Humidity	• Hygrometer
• Light intensity	• Light sensor
• Pressure	• Barometer
• Strength of signal	• GSM, GPS, WiFi, BlueTooth, FM radio

Table 1 - Sensors in the mobile device

In the following table 2 is described which information can be gathered about monitored person, what types of disturbance can occur and how to deal with disturbances.

Sensor	What can be measured	Type of disturbance	Solution
Gyro	Tangential position to Earth surface of monitored body	Movement of the monitored person	Filtering short extremes
Microphone	Breath, call for help	Ambient noise, speech, problem with power consumption	Noise level threshold, spectral analyse
GPS	Position of the monitored person in the area	Reflections and obstacles	Lower threshold
Accelerometer	Movement	Sensor generates own noise and whole device is too problematic noise generator	Testing hypothesis about correlation of gathered data with expected function

Table 2 - Sensors on which is our research focused

Originally was expected to use microphone for heartbeat measurement. Acoustic band of microphone is unfortunately too high. As can be seen from fig 1, heartbeat band is about 1Hz and acoustic band of the microphone in the device starts at 16Hz. Results from the measurement was not sufficiently recognizable. For the future research device with more appropriate microphone will be used.

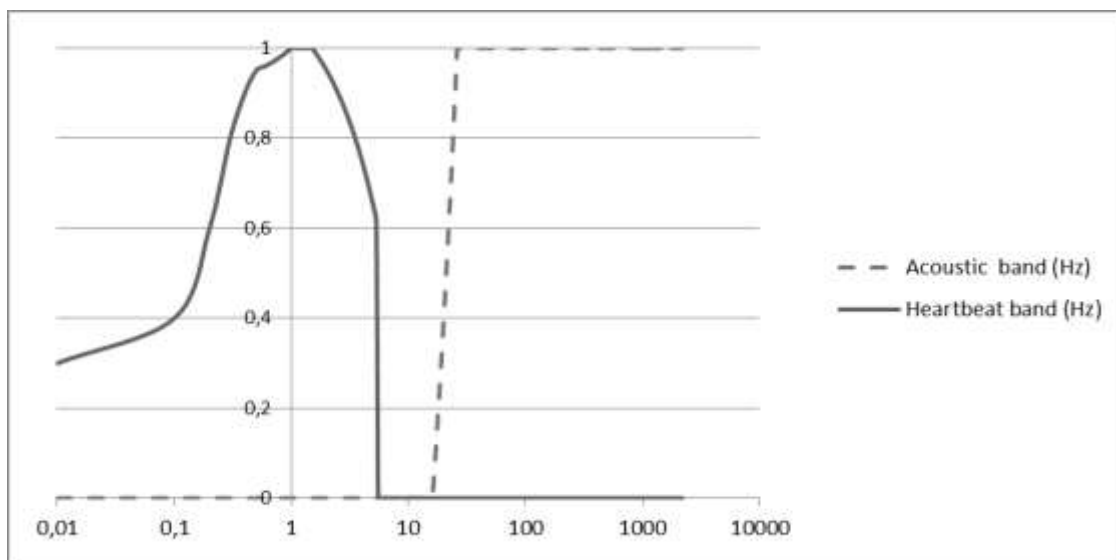


Figure 1 - Band of heartbeat and acoustic band of microphone

CONCLUSION

System for the healthcare monitoring has been introduced in this paper. System is using internal sensors of mobile phone device. There is a lot of noise in signals from the sensors which has to be filtered. Few solutions how to deal with this noise has been introduced. Monitoring heartbeat using the microphone on the mobile phone turned to be a dead end for now because of the low sensitivity of

microphone in the useable bandwidth. Band of the heartbeat is below acoustic band of the used microphone. For the future research new type of mobile device will be used.

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INTELLIGENT ENVIRONMENTS AND AMBIENT INTELLIGENCE – SOCIAL ISSUES OF APPLICATION

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ABSTRACT

Ambient intelligence and intelligent environments in general represent actual trend in development of the field of artificial intelligence. Along with incorporation of these technologies into our everyday life, there are also existing issues related to privacy, security, ethics and confidentiality, which are still not satisfactory solved. This contribution is focused on area of Ambient Assisted Living (AAL) and medical homecare, both considered in context of our system in development. The system is intended to be used primarily by elderly people whose medical condition do not require hospitalization but rather continuous medical monitoring of their health condition. The purpose of the system is to improve quality of user`s life and minimize impact of mentioned technology usage on their privacy, dignity and social life.

KEY WORDS

Ambient intelligence, intelligent environments, artificial intelligence, intelligent systems.

INTRODUCTION

Ambient intelligence is an area focused on design of environments where electronic devices try to help inhabitants of these environments (users) in their everyday tasks. Such help is supposed to be discrete, unobtrusive and non-interfering with their life. Only minimum of interactions between user and the system is expected. These are basic characteristics of intelligent environments` design. For more detailed information on ambient intelligence or intelligent environments, see also (Augusto, 2006) or (Augusto, 2010).

There is a significant difference between use of such technologies at workplaces or outdoors and at home. The home environment is a private area and it is a very sensitive matter when considering possible invasion of the privacy of its inhabitant(s). Use of modern technologies in our everyday life brings up to attention important questions related to issues like privacy, security and even ethics when dealing with personal data. Although the technological advancement progressed enough for ambient intelligence applications to be available to general public on a larger scale, mentioned issues still remain generally unsolved.

In this paper, we are focused primarily on issues related to our system for medical healthcare for elderly people (see the next sections). But many problems that will be mentioned are not exclusive for our domain and can be easily expanded to the whole area of intelligent environments design.

STATE OF THE ART

The idea of medical applications in intelligent environments is not by any means novel. On the contrary, these are some of the most important applications which were being considered from the beginning of the field. This is due to the fact that the people who benefits the most from the

intelligence in the environment are people with handicap (blindness, motion disability, etc.), elderly, dependent, or otherwise disadvantaged. These are who benefit the most from the use of such systems.

Assistance and medical care are most important uses of the system for intended group of users (elderly, handicapped, dependent, etc.). Requirements for such systems are mentioned for example by Larizza (Larizza et al., 2012) or Rogers (Rogers et al., 2010). In this context, a Spanish project AmIVital can be mentioned as well, see (Valero et al., 2011). AmIVital is focused on complex improvement of elderly people's quality of life and of provided services. This is done by services called e-Health, e-Information, e-Learning, e-Leisure and e-Assistance (Valero et al., 2011). This altogether forms up a complex solution.

Other interesting project is NOCTURNAL, focused on specific problem of providing services and systems of AAL during nighttime (Augusto, 2011). Another project REMOTE (Bekiaris et al., 2011) is aimed at "application of tele-healthcare and ambient intelligence by enhancing the elderly's home with audio-visual, sensor, motoric monitoring and automation abilities to trace vital signs, activity, behavior and health condition, and detect risks and critical situations, as well as provide, proactively and reactively, effective and efficient support at home."

Discrete interactions are of less importance in the context of medical healthcare and assistance. This is in contrast with commercially more interesting applications of intelligent environments, like entertainment or living comfort, where discretion plays important and decisive role. In our context, the more important is quality of assistance services and precision of diagnostics, if the system is supposed to have medicinal application. Examples of such systems are: detection of respiration difficulties, fall detection, or focus on rehabilitation, etc. These are problems specifically related to domain of ambient assisted living (AAL), homecare or assisted healthcare rather than (more general) ambient intelligence. Also, as Fraile pointed out (Fraile et al., 2009): "Home Care requires the improvement of the services offered to the users as well as the way they can be accessed". Fraile's work is focused on design of multiagent hybrid system (combining reactive and deliberative agents) for homecare application. If there is expected interaction of non-specialist with the system and user-friendly interface is expected by default. All the mentioned aspects leads to conclusion that homecare AAL applications are quite specific and different from standard approaches for designing intelligent environments and special design problems are to be addressed.

Along with standard requirements for administration of intelligent environment like data security and quality of data transfer, there is also important question of privacy, especially for medical applications. Results of study done by Kanis (Kanis et al., 2011), quite clearly shows that some technical solutions like video or audio recording of users (residents) are considered to be too invasive into one's privacy. This could be significant obstacle for most users when considering use of such systems. This question will be discussed in more detail in following sections of this paper.

SYSTEM DESIGN

Our work is focused on design of intelligent monitoring system for medical homecare. Elderly people are expected to be target group for this system, but anyone with chronic condition requiring constant medical monitoring is a potential user as well. Purpose of the system is to continuously monitor medical condition of the user by wearable set of sensors. Central piece of the wearable system is smartphone (with software application). Data from sensors are wirelessly send to server for further processing and analysis. Expert system application then evaluates result of this analysis and an alarm is set in case of medical emergency (fall, heart failure, respiration difficulties, etc.). The basic input/output components of the system are shown at the Fig. 1.

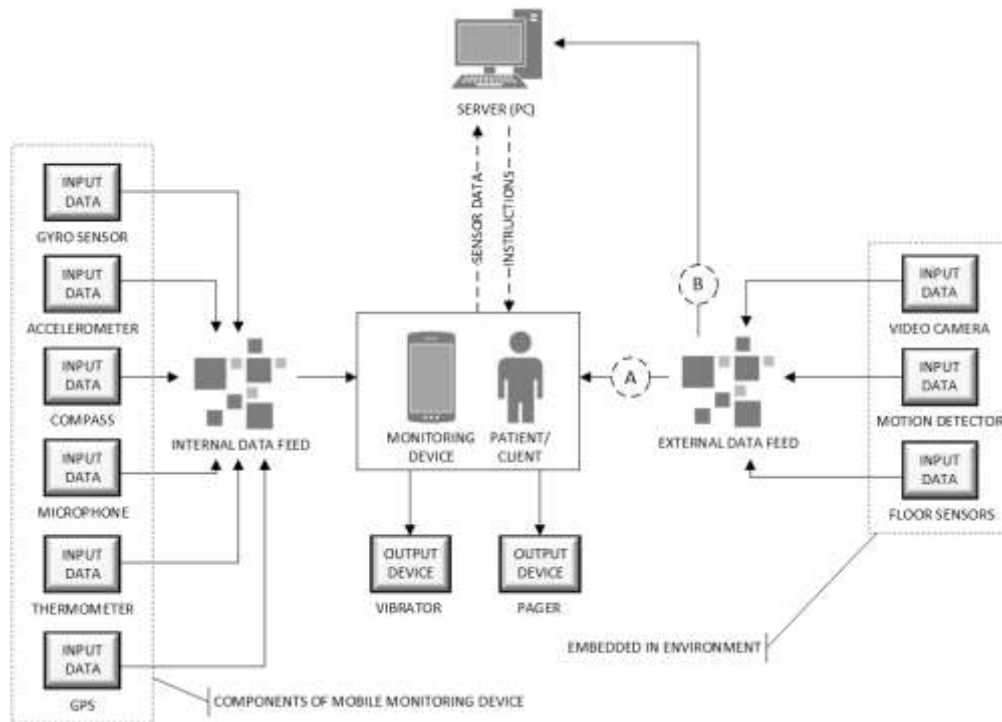


Figure 1 - Sources of data for the monitoring system

The Fig. 1 shows most important data sources (on the left) of the monitoring system (in the middle). The internal data feed is considered to be primary source of data. Devices on the right side of the Fig. 1 are not part of the system at this moment. However, their incorporation is possible and will be most probably required in the future. Input of video cameras, motion detectors or floor sensors (list could be extended as needed) may provide useful information when system tries to recognize health problems or detect fall of a client, etc. and there are already usable technical solutions available, well adjusted for the needs of this system, like (Larizza et al., 2012), (Kosmopoulos, 2011) or (Nieto et al., 2009).

The main components and communication within the system are shown at the Fig. 2. The monitoring device (worn by user) transfers sensor data to server for further processing and analysis. Part of data may be processed at the level of monitoring device itself (indicated as “A” data route on the Fig. 1), but since data analysis task would be consuming considerable amount of computing power and energy of the device, majority of the data is analyzed on the server (datafeed “B” on the Fig. 2). Data travelling through “A” are typically reduced in size after local processing, conserving energy and time required for wireless data transfer.

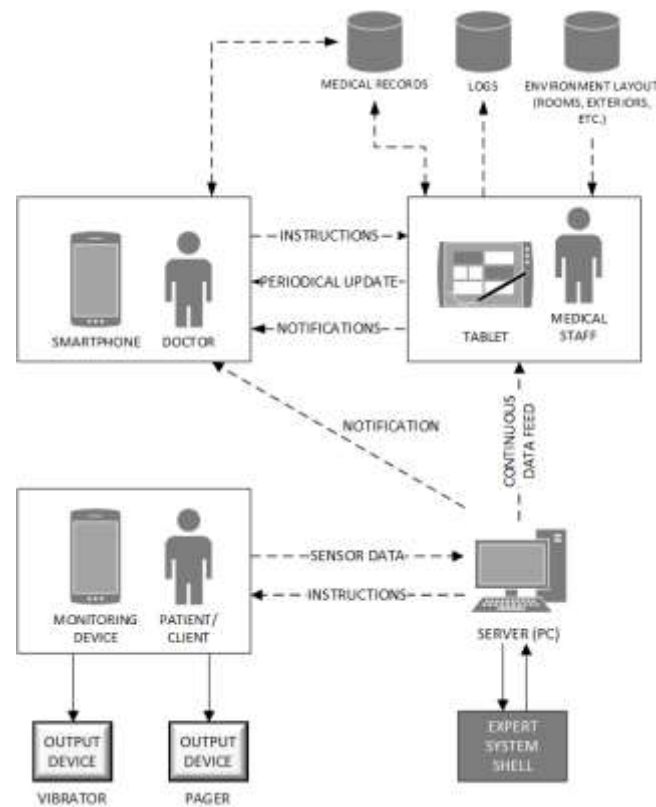


Figure 2 - Communication in the system

Expert system (Fig. 2, bottom right) is used for recognition of potentially dangerous situations and if such situation occurs, it sends notification to both medical staff and doctor. In order to do so, expert system uses data from different sensors to validate classification of actual situation. Expert system component is also important for interaction with attending people like family members, nurses, etc. when the user is residing in the home environment. It makes communication with the system easy and comprehensible because it is also responsible for the interpretation of actual situation.

The medical staff is responsible for providing assistance, if needed, and is equipped with tablet containing overview of all patients and their (medical) status. This device contains also information about environment (layout, building plans, maps) as well as medical records of all patients currently in care. Logs database is used for maintenance reasons and continuous updates on system's functioning are stored here (this is important especially when an error occurs or when optimizing system's performance).

The smart phone device used by doctor provides overview of each patient's health condition in periodic time intervals (it is not necessary to have continuous data feed). Doctor is able to send instructions regarding medication, examination etc. to the medical staff.

At this point, it is necessary to mention that there are two versions of the system considered at this time. First version is intended for use at medical facilities like hospitals, long-term healthcare clinics, etc. and second is intended for use in home environment. The latter would require some slight changes in architecture which is shown at the Fig. 2, since there will be no "medical staff" but rather family member or nurse attending to the user, but otherwise the system will work in a similar manner.

PRIVACY, SECURITY, AND SOCIAL ISSUES

The topic of privacy and appropriate security measures for ambient intelligence systems still requires further attention of academic community as well as of commercial subjects, see also (Ziefle, 2011). This view is shared for example by Rothenpieler (Rothenpieler et al., 2011) who suggests that data obtained through monitoring should be fully under control of the user/client. Easy technical solution, offered by Rothenpieler, is so-called "privacy switch" which can shut off all monitoring devices. This

can be useful especially when user have visitors or is doing something requiring privacy. Thus the use of monitoring devices have no impact on user`s social life which is important aspect of elder people`s lives. Although this may be, at the first glance, in conflict with medical requirements of constant monitoring, if the user has visitors and is not alone, they are able to call for help if anything happens. For other situations, set of reasonably formulated rules may be established for use of “privacy switch” so that it can perform its function correctly. More detailed discussion of this can be found in (Rothenpieler et al., 2011).

There is also a general agreement on the volume of gathered data – it should be minimal. Rothenpieler directly states (Rothenpieler et al., 2011): *“The collected data about the user has to be minimized to the amount which is required to effectively fulfil the monitoring task... The data further should be kept anonymous as long as possible and should only contain references to the originating household if this information is needed, e.g. by an ambulance. The use of wireless sensor nodes instead of primitive sensors offers the possibility of in-network analysis and processing of data.”*

Reflection of privacy concerns is a basic pre-requisite for successful system application. Study of Kanis (Kanis et al., 2011) shows that users are willingly sharing details of their everyday routines with attending medical staff only. In this context, Rothenpieler (Rothenpieler et al., 2011) suggests use of service portal, where data of both private and general nature would be stored. Part of data should be directly inserted by the user (hobbies, friends, etc.). Portal should be secured enough to protect sensitive data, but with minimal participation on the side of the user. Limited technical skills of user are to be expected and taken into account.

Requirements for privacy are somehow in conflict with the fact that certain amount of data could be used for additional services providers (grocery delivery services, medical services, house cleaning, etc.) which would make it interesting for commercial applications. This remains to be open problem at this moment.

Interesting aspect is also mentioned by Rothenpieler (Rothenpieler et al., 2011). User has the right of nescience (unknowingness). *“Given, for example, the automatic diagnosis of a disease through the service portal, this information should not be accessible instantaneously to the user. Instead, this information should be communicated through the use of a human intermediary such as the user’s family doctor. The computer system lacks the ability to correctly inform the user about the actual chance of the diagnosis’ correctness and its consequences while not being able to judge if the user actually wants to be informed about this special diagnosis.”*

All the above mentioned aspects of intelligent monitoring system design lead to following recommendations:

- System must have transparent design. Technical solution and architecture must be explainable and presentable even to person with limited technical knowledge.
- System must respect privacy of the user.
- User must have at least partial control over system.
- System must be protected from the outside and sensitive data can be provided only to attending medical staff.
- Data should be collected in minimal quantity which is required to effectively fulfil the monitoring task.

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CONCLUSION

The proposed system is focused on monitoring of health condition of primarily elderly people. Since application of such system may be invasive for one's privacy, especially in home environment and in long-term use, important issues related to the privacy and security of the system must be dealt with. We have presented list of recommendations that will help solve these issues and make the system more acceptable for users. Because effective functioning of the system may allow user to live independently in his/her own home environment, instead of staying in medical facilities for health monitoring, it may be significant improvement of user's quality of life and his/her personal comfort.

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CONTRIBUTION TO SYSTEM APPROACH TO NOTIFICATION AND INFORMATION OF CIVILIANS IN EMERGENCIES, DISASTERS AND CRISES

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ABSTRACT

The primary task of the early warning systems, is the distribution of important information to the required location timely, in order to prevent loss of life, injuries and property damage. Today's modern information technologies can provide the possibility of developing systems which can timely send warning messages to citizens within a specific area in order to protect them from a crisis event that occurs in a bordered area. The current paper attempts to design a new system model aimed to be utilized for warning citizens outside e.g. a banking house about criminal activity in the inner part, within a target area, and prevent them from entering inside. The core of the proposed early-warning system is the RADIO-HELP system enriched by an algorithmic message encryption/decryption process. Combination of these methodologies forms the proposed contribution. People inside the building shall receive by the Police Operational Center encrypted message so that no panic situation will occur and no escape effort will be made by criminals; on the other hand citizens outside the building shall receive clear decrypted message. If the message is encrypted or decrypted is dependent on the geographic definition of the target area. The fact that the message will be decrypted in the relevant locality is dependent on the geographical definition of the target area.

KEY WORDS

Broadcasting; decryption; emergency; encryption; information; RADIO-HELP.

INTRODUCTION

The transmission of relevant information during emergencies, crises and disasters to demanded places has been always considered to be an important task. However, in today's "modern world", where the development of information technology is rapid, multiple advanced technical resources that can assist in the early and timely distribution of critical and important information to desired locations exist. But, as it turned out in the recent past, the transmission of necessary and sometimes vital information in crisis situations (floods in the Czech Republic in 2013, leakage of hazardous sludge from the aluminum processing plant in western Hungary in October 2010, etc.) was not always effective or failed completely (Fire Rescue Service of CR, 2013) (BBC, 2010).

Emergency can be defined as an event or situation that is in a certain environment caused by natural disasters, accidents, criminal activity, threats to critical infrastructure, disease, threats to internal security and economy (Coombs, 2010). Examples of emergencies are fires, floods, storms, traffic accidents, plane crash and threats against public safety as a result of criminal and terrorist events and so on.

As a consequence, the question is how could we effectively use available technology to ensure that in case of an emergency or crisis situation, important information will be delivered to concerned

recipients on time, in an understandable form and moreover only to locations where the concrete message will be useful.

The aim of this paper is to outline possible methods of distributing information in emergency situations that, additionally, require data encryption, so that they are readable only in a certain location/position. Safety support during criminal activity or terrorist attacks is one of the areas where coding of information based on the position of the receiver could be extremely useful.

The rest of the paper is structured as follows: The starting point of the proposed solution is a model situation that is described in the Section II-A. Section II-B mentions the basic system requirements. Section III-A gives information about RADIO-HELP system (Skrbek, 2009), which constitutes the basic building block for the design of a system for distributing positionally encrypted information. Section III-B provides basic attributes of the encrypted positional broadcasting. Details about model of the message transmitting procedure are given in Section IV. The paper closes with a summary in Section V.

1. MODEL SITUATION AND BASIC REQUIREMENTS

1.1. MODEL SITUATION

A wanted criminal is spotted at a certain banking house. The Czech Police coordinates the measures needed to be taken in order to secure safety within the bank. Moreover, a critical police task is to warn the citizens, who are approaching the given bank and advise them to avoid the area. Therefore, it is necessary to define the message target area with regard to the bank, so that only people located outside the defined region will obtain the broadcasted police warning. As the flow of information within the center is coordinated by the police, the possibility of confusing the bank visitors inside the center with a transmitted message aimed for another group must be eliminated, because this could cause a panic. It is also important that messages distributed through this information channel will be kept secret for criminals.

A graphical representation of a model situation is shown in Fig. 1. The area where it should be received decrypted message (clear warning message) is marked as a Zone A. Area of banking house and Zone B circle are areas for which the message is encrypted. The location of an armed criminal is marked in Fig. 1 with black color.

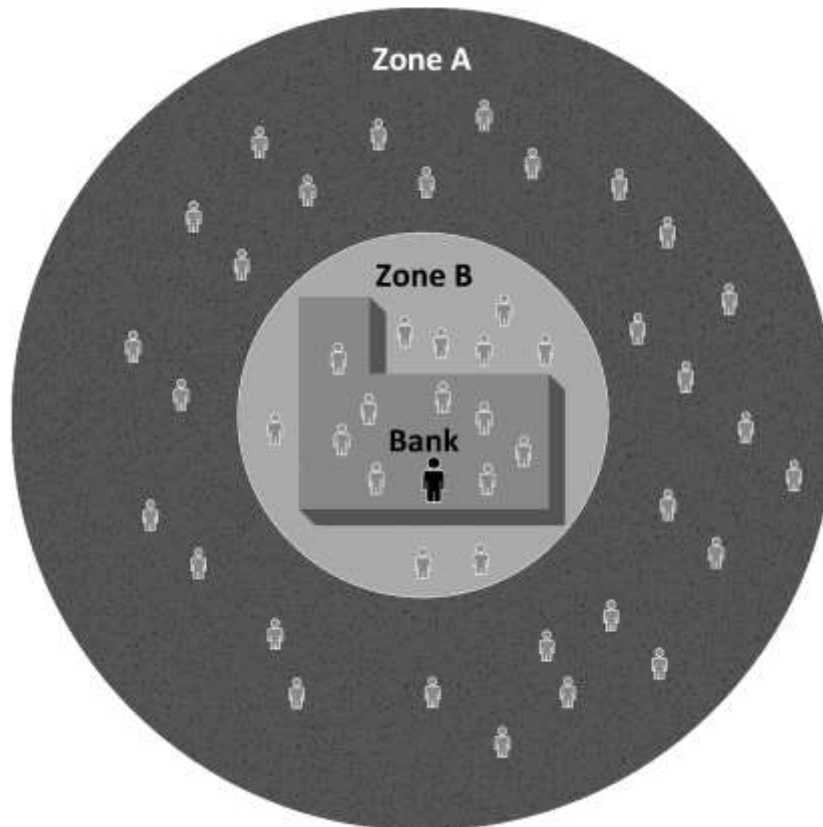


Figure 2 - Graphical representation of a model situation

1.2. SYSTEM REQUIREMENTS

The idea of a transmitting encrypted information based on the position, does not aim to develop a completely new system, but to use existing technology components and solutions that will, however, be integrated to new functional units.

The basic requirements are the following:

- Information must be available to everyone (citizens, visitors, etc.) who is inside the target area,
- The ability to encrypt information, based on geographic definition of the target area,
- Independence of the functionality of mobile networks and the Internet,
- The information provider must be a reputable source,
- Security and robustness of the system against abuse,
- The possibility of ongoing testing and verification of functionality.

2. TECHNICAL ATTRIBUTES OF THE ENCRYPTED POSITIONAL BROADCASTING

The basis of the proposed system for encrypted positional broadcasting is the use of system called RADIO-HELP (Skrbek, 2011).

The aim of the current research team is to create a modern and innovative early warning system that will inform citizens that a crisis event due to e.g. criminal activity takes place within a specific area.

More precisely, the currently described methodology will be based on the combination of two tested scientific tools. The first tool is the RADIO – HELP system, an innovative message broadcasting instrument that utilizes superposition of codes for forced receiving of radiobroadcasting signal.

The second tool that will be utilized as an additive feature to the above mentioned technology, with the ambition to result in the formulation of a modern and innovative application, is the position based encryption/decryption algorithm. The location based encryption algorithmic procedure is also delineated and utilized by multiple researchers who have already developed and tested its functionality on mobile users.

Scott and Dening et al. (2003) proposed a data encryption suggested a data encryption algorithm by using the GPS called Geo-Encryption, the functionality of which is based on the traditional encryption system and communication protocol. For the sender the encryption was encrypted according to the PVT (Position, Velocity, Time) of the receiver.

Futhermore, Liao et al. (2008) introduced and proposed the Location – Dependent Data Encryption Algorithm (LDEA). The position based encryption concept is also inspired from a similar approach called Location Based Services (LBS), the importance of which is underlined and thoroughly analyzed by Mohopatra and Suma (2005).

Location Based Services are classified in four categories (Mohaparta, 2005):

- Emergency service
- Information service
- Tracking service
- Entertainment Service

Taking into consideration the emergency and information service categories and also the target operation of the functionality defined by the present work, it can be realized that a prospective encryption algorithm dependent on the position of the mobile user will be derived from existing similar algorithmic approaches in order to extend the RADIO-HELP functionality and ameliorate the prevention of criminal actions within a target area.

2.1. DESCRIPTION OF RADIO-HELP SYSTEM

Detailed principle of RADIO-HELP system is described in (Skrbek, 2009) under the working title RADIO-H (RADIO-HELP). It is based on simultaneous application of analogue broadcasting technology with superposition of digital content (HD RADIO or DRM) or full-digital broadcasts with the possibility of defining the positional coordinates via GPS (Skrbek, 2011). HD Radio technology (designed by iBiquity Digital Corporation) was selected in 2002 in the U.S. as a key technology for the digitization of radio broadcasting. Currently, this technology carries a large percentage of U.S. radio stations.

HD Radio technology uses the principle of superposition of the digital signal to analogue signal. The transmitted relation of Radio-Help uses positional codes for identifying areas of compulsory income, i.e., where the broadcast is directed. The receiver in the area is maintained in a standby mode and captured broadcast on fixed rate compares its position according to GPS coordinates with areas included in the broadcast. If there is compliance, it activates forced broadcast reception session. After the broadcasting code ends, the receiver switches itself into the standby mode again. Subscribers of RADIO-HELP that are outside the defined zone will not be disturbed by warning broadcast sessions.

This principle implies that it is possible to transmit separate sessions to more areas simultaneously. Long wave radio transmitters, which with new higher quality broadcasting channels gradually lose their utility, could be used for the broadcast. In such a case, it would suffice to cover the whole Czech Republic just by one central long wave radio sender with a superposed digital channels (Kubát, 2012).

Due to the development of IT where circuits for terrestrial broadcasting and positioning GPS are now equipped with most new mobile phones, it should not be technically demanding to use it for purposes of positionally based broadcasting.

BASIC ATTRIBUTES OF THE ENCRYPTED POSITIONAL BROADCASTING

The concept of the proposed model relies on the early warning broadcasted messages to citizens within and outside a defined area, where criminals and suspects are spotted by the police, and police actions against the latter is about to take place. The core characteristic of the transmitted messages is that they must be based on position. As a consequence, the data sent inside the defined area where criminals are found in the certain moment, will differ from the data content which will refer to the people who are at that time outside this area. In other words, the broadcasted warning message has to be sent as encrypted (i.e., ciphertext) when it is addressed to the citizens inside the target area and as plaintext or decrypted in the case that it is addressed to the people found outside the same area.

It can be, thus, realized that the algorithmic approach which is related to the encryption/decryption procedure of the early warning messages is comprised of the following steps: a) encryption of the broadcasted message and b) decryption of the message when i.e. the mobile user is found outside the region.

Multiple message encryption/decryption algorithmic approaches exist, such as the symmetric, asymmetric, hybrid and GeoEncryption (Scott, 2003). This paper presents the GeoEncryption algorithm, since it is an approach that takes into consideration the location of receiver, which is core characteristic of the desired system. However, the final algorithmic encryption strategy, which will be added to RADIO-HELP system in order to formulate the target contribution, will be decided in future part of the research.

The aforementioned area can be a shopping center, a bank, a park, a hospital, a public organization or even a square. When police receives information about the presence of a criminal in a banking house the immediate action that should be taken according to our proposed model, in order to protect the lives of citizens and succeed in eliminating the danger to which they could be exposed, is comprised of the below described procedure.

MODEL OF THE MESSAGE TRANSMITTING PROCEDURE

The final critical step of the system's conceptual construction was the flow specification of the broadcasting process of the so called early warning messages. As soon as the criminal's presence (i.e., in a bank) is realized by the Police, there will be an immediate broadcast of a warning message to the citizens who are at that moment inside the area (center) and at the same time for those citizens who are outside the area so that they will not attempt to visit the defined space. In the second case, the message is characterized as the early warning protection message. The model's flow with regard to the early warning message transmission is depicted in Fig. 2. The transmission procedure is initiated by Message encryption. The warning text message is formulated and then encrypted.

The encryption is based on the definition of the target space of the warning message as well as the area for which the message is encrypted with a special algorithm based on GPS coordinates related to this area.

The next step of the process is the transition of the encrypted message from the Police Operation Center to a special transmitter. If the transmitter doesn't reject the incoming message due to a technical problem, the same message will be sent at once to civilians' mobiles, radios, car radios and other possible devices in a form of text. For the user group placed inside the target area the broadcasted message, due to encryption, will be displayed as advertising text so that it will not be understood by criminals as warning message from the Police. Moreover, this form of text will help the police take action without the cause of panic to citizens. Panic situation will be avoided since this group of end users will obtain the same encrypted message in the form of advertisement.

However, the message will be also addressed to a second group of people outside the defined area. In this case it will be decrypted and displayed in its original form as a clear warning text. As a result the second group will be successfully and timely informed of the forthcoming danger and will avoid the specific area.

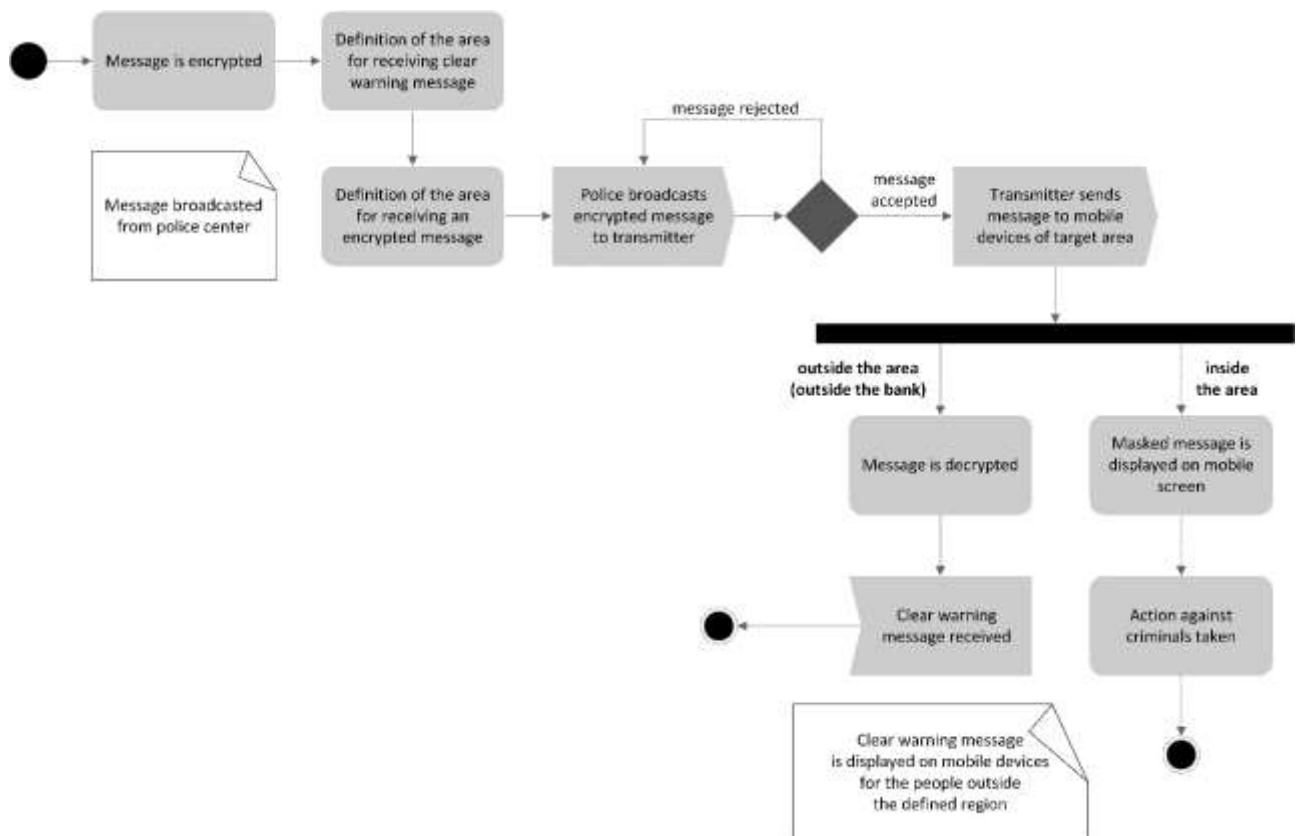


Figure 3 - Activity Diagram of the Early Warning Message Transmission Model

SUMMARY

Positionally encrypted broadcasting system should be a future additional element to the existing concept of RADIO-HELP system, which will extend its functionality.

Throughout the creation of the model among the core issues that were discussed as possible obstacles of the execution of the process in practice and during real crisis situation, were the following: a) the limit or border between the region inside and outside the target area and its definition, b) the type of the message sent to people inside the area (encrypted) and outside the area (decrypted), since the message will be received by criminals as well and will try to escape, c) algorithmic encryption/decryption methodologies and finally, d) the technology utilized regarding the data transmission (medium of transition – transmitter, receiving devices, etc.).

The above stated topics are considered to be indispensable parts of the new functionality. In this way the combination of RADIO-HELP system and a location based encryption algorithm will formulate an innovative and useful scientific contribution in the area of location based emergency and information services.

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ALTERNATIVE WAYS OF EARLY WARNING IN TRAFFIC USING MOBILE DEVICES

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ABSTRACT

Early warning systems are an important part of traffic safety. This paper compares and analyses the current systems, evaluates them and proposed a new solution consisting partly of already published solution and from a new method using social GPS applications. There should be financial savings as well. These savings are a subject of further research.

KEY WORDS

E-call, crashes, warning, information, Radio-Help, WAZE.

INTRODUCTION

In the previous paper (Kubát, 2012), an improvement of current distribution of information in case of a traffic accident was proposed by our team. This paper endeavours to improve the already proposed solution. The extension is based on using a social GPS application which already works and helps drivers. But it works separately and independently on a NTIC (National Traffic Information Centre) (NTIC, 2013) and this paper outlines how it could be implemented into the already described system.

CURRENTLY USED TELEMATIC METHODS

Currently the information about an accident or a problem has to be reported by a driver or a witness of the accident. It means a phone call to the emergency line 112. This report is then transferred to the NTIC. From NTIC it is distributed via following information channels: variable information boards, RDS-TMC and voice relations on some radio stations. Disadvantages of those particular methods were in detail discussed in previous paper. (Kubát, 2012) It can be briefly stated that the most important negative characteristics include the maintenance of variable information boards, the inability to work in bad weather conditions (heavy rain, blizzard, foggy weather and finally the delay which always appears. RDS-TMC and voice relations on radio stations can be missed by drivers.

There are some problems on the input as well. Today the information about a traffic accident is reported verbally to the emergency operations centres via mobile phones, either by those involved in accidents or their witnesses. However, this is associated with problems when attempting to better understand the given situation and determining adequate intervention (the exact position and direction of the vehicle, the scope of damage, elimination of repeated reports of the same accident, etc.). Speed of intervention is a key factor for its success, whereby any possible delays influence negatively the outcome of the entire rescue operation.

SHORT RANGE PLANNED METHOD (ECALL)

Project co-funded by the European Union aims to the creation of a system that enables automated reporting on accidents to the European-wide emergency line 112, including accurate information about its location. When the eCall device installed in a car detects an accident by means of sensors, it automatically sends a message to the nearest emergency centre, indicating the exact geographical location of the accident as well as other data. This system can be activated either manually by pressing a button on the dashboard by the vehicle passengers or automatically by the vehicle sensors triggered during an accident. After the system is activated, a connection with the nearest emergency call centre (PSAP) is established transmitting both sound and data flows. The sound connection enables vehicle passengers to communicate with professionally trained call operators while at the same time data channels are used to transmit data messages (MSD) to these operators. Each message contains 43 details about the accident, such as time, exact location, car identification, eCall system status (whether the eCall was activated manually or automatically) and information about possible service providers. Based on this information, the operator will liaise with the integrated emergency services to direct them to the exact accident location as well as provide them with an exact description of the accident's severity and the number of injured. (Vávra, J., 2010)

A manual use of the system can be useful when a traffic accident is witnessed (European Commission, 2010). eCall systems should be installed in all new cars, at the latest, by 2015 and possibly also installed in older cars.

Although this system brings a clear improvement of the current situation in terms of saving lives and providing quick health care during accidents, it does not provide a solution for distributing information about the accident to the drivers approaching the place of accident, i.e. who are potentially at danger. When using existing information channels, the acquired accident data could be made available in about 5-10 minutes via motorway information boards, RDS-TMC messaging and radio travel news. However, each of these distribution channels has specific limitations and based on current traffic density the above-mentioned reporting times are clearly insufficient. The next disadvantage is a fact, that according to the system specification, it cannot locate the car before the emergency message is activated. It means that after activating the message, the system starts searching for satellites therefore a delay is inevitable.

SZSTEM FOR AUTOMATED FOREWARNING OF VEHICLE CRASHES

For better and particularly early distribution of warning information, a system called System for Automated Forewarning of Vehicle Crashes (the System) (Kubát, 2012) can provide remarkable help. This system has a data connection to the receiver systems-vehicle emergency call (e.g. eCall). The principle consists of full automation of generation and transmission of all relevant information about the accident to vehicles moving in its vicinity. The process of warning is initiated by the crashed vehicle, which will send information about the accident using eCall immediately after the collision happens together with the exact location of the accident. Information is received by the central office of the System which immediately generates data and / or voice information about the incident, including the positional code of the accident. Data will be sent via radio session and to car receivers as well. (Brunclík, 2010)

System receivers (mobile phones, navigation devices) must be equipped with a positional code comparator of an accident positional data generated by the positioning system receiver. If the comparator evaluates that the position code of an accident coincides with position code of the receiver and vehicle movement will be evaluated as being directed to the scene of the accident, it will be forced to activate the data reception and / or voice session. In practice, we may be able to automatically inform road users according to their current position and direction of the danger which is coming, almost immediately.

The transmitted relation of Radio-Help uses positional codes for identifying areas of compulsory data reception i.e. where the broadcast is directed. The receiver in the area is maintained in standby mode and capture broadcast on a fixed frequency. Then it compares its position according to GPS

coordinates with areas included in the broadcast. If there is an agreement it activates forced broadcast reception session. After the broadcasting code ends receiver goes into standby mode again. Subscribers of Radio-Help that are outside the defined zone will not be disturbed by warning broadcast sessions.

The described process implies that it is possible to simultaneously transmit separate sessions to more areas. For the broadcast could be used longwave radio transmitters, which are currently in transition to shortwave broadcasts gradually lose its utility. In this case, would suffice to cover the whole CR only one central longwave transmitter.

More detailed information can be found in the previous paper (Kubát, 2012) or under the working title RADIO-H (Radio Help) (Skrbek, 2010, p. 138).

WAZE METHOD

WAZE is a free social GPS application featuring turn-by-turn navigation. It means that the driver is led through every crossroad. WAZE is supported by Android, iPhone, Symbian, Windows Mobile. WAZE differs from traditional GPS navigation software as it is a community-driven application and learns from users' driving times to provide routing and real-time traffic updates. It gathers map data and other information from users who use the service. Additionally, people can report accidents, traffic jams, speed traps, police patrols. It can also update roads, landmarks, house numbers, etc. WAZE was recently purchased by Google. Google claimed that it would not become involved in WAZE activities. But it can be expected that eventually there will be some changes.

WAZE is available for download and use anywhere in the world, but while some countries have a full basemap, other countries still require users to record the roads and edit the maps. Currently WAZE has a complete base map in the United States, Canada, United Kingdom, France, Germany, Italy, Netherlands, Belgium, Israel, South Africa, Ecuador, Chile and Panama.

In addition to turn-by-turn voice navigation, real-time traffic, and other location-specific alerts, WAZE simultaneously sends anonymous information, including users' speed and location, back to its database to improve the service as a whole. This crowd sourcing allows the WAZE community to report navigation and mapping errors and traffic accidents simply by running the app while driving.

According to WAZE, there were 20 million users in June 2012, who were doubled within a 6 month period. Over 3.2 billion miles had been driven by WAZE users.

For the purpose of early warning we will deal only with the alerts. The routing and navigating is not important for this paper. WAZE can be used for warning in both cases – car accidents and traffic problems. It will inform other users the fastest way (compared to previously described methods). On the other hand, it has some disadvantages. A smartphone is necessary (OS: iPhone, Android, Windows Mobile or Blackberry) and a data plan is needed (to eliminate expenses for mobile data). But even with a data plan there are areas with no signal. In case of an accident there is a delay described in next chapter.

A WAZE user has to be disciplined and not distract other users by sending useless messages just for obtaining more points in the WAZE system. Points serve for progress in WAZE user hierarchy. During the report of an event a driver is distracted too.

WAZE does not get information only from its users but from NTIC as well. The reverse flow of information is not possible at the moment. Reports from drivers are verified by other drivers but WAZE is still not reliable information source for NTIC. Of course, even a WAZE user has a duty to report the accident on line 112. In this case the other WAZE users are informed two times.

The idea is to allow information from WAZE report flow into NTIC which would then deal with it like with information from any other source. The data format of the information would have to be standardized. After the standardization the information could be processed flawlessly. It would ensure better awareness on the input. If the information is properly verified it could be processed by the Radio HELP system immediately without causing delay in NTIC. WAZE implementation would take effect

in case of traffic problems that are not life-threatening. In those cases eCall is not activated and drivers are not obliged to inform NTIC about the problem.



Figure 1 - Transmission and acquisition of information in the event of an accident with the use of eCall, Radio Help and WAZE (Author)

COMPARING SEPARATE SEGMENTS OF EACH METHOD

We could divide the entire process into three parts: input, processing data and output. We can group them together and compare their advantages and disadvantages. In case of the traffic problem (not an accident), the eCall based reporting would be omitted. In the following summary good data coverage for WAZE is assumed.

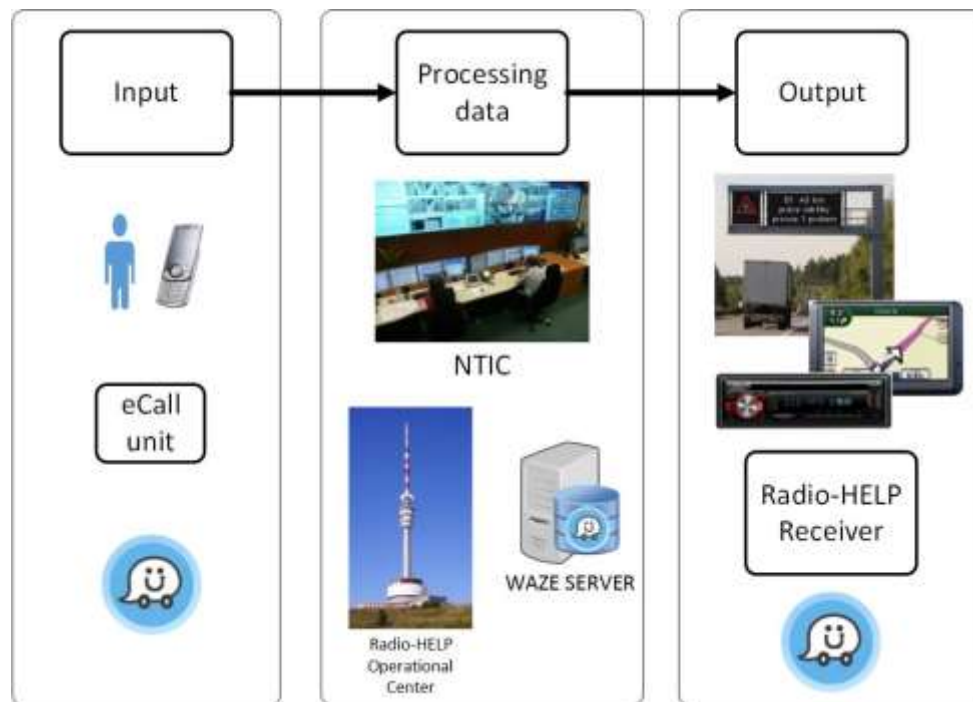


Figure 2 - The system divided into particular segments (Author)

The situations on input can be following:

- A participant or a witness will call emergency line (112) and announces the accident/traffic problem. Then NTIC will have to verify the message by sending police unit or fire department unit to check coordinates of the accident. A disadvantage of this method is an inevitable delay caused by the necessity of verification. The calls could also be compared to other calls. It would request waiting for next people to call the NTIC.
- eCall unit will automatically open a communication canal with an operator in the emergency centre (only in case of an accident). This method is the quickest one but it is switched on only in case of an accident and its implementation is not finished yet.
- WAZE user inputs information about an accident or a problem. After the accident is reported the information is forwarded to other users promptly. Besides disadvantages mentioned earlier there is a delay in special cases like a chain crash. There is no time to input the event so approaching drives have no chance to be informed. Even in usual (not chain) car accident the third driver will be warned (first driver crashes, second driver reports the accident and third driver get a notice).

There is no absolute winner. The best choice consists of combination of all methods.

Data processing:

- NTIC – quick response due to the number of reports. But there is a human factor causing delays.
- Radio-HELP – automated processing, but it requests standard data format on input, which is possible only in case of eCall or WAZE input (or other automated solution).
- WAZE server – no delay, a verification is done by other drivers (WAZE units)

After comparing the fastest input (eCall) and fastest data processing (Radio-HELP and WAZE), it was concluded that a combination of those two methods is not possible. eCall is automatic, but in current circumstances it needs a human worker to process information about an accident. On the contrary, Radio-Help and WAZE methods are processed automatically, but they need a human user to input the event.

Output – message for drivers:

- Output via standard methods (Variable information boards, RDS-TMC...) strongly depends on the quality and speed on previous two segments (input and data processing). There are exceptions (i.e. variable information boards in strong snow-fall) but in general this claim is correct.
- Radio-HELP receiver provides immediate information about the traffic problem. But at the moment it is only in a conceptual stage on which further work has to be done.
- WAZE interface (smartphone) provides voice alert and it is quick as well. Especially for traffic problems without eCall activation.

LEGISLATIVE ISSUES

In the Czech Republic, holding mobile phones while driving is forbidden. But the phone can be placed in a holder so a user doesn't have to hold the device, just to tap on the display. Moreover, mobile phones, tablets and *single-purpose* navigation devices are widespread these days and the difference among those devices is getting smaller and smaller. So if we can't use mobile phones in cars, can we use tablets without a SIM card? If not, where's the difference among those tablets and a dedicated navigation device? Developing the interface that would allow drivers to fully devote to driving would be very helpful. The interface could be based on vibrating on steering wheel, color LED diodes blinking and acoustic signals.

SUMMARY

As a conclusion it can be seen that no one of the above methods is the best. However, it would be useful to incorporate WAZE into NTIC. The verification could be done via three times confirmed report from WAZE users. It would still be faster than sending there police or fire department unit to check it out. Although there are some obstacles, it should be quite simple to incorporate information from WAZE server into NTIC. The question is whether NTIC will be willing to adopt this solution. The broader spreading of smartphones and lower expenses for data plans could make things even easier.

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AGILE BUSINESS OBJECTIVES IN PROJECT MANAGEMENT

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ABSTRACT

Building innovative products, processes and business models requires a new approach to project management as well as in a management in general. This paper shows key business objectives in agile project management.

KEY WORDS

Agile, Project Management, Business Objectives, Innovation, Adaptability.

AGILE PROJECT MANAGEMENT

For decades now, corporations have been changing from a hierarchical approach to project management to being more collaborative as knowledge work has grown in importance. In the center of increased globalization is the need for project managers to have flexibility in a project system in order to be able to adjust constantly to emerging challenges and opportunities. By Fernandez (Fernandez, D.J., 2009), the need to distribute responsibility and initiative in support of adaptation to change is familiar territory to "agile" approaches to projects.

Glen Alleman (Alleman, 2007) describes agile as a "thought process" with the following practices:

1. Think small incremental deliverables
2. Get the customer to have some skin in the game
3. Never have breakage - have continuous quality assurance at every point through assurance process
4. State up front requirements are fluid - build the processes around fluid requirements.

Agile practices in project management grew out of a need to manage projects characterized by complexity and uncertainty with responsiveness and adaptability. When goals and solutions are unclear and there is high volatility, there is particular need for alternative approaches to managing projects.

The effort to accommodate agile project management approaches and learn how to be flexible and adaptable may well be worth the investment for many project managers. This flexibility could be highly advantageous when faced with certain types of projects and project scenarios.

AGILE BUSINESS OBJECTIVES

Building innovative products, processes and business models requires a new approach to project management as well as in a management in general. Regarding Highsmith (Highsmith 2002), there are five key business objectives for a good exploration process:

1. Continuous innovation – to deliver a solution always on current customer requirements
2. Product adaptability – to deliver a solution or a product based on future customer requirements

3. Improved time-to-market – to meet market windows and improve return on investment (ROI)
4. People and process adaptability – to respond rapidly to changes of improved products, variable solutions or a change of the business
5. Reliable results – to support business growth, profitability or an overall market share

CONTINUOUS INNOVATION

The most important research at this field stated, that ultimate customer value is delivered at the point of scale, not the point of plan (Higsmith, 2002). Developing new products and services requires a mindset that fosters innovation.

In other words, requirements must be prioritize through its value to the customer. Value is the only parameter at this point.

PRODUCT ADAPTABILITY

The future will always surprise product management practices. For some products, changes in the market, in the technology field or specific requirements happen even weekly. By McKee (McKee, 1993), the only way to survive is to strive a critical design criterion for a development process. In agile project, technical excellence is measured by both capacity to deliver customer value today and create and adaptable product for tomorrow.

Agile technical practices focus on lowering technical debt – basically improving the ability to adapt – as an integral part of the development process. Project leader should always push to this model and champion it.

The determinants of product adaptability can be summarized in terms of performance criteria and product domain. Performance criteria can be internal (e.g. production efficiency) or external (e.g. market acceptance). Likewise, product domain can be limited to a single product line or a product mix (i.e. multiple product lines).

According Macbeth (Macbeth, 1987), there are four dimensions of product adaptability:

1. Modifiability (the efficiency with which an organization can change research and development, production, or other product-related systems)
2. Compatibility (the efficiency with which an organization can change its product mix).
3. Acceptability (the market approval and reception of a product).
4. Leveragability (the linkage of a product with others in the product mix through common brand names, promotion, and presentation)

IMPROVED TIME-TO-MARKET

As the statistics for rapidly shrinking product development times indicate, reducing delivery schedules to meet market windows continues to be a high priority business goal for managers and executives.

By Highsmith (Highsmith 2002), the iterative nature of the agile project management contributes to improving time-to-market in focus, streamlining, and skill development.

PEOPLE AND PROCESS ADAPTABILITY

To product the innovative products and services, organization must first build adaptable teams. Teams whose members are comfortable with change (Sliger, 2008). Teams, who view change not as an obstacle to resist but as part and parcel of thriving in a dynamic business environment.

Agile project management principles and framework encourage learning and adapting as an integral part of delivering value to the customers.

RELIABLE RESULTS

Production processes are designed to be repeatable, to deliver the same result time after time. Good production processes deliver the anticipated result: for a standard cost, within a given time – as a predictable.

Exploration processes are different. By Highsmith (Highsmith, 2002) a repeatable process is one in which doing the same thing in the same way produces the same results. One that is reliable delivers regardless of the impediments thrown in the way – reliability means constantly adapting to meet a goal.

If the goal of the organization is to deliver a product that meets a known and unchanging specification, the repeatable processes should be designed. However, if the goal of the organization is to deliver a valuable product to a customer within some targeted boundaries, when change and deadlines are significant factors, then reliable agile processes work better.

CONCLUSION

Agility is the ability to both create and respond to change in order to profit (to the organization) in a turbulent business environment.

Creating change disrupts competitors (and the entire market). Creating change requires innovation: developing new products and new services, creating new sales channels, reducing product development time, customizing products for increasingly smaller market segments etc.

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ADDED VALUE OF AGILE METHODS IN STARTUP

INCREASING VALUE BY MODERN SOFTWARE METHODOLOGY

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ABSTRACT:

The following work should briefly outline using of agile methods in current IT environment by developing applications and components for complex support of bank and insurance companies and their web based applications. Very small team of 4 people is challenge to create system by intensive using flexible and adaptive methods to get final result on time support by limited material and human resources. One of distracting determination of the project is that there is no other project which is using financial companies presently developed system data sentences of web services.

KEYWORDS:

Agile methods, Software method development.

1 METHOD INTRODUCTION

“Four guys are standing on a street corner . . .

an American, a Russian, a Chinese man, and an Israeli. . . .

A reporter comes up to the group and says to them:

“Excuse me. . . . What’s your opinion on the meat shortage?”

The American says: What’s a shortage?

The Russian says: What’s meat?

The Chinese man says: What’s an opinion?

The Israeli says: What’s “Excuse me”?” (Leigh, 2006)

There was always a lot to discuss and analyse about Israel success story and especially success story not too far Israel tech-entrepreneur history about which was written few a very well know and appreciated books. Behind this we could find various reasons as Israel mentality, Israel’s business culture as famous Israeli chutzpah and all the different challenges that nation is facing or compulsory army service where assertiveness is the norm.

Although we are aware of that information we could find nowadays a few warning.

“A decade ago, Israel had far the highest density of start-ups in the whole world, and draw up more venture capital than anywhere. Today, the entrepreneurial pace feels more like warmish than hot” (Lagorio, 2011)

This just reminds us awareness and tells us that nothing holds forever and we have to be aware that change is status. Status of the human history. No matter if in politics, software or methodology.

Let us come closer to our concept and take an example in USA market – every year is set up 1 million of a new business. 40% of them finished their activity within one year and within 5 year overall collapsed 80% of them - 800 000. From the 200 000 remaining within next 5 years stops activity also 80% - 160 000. So it means that till 10 years bust-up 96% of initial businesses.

Behind this can be a lot of different reasons but a few of them have bigger weight and also seems to be valid especially for tech-companies. Some of them are worth to highlight. As the one that is close to my forward intentions is “Failure to anticipate or react to competition, technology, or other changes in the marketplace” (Mason,2010). This is the reason that we found in group of critical ones and we try to eliminate it by practically using of agile system methods.

“Agile methodology is an approach to project management, typically used in software development. It helps teams respond to the unpredictability of building software through incremental, iterative work cadences, known as sprints. But before discussing agile methodologies further, it’s best to first turn to the methodology that inspired it: waterfall or traditional sequential development” (Deluca2005).

1.1 SHORT METHOD OVERVIEW

This short overview and list of well-known agile development methods consist of:

Agile Modeling - methodology for building & document of software systems evolution. As software development method it is much more flexible than traditional methods of developments. Software developers aim to cooperate with the users/customer in providing an adequate documentation to maximize stakeholder value.

Agile Unified Process (AUP) – simplified version of the IBM Rational Unified Process (RUP). The AUP applies agile techniques including test driven development (TDD), Agile Modeling & change management, and database adjust to improve overall productivity.

Feature Driven Development (FDD) is an iterative software development process. FDD combines business best practices into a pragmatic complex. These practices are entered into process from a client functionality view. Its main target is to deliver tangible, working software on time.

Scrum is a reciprocate and incremental methodology for software development projects. Scrum contains sets of methods as the "ScrumMaster", who ensures the process is followed, the "Product Owner" who represents the stakeholders and the business the "Development Team" as coders, testers.

Crystal Clear is method applicable for teams up to 8 co-working developers located on systems that are not result-critical. The Crystal methods concentrate on efficiency as part of project safety. Crystal Clear method focuses on people, not processes. This method requires the following - Periodic delivery of practicable code to users, Improvement based on feedback, Detailed communication.

Kanban (development) is a famous method for developing products & processes with a just-in-time delivery manner. It stress on to pull work from a queue, and the process, from definition of a task to its delivery to the customer. Kanban consist from two main parts: process management system that tells what, when and how much to produce. The Kanban method as an approach to innovative process change for organizations.

1.2 WORKFLOW AGILE METHOD EXAMPLE

Workflow management systems are frequently used to control the execution of business processes and to improve their efficiency and productivity. In past, workflow management systems have been applied to almost static environment in which the activities flows is highly predictable. However, today’s business is characterized by ever-changing requirements and unpredictable environments. Existing workflow management systems do not address the needs of the majority of processes and it is widely recognized that more flexibility is needed to overcome these drawback.

Due to this limited flexibility companies have been restricted to quickly respond to changing circumstances and they could not always realize the expected cost savings.

When the workflow system is not able to quick respond to changing circumstances, users are forced to circumvent the system to do their work properly. Bypassing the system results in a lack of efficiency and missing traceability. Additionally, the knowledge needed to complete the work is lost as it is not recorded in the system and therefore cannot be reused efficiently when similar problems arise in the future. The workflow system is getting to be useless.

To eliminate these problems, developers are pushed to create very complex and sophisticated workflow models. So the time to model this workflow is going to be so high that could be more expensive than expected savings. Covering all possible situations in processes could goes to model useless or non-necessary part of workflow.

Applying agile methods of developing software could be solution. In fact it means extending workflow system by case-based models. It allows getting all actual parameters for predefined workflow model.

Extending workflow management with case-based reasoning is motivated by the complementary strengths of rules and cases.

Rules	Cases
General knowledge	Specific knowledge
Work best in well understood, narrow domains that are stable	Work best in poor understood, wide domains that are dynamic
A lot of knowledge is included from the beginning	Only a limited amount of cases available at the begging
System is limited to predefined rules	System adapts itself to a new situation

Table 1 - Rules & Cases of Agile Method

Agile methods tend to create main core workflows instead of modeling complex workflows which are time expensive. These workflows are evaluated in real time by users. And users create new cases and new suggestions. These cases are considered and could become to rules.

1.3 SHORT PROJECT INTRODUCTION

Project is based into few phases and initial one is software application development in insurance & financial area. It should bring on market tool that will be possible to compare wide range of data that are offered by business and also compare historical data. Next phase is linked cooperation with cities put in place a sophisticated process that enables local authorities give citizens car liability insurance immediately.

This article is part of the detailed work which will examine and quantify what was benefit of using agile method for developing this type of application.

2 ACHIEVEMENTS

We took 12 principles from Agile Manifesto and tried to compare them with our approach to get basic direction for project effectiveness and improvement.

“Our highest priority is to satisfy the customer through early and continuous delivery of valuable software” (Buchalceová, 2009).

This is the biggest advantage of project on the one hand and also the biggest disadvantage on the other. As we enter the market with new vision which consist from new features and design of the front end solution. Also other part of the project outside of IT part like promotion and marketing consist from innovative but unproved methods.

“Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage” (Buchalcevoa, 2009).

Another also critical point of project because of conditions in this area - global market based on concurrent changes and turbulent environment where faster one is usually better one.

“Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale” (Buchalcevoa, 2009).

One of assumptions which in time was transform to fundamental requirement. As you enter new problem which you need to cover in your solution you become aware of that continuous pre-testing of components of your system is priceless and have a huge impact on final success or failure.

“Business people and developers must work together daily throughout the project” (Buchalcevoa, 2009).

By home office every day video conference through Skype with IT members of project and twice a week working in office is almost necessary condition.

“Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done” (Buchalcevoa, 2009).

The best motivation of individuals is to make them part of project.

“The most efficient and effective method of conveying information to and within a development team is face-to-face conversation” (Buchalcevoa, 2009).

This was already mentioned as one of the most critical conditions in development whole project and not only team conveying information. This type of process work needs information and views sharing and cooperation as much as possible. There can be easily seen synergy effects by sharing knowledge. Working on one place in a small group of people brings also higher effectiveness as they usually unconsciously motivate themselves.

“Working software is the primary measure of progress” (Buchalcevoa, 2009).

This measure is important and also not difficult to put in place for a small team and for mid-end ambitious software. This is in-line with partial testing of software components.

“Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely” (Buchalcevoa, 2009).

This can be real challenge to hold the pace of the beginning enthusiasm issue during whole projects

“The best architectures, requirements, and designsemerge from self-organizing teams” (Buchalcevoa, 2009).

This findings would possibly be true as this is basic of our ideas how to be ahead of competitors a bring added value to customers and market. But we have to pay attention that this concept also brings potential risks as is given big expectations from each individual and there is also a large dependence on every one in team. Therefore is necessary although it is in conflict with pure agile methods to have at least partial documentation and back up for major members of team especially for core coders.

“At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly” (Buchalcevoa, 2009).

As the part of whole process there is always space for progress make product more effective, extend range of services using learning approach.

2.1 PROJECT DIRECTION

As the most suitable for the fast development and effectiveness in project was naturally chosen method FDD described as “enable and enforce the repeatable delivery of working software in a timely manner with highly accurate and meaningful information to all key roles inside and outside a project”^[4]. Reasons were simplicity; focus on deliverables and measurable milestones.

2.2 USING DYNAMIC METHOD

This is an example of written code for a new financial functionality which will be on of assets of the project.

```
//set source code replacements
string className = "Class_" + Guid.NewGuid().ToString("N");
string methodName = "Method_" + Guid.NewGuid().ToString("N");
string returnType = returnType.FullName;
Type genericType = returnType.GetGenericTypeDefinition();

//check for generic type for return
```

CONCLUSIONS

Developing finance application in a small team it became logical to use some of agile methods to help us with large number of data, different features and project big breadth itself. Naturally as the most proper agile method for using in our project came to be FDD Feature Driven Development. On a regular basic we implement application features usually once in 2 weeks and every implemented feature we submit for testing. Among advantages belongs changing scope and list of project features what can easily processed using this system. By correct using of agile method we hope to bring to market product with unique list of features based on stable platform which will need low level of services and most of processes can be automatized. Also we expect much easier promotion and marketing of product with wide range of services for customer.

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EXTENDED ABSTRACT

This paper should be a part work which will outline of using agile methods in current IT environment by developing applications and components for complex support of bank and insurance companies and their web based applications. As a future step there should be also continuance in keeping project on track by using agile methods. Quantification of effects and final work conclusion should consist from technical part as economic values and compared rations and also should try to show benefits and

added value which cannot be measurable; e.g. easier communication or information access. Also very interesting is area of assessing and describing possibilities of cooperation state government with entrepreneurs on low levels which will be described in later phases of project. Project is unique by aspiration of bringing something new on the market focuses on added value for customer. Currently there is no other application using system data sentences of web services and in use by financial companies in Czech. As the project is quite wide, team quite small with limited resources passing different traps it could be easily jeopardized. We will see. Maybe is waiting something interesting in future what will makes to feel proud of great progress. And maybe not. I'm optimistic.

HOW CZECH COMPANIES COMPLY WITH FACEBOOK'S RULES

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ABSTRACT

Facebook is the largest social network with over a billion users, making it world's biggest database. In the Czech Republic there are more than 3 million users of Facebook, roughly 61% of Internet users in the country (Facebook, 2012). The number of users is constantly increasing and various companies try to take advantage of that situation seeking possibility of aiming advertising on a specifics (age, education, social background). Facebook implies a specific set of rules, which should be obeyed by the companies, to use this unique and partially free possibility of promotion. The paper summarizes what are the rules on Facebook and how do companies in the Czech Republic comply with them.

The paper will start with an analysis why it is important and attractive for companies to be present on Facebook. The paper contains the rules of Facebook related to the management of corporate websites and their use. These rules seem to be prepared for the users of the network, but at first Facebook does it for itself interest of observing the users. The theoretical part is followed by research, where a sample of companies was chosen, in which I tested compliance with the aforementioned rules. Examined are companies in terms of abuse and type of errors that occur most frequently. At the final part of the research paper are described some of the businesses that violate Facebook rules. They are divided into three groups in order to their size and compared their behavior in the network with the rules mostly violated. The conclusion is that the big companies are not breaking the rules of Facebook as the smaller and midsize companies do. The reasons could be economic, ethic and technical. Smaller companies look for the cheapest way to attract more customers and choose more aggressive campaigns.

KEY WORDS

Facebook, Facebook's rules.

PREFACE

Number of business profiles on social networks is growing significantly. A lot of companies whose business has nothing to do with technologies are reaching the Social networks nowadays. They do not know how to work with the network and trying to get the maximum profit. This situation causes the inappropriate use of e.g. Facebook and violating the rules, bending them etc. The possible fine is elimination the profile.

The article is focused on companies from different sectors in the Czech Republic that are present on Facebook. In order to determine whether they comply with or violate the rules of Facebook.

INTRODUCTION TO FACEBOOK RULES

Facebook is a service strictly constrained of a range of binding documents that define the rules of using for the use of personal and corporate needs. We can of course ignore them, but if the company wants to run a long-term business on Facebook, it would be better to know what is permitted and what is prohibited.

ADVANTAGES AND DISADVANTAGES OF SOCIAL NETWORKING

People are not used to communicate with each other that much in person, but rather on social networks like Facebook, Twitter, LinkedIn etc. The companies are therefore focusing on potential customers in their “natural habitat.” (Vance, 2012)

The aim of a company is to spread information among as many users as possible. An average person on Facebook has over 345 people in their friends list (Böhmová, Malinová, 2013), lot of people even few times more. It would be very difficult to get in touch with these people so easily without a social network. That means, the company can influence more potential customer through one person on a social network than in real life.

Facebook rules limit the way, how people, by filling out their profiles give away information for statistical research and are actually letting companies aim their advertising on a specific user, based on age, location, hobbies, social group etc.

Another advantage shows following research conducted by Nielsen, an American global information and measurement company. It states that 90% of consumers do “completely” or “somewhat” trust recommendations from their friends. Furthermore 70% trust companies’ websites and another 70% reviews from other clients the most. (Nielsen Report, 2012) Facebook provides potential customers with all of this and holds a hand full of aces therefore.

In the case that you place on your corporate site Facebook plugin, you show that your company keeps up with the times. Company profile can be used to the further promotions such PPC campaign on Facebook. In addition, you can use various viral and social applications.

If we mention disadvantages, we could name the necessity of regular updates, so fans don’t lose interest, the possibility of even bad references, which are contra productive and the obligation of companies to obey specific rules. The page must be actively organized. The company should be putting the statuses, news and communicate with customers. In the Facebook is not permitted everything. It is very useful to know the rules, otherwise the company can lose its page.

GENERAL RULES ON FACEBOOK

The basic document describing what is allowed and what is not, is the Statement of Rights and Responsibilities. (Facebook, 2012) The most important rules that the document discusses are following:

Starting with rules for personal account. A person, who wishes to create a Facebook account, must be aware of the fact that he/she is directly responsible for everything posted by him/her on Facebook. The user also must agree with waiving copyrights to whatever they should upload on Facebook. There is also a specific set of rules designed to make Facebook a place, where no harassment is present and the danger is minimized.

From those above mentioned areas, specific rules for companies are derived.

These rules include (Facebook, 2012):

1. Spam shall be avoided at all times.
2. You shall not collect data about other users or use software, which has the power to do that without asking permission from Facebook in advance.
3. You shall not initiate activities that could be considered to be a pyramid scheme.
4. You shall not spread harmful software or viruses.
5. You shall not try to access accounts that belong to another users.
6. You shall not harass or blackmail other users.
7. You shall not post hate updates, pornographic content, content showing or encouraging violence etc.
8. You shall not create pages, advertising alcohol or adult content without proper age restrictions.

9. You shall not use Facebook for actions in conflict with the law.

10. You shall not break this set of rules or encourage someone to do so.

The user also has to follow a different set of rules, dealing with rights of other people, using Facebook's symbols protected with copyright or when creating applications for Facebook.

The main problem is that Facebook can change or adjust rules any time and the users or companies have to check the web page of rules on Facebook frequently.

PRACTICAL APPROACH

In the practical parts focused on, whether companies in the Czech Republic comply with rules set by Facebook and whether there is any correlation between the size of the companies and their behavior.

The companies are divided in three groups, as mentioned above, large, small and middle-sized. There are 100 companies in each group. The companies are from different sectors of an economy. I observed each company and focused on its Facebook behavior. The companies were selected randomly only by size. Students collected the data during the preparation of the semestral paper in the period of April-May 2013. The behavior of the companies was divided into four groups due to the characteristic of the rule violation:

1. Applications and Software - malware, functional hyperlinks.
2. Ethics -sexual topics, inappropriate content, incorrect grammar, third part advertising, prohibited offering of discount vouchers.
3. Narcotic drugs - tobacco, drugs, alcohol (in some countries completely prohibited, in others strictly regulated the information about these items, especially about their positive influence on people etc.)
4. Company page management - name, profile picture, name should reflect its website content, page names must not only be of general concepts (Restaurant) Publication of the contest, contacting the winners of contest.

RESULT OF RESEARCH

Each company from the research was investigated from the perspective of the violations made. There wasn't counted the accumulation of the violations in each group. The companies that are understood as violators of the Facebook rules, behaved incorrectly at least in one item of one group. The number of the companies that didn't break any rule established by Facebook is higher than 50% in all sizes of the companies. The biggest companies behave more correctly, than the other two groups of companies. Almost 70% do not violate the Facebook rules. More details you can see in table 1.

The size of the company due to a number of employees	Number of companies	Number of companies which do not break the rules of Facebook in %
Small company - less than 100	100	35%
Midsized company - 100 to 499	100	52%
Big company - more than 500	100	69%

Table 1 - Number of companies which do not break the rules of Facebook in % (Author, 2013)

The explanation of that situation could be following: Big, well-established companies do not act so aggressively, because Facebook for them is not the only a place for promoting their products. They have a wide range of possibilities for offering their products, informing about new deals and staying in contact with the clients. They are able to make big advertisements in newspapers, radios, TVs and

internet. Their webpages are frequently visited and well-known. In respect of all the possibilities that a big company has, it is not necessary for it to take a risk of behaving incorrectly in Facebook. Firstly, violation can cause blocking of their page or deleting the profile. Aggressive acting could attract some new clients, but it will not equilibrate the problems caused by blocking the profile. Finally, many companies are proud of their image that could be negatively influenced if the company breaks the rules.

On the other hand small and midsize companies act actively in Facebook, sometimes crossing the border of the rules, because the balance of the risk and benefit for them is not so negative. Of course, depends on each company, but in general, Facebook is for smaller companies cheap or even free way for attracting new clients. Creating contests is one of the best ways of widening their clients' database and at the same time making their brand better known. The risk of being blocked is high, but there is not a big problem to create a similar profile and continue with the violative behavior. Many small companies are not as aggressive as described. From time to time they break the rule, but the reasons are usually the same.

The correlation of being small, midsize or big company is not significant, but it is evident. Focusing in more detailed way, the companies are most frequently violating the rules of organizing contests, using letters in profile photos or presenting offers of the third parties.

Areas of rules	Companies that violate stated area of rules		
	Small companies	Midsize companies	Big companies
Applications and Software	10%	4%	1%
Ethics	42%	38%	18%
Narcotic drugs	9%	3%	8%
Company page management	38%	22%	18%

Table 2 - Companies that violate stated area of rules by size (Author, 2013)

From the table 3 is evident that promoting the third parties is most violated point from this group. It is the most violated item for midsize companies and big companies. Investigating the small companies we find out that there was this point one of the most violated accompanied with Offering the discount vouchers and Incorrect grammar.

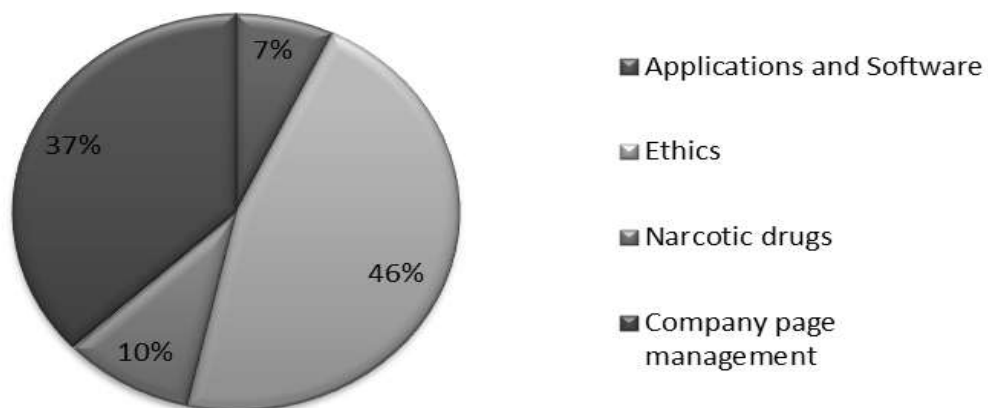
Their analysis resulted in following findings:

Areas of rules	Companies that violate stated area of rules		
	Small companies	Midsize companies	Big companies
Ethics	42	38	18
Sexual topics	7	4	1
Inappropriate content	9	6	2
Incorrect grammar	18	12	4
Promoting third parties	19	20	14
Offering the discount vouchers	25	14	6

Table 3 - Companies that violate Ethics (Author, 2013)

Here is the fact that direct correlation between the size of the company and errors does exist. The bigger the company is, the more it complies with rules.

Percentage of errors by category



Graph 1 - Percentage of errors by category (Author, 2013)

The graph 1 shows the comparison of four analysed groups no matter the size of the companies. It is possible to observe that the most frequently are violated the ethics rules. The second most problematic is the area of Company page management. On the other hand the areas that are not violated much are: Narcotic drugs, Applications and software. The reason why drugs are not the less used is that this group includes alcohol and tobacco, which are sometimes promoted illegally especially by the smallest companies. Ethics is the most violative group because includes the most attractive rules for the companies to be violated such as promoting third parties or offering discount vouchers.

CONCLUSION

Facebook phenomenon continues to grow on the volume of users and even corporate profiles. This trend is likely to continue in the nearest future. Facebook is moving huge amounts of current and potential customers. It is therefore not possible to ignore this trend. Using a suitable communication on the corporate profile, companies can build relationships with existing customers and job seekers.

The study was designed to examine a sample of companies in the Czech Republic that are present on Facebook. The main objective was to determine whether they violate some rules and in which way.

With the help of theoretical bases was possible to create 4 groups. The groups were: Company page management, Ethics, Tobacco, alcohol and drugs, Applications and Software. Each group contained from three to six items of incorrect behavior. In total 300 corporate profiles of a wide variety of companies from different areas of the society were investigated. The behavior of the companies in Facebook was monitored. The results have shown us some interesting points. Firstly, narrow majority of the companies behave correctly in Facebook, that means, they didn't break any rule. The most correct group of companies (from the point of view on size) were the biggest companies with more than 500 employees. On the other hand, the biggest violators of the rules are the smallest companies from the range. The biggest the company is the less it breaks the rules. The reasons for being correct are: well established mark, threat of bad influence on the reputation of the company. The reasons of not being correct are: necessity of promoting itself no matter how, effort to spend less money. The most violated items from the research were: Illegal contests and informing about third parties.

I conclude that majority of the businesses behave correctly in Facebook and respect the rule established by Facebook. But there is a significant number of the companies that violate the regulations. Violators are mostly small and midsize companies. The number of the companies breaking the rules is so significant which leads to two important issues. First, the rules aren't sufficiently enforced by Facebook. If yes, there wouldn't be as high percentage of violating companies. Second, some rules are not may be necessary for the fluent functionality of Facebook. For example correct grammar is not a big problem. It does not affect anybody in a bad way. If the company is grammatically incorrect in its posts etc. customers will refuse that point and would be judges of the situation.

The most important information is that Facebook creates the rules for itself at first. For observing the people, progressing the network, understanding the needs and maybe some other hidden reasons. In general the companies in their majority respect the rules and comply with them.

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SYSTEMS THINKING IN PROJECT MANAGEMENT FROM THE POINT OF VIEW OF A PRACTITIONER

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ABSTRACT

Each project is faced with problems, whether arising objectively or subjectively. The cause of the problem suggests that the ideal state in the implementation of a project has not been achieved. This paper is a discussion of systems thinking and systems approach in the project management. We discuss the implications of the utilization of these thought processes, impacts of the project and opportunities for improvement.

KEY WORDS

Systems thinking, systems approach, project management, training, project management methods, failure of systems thinking.

INTRODUCTION

We know from experience that every project faces challenges, whether arising objectively (by changing the environment or circumstances) or subjectively (errors requesters and processors) and the cause of the problem suggests that the ideal state in the implementation of a project has not and probably will not be achieved.

Naturally, in the mantra of every project that was conceived and developed systematically, the emphasis is on the principles of systems thinking and systems approach. Does this mean that the systems approach does not work, respectively, or is abusive? This is certainly not the only human thinking that is not perfect and we will never know in advance the perfect development environment. This does not mean that you can not identify errors / weaknesses in the systems approach. The least we can do is reflect and look for ways to get them the next time, to avoid or mitigate.

WHAT THEORY SAYS – THEORETICAL BACKGROUND

In the introduction it is possible to cite the classics of systems approach with us, "In a systematic approach we consider a way of thinking, a way of solving problems or course of action, in which phenomena are understood comprehensively in its internal and external relationships." (J.Habr-J.Vepřek: 1986)

Systems thinking tries to capture the relationships that affect the partial or total result. As a basic thought process of systems thinking includes (Farková, 2006):

- Analysis - mind complex distribution units (facts) to a simpler
- Synthesis - mind unification of two or more parts into a whole

- Reconciliation - thought determining the extent of similarities or differences in terms of specific character
- Abstraction - the thought process that separates general and essential features
- Categorization - rational classification of objects and phenomena into mental categories according to their mutual similarities
- Generalization (generalization) - mind capturing several specific properties of objects in a category that, based on the intellectual connection assign all objects a category
- Induction - method of reasoning from specific cases to general law
- Deductions - the process of reasoning in which the predicted is concluded as arising from these assumptions, the inference is clear not only likely
- Analogy - way of reasoning based on similarities to other phenomena or objects
- Depth - recording the essential context and relationships
- Width (give substance) - versatile and rich knowledge, ability to solve problems considering all the relationships and connections.

Their use in rational combination fulfills the principles of systems approach. Of course, the rate of use of procedures depends on the level of the task. Therefore, we can distinguish the level of systems thinking (Lacko, 2010), which reflects the state of our knowledge of the system and the relevant area.

FAILURE OF SYSTEMS THINKING IN PROJECT MANAGEMENT

We know that each project has three stages - analysis, solution design and implementation of solutions. In all of these stages it is necessary to try systems approach and systems thinking. Nevertheless, what is formed is a set of larger or smaller problems:

- Problems of relationships: range- resources - time
- Problems of communication within the team and with the environment
- Problems of identification and risk management
- Problems of different views within work teams and outside the project
- Problems of resulting from information interference or unclear definitions of terms
- Problems of quality control
- Problems in managing project changes and their impacts

Relationship problems in the team and with the surroundings (such as the impact of the project on individual positions in the organization).

Specifically, these problems are manifested as contained in trials (ERNST @ Young, 2010). According to this research these are the five most frequently mentioned reasons for the failure of projects:

- 1) a change in project scope due to subsequent changes in external factors
- 2) weak project management / organizational structure unclear
- 3) insufficient or overly optimistic budget / planning
- 4) change in scope of the project due to its poor initial definition
- 5) differences in expected outcomes of the project.

So try some speculation about what in these cases could be wrong in terms of systems approach (This only slightly outlines the examples, however, leaning on my own practical experience of both the contracting authority and implementer of the project IT).

Ad1) non-use generalization - almost always leads to external changes during the development and implementation of the project and therefore it is necessary to build projects so that they are "encapsulated" and could have these changes incorporated.

Ad 2) You often underestimate the power of interpersonal relationships, it is often not the case that good design is simply a "must". According to the survey, only 45% of projects are fully qualified for this position (they are often deployed specialists without a broader awareness of the project or the one who is at hand).

Ad 3) Sometimes systemic thinking is completely abandoned and replaced by a fatalist view or an attempt to obtain an order at any cost to the supplier.

Ad4) This is poor problem analysis, a poorly defined object in the contract.

Ad5) Poor design (synthesis), a misunderstanding, a late addition of content and subsequent changes in the project.

Other examples of the consequences of a non-systems approach is the ignorance of the context, the inability to join partial knowledge, an underestimation of risks and its bad evaluation, limited alternative solutions, lack of feedback or its breach, or underestimating the negative impacts of the options.

WAYS TO SOLUTIONS

As mentioned in the introduction, there are always possibilities for improving the situation and ways to implement these options.

In my opinion, the two functional major directions are:

a) to trust methodology

b) to trust people.

Ad a) for the management of projects we have available the methodologies (PMBOK, IPMA, PRINCE2 and others), which set out the procedures and the stages, ie the basic axis of the project. We also have methods of systems analysis and synthesis, as well as national standards for building information systems. In these methods, see recommendations on how to analyze and synthesize which graphics, software or other techniques can be used or what documentation is necessary.

With their use, however, we can not guarantee the success of the project. It is necessary to recognize, understand and deal with standard and non-standard situations that arise during the project. In project management there are problems and deviations, the solution can not read the methodology. No methodology, without the proper systems approach and systems thinking of the participants in the project, can succeed. Therefore:

Ad b) rely on (albeit imperfect) the human mind, which can be changed for the better and practice direction so as to achieve (Farková 2006)

- Accuracy (logic) - the ability to perceive and express problems concisely, to do this consistently in search of a solution, follow logical principles
- Flexibility – the effort not to hold on to, in solving problems, outdated and often ineffective ways, but look for newer, more effective and original solutions
- Criticality - the ability to judge impartially and shrill opinions, solutions of others, rejecting prejudices, blind faith and authority, the habit of conquering opinions and criticism of individuals
- Creativity - the ability to provide increased intellectual activity, production flexibility, intellectual content, originality and independence.

Of course, the principle of systems thinking relates to critical thinking, which is capable of independent thought, to assess the situation, is able to think clearly and rationally, not to accept the first impression, keep distance. It is also necessary to understand the needs of people on the team and

the customer, respect different opinions and be able to argue, to be able to take on a different perspective, as appropriate, as this is part of the responsibility for solving problems.

These approaches can be introduced in each project in two ways:

- 1) Choosing the right people who can do systems thinking,
- 2) To train people because the desired properties can to some extent be learned. You can attend courses in brainstorming, the Delphi method, swapping, argument, etc...).

The intellectual potential of the approach is the individual disposition of each person that can develop learning and gain experience. This is the mental model and the internal model vision of the world in every person.

CONCLUSION

Systems and critical thinking skills for successful project management need to be developed and constantly applied. The solutions to the problems of the project, which clearly result from errors in systems thinking, is the solution:

- a) Creating intelligent databases, methodologies and guidelines for solutions to known problems, for people using them must apply thinking that is accurate, consistent, critical
- b) Compose a team of suitably trained people in methods of systems approach, adapting them to the style of work that promotes systems thinking.

For the success of the project it is very necessary to respect the principles of systems thinking and therefore: to be able to define the system and its surroundings, define the goal, behavior, structure, realize the interaction of elements and relationships, take into account that there may be changes (inside and outside). If the Project Manager shall respect these facts, then the next step is the evaluation and design of solutions.

In the end we can use a quotation (from Peter Senge): "Really serious challenges that humanity will face relate to our inability to understand our complex human systems and manage them."

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COMPLEXITY ANALYSIS FOR PETRI NET-BASED STATE SPACE GENERATION

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ABSTRACT

One of the most important parts of system thinking are the means by which is possible to capture the analysed system in some form (diagram, picture etc.). One of such means are Petri Nets, which allows to capture and analyse complex systems characterized by concurrency or non-determinism. One of the main disadvantages of the use of Petri Nets for modelling and analysing real problem lies mainly in exponential complexity (state explosion), which complicates the analysis of larger models. Issues of Petri Nets are associated with a number of facts related to the complexity and provability of specific properties that are also used for the purpose of verification and performance analysis. Analysis of the complexity of these properties can make more effective the above operations (verification and performance analysis) and also provide space for expansion of issues related to algorithmic complexity of the related disciplines (e.g. queuing theory). This paper analyses the algorithms for state space generation of Petri Nets. Specifically, the description and comparison of the "common" approach, which consists in generating memory-free states with the need to verify the uniqueness of each state and generating based on the principle of dynamic programming, which allows to significantly streamline a time-consuming calculation. From a theoretical perspective is analysed time and space complexity of these algorithms.

KEY WORDS

Petri Nets, Complexity, Analysis.

INTORUDCTION

One of the most important parts of system thinking are the means by which is possible to capture the analysed system in some form (diagram, picture etc.). One of such means are Petri Nets, which allows to capture and analyse complex systems characterized by concurrency or non-determinism. The issue of generating the state space of Petri Nets is closely linked to the overall efficiency of the usability of Petri nets as a tool for verification and simulation of complex processes (systems) exhibiting concurrency, non-determinism or asynchrony. This fact is mainly due to the exponential explosion in terms of not allowing use of Petri Net for extensive, in reality commonly occurring, problems. Algorithms/approaches for generating state spaces of arbitrary Petri Nets, should be streamlined for time and space complexity.

The aim of this work is to analyse the complexity of two proposed algorithms for generation of the state space of arbitrary Petri Net. The analysis is performed based on the concepts of complexity theory. The main approaches analysed in this work are the common (naive) approach and the approach based on the principle of dynamic programming.

DESCRIPTION OF THE ISSUE

This section focuses on the description of the basic facts about the problems associated with the theory of Petri Nets, complexity theory and the classic methods of generating the state space of Petri Nets.

PETRI NETS

Petri Nets are a suitable tool for modelling discrete dynamical systems that contain concurrency, parallelism and synchronization (asynchrony). Their main advantage is the ability to precisely verify the assumptions related to the model. Petri Nets were defined by Carl Adam Petri in 1962 (Petri, 1962) and since then their development has progressed in a number of directions. One way is to define new properties that can be defined over Petri Nets, which allows extending the verification capabilities Petri Nets. There are a number of basic properties of Petri Nets, such as liveness, boundedness, reachability, and many others (Češka et al., 2009, Peterson, 1977). Most of these properties also require a number of assumptions, which limit the definition of Petri Nets (eg assumption that network is without their own cycles for analysis of boundedness).

Another trend in this area is expanding the definition of Petri Nets with new features that simplify and enhance the modeling capabilities of this tool and allow performing a number of performance analysis over these networks. Examples include time, timed (Zuberek, 1991) and stochastic Petri Nets (Marsan, 1990), which allow to refine the behavior of the simulation model by adding an attribute that expresses the time (or other, e.g. cost) needed for various events (deterministically or stochastically defined). Another example are the colored Petri Nets (Jensen, 2009), which combines classical Petri Nets with other modelling language, thus drastically expands (and largely simplifies) modelling capabilities Petri Nets. The main drawbacks of this second approach (expanding the definition) are limited verification options.

P/T (Place/Transition) Petri Net is a 6-tuple, $PN = (P, T, F, W, C, M_0)$ where:

- $P = \{p_1, p_2, p_3, \dots, p_m\}$ – a finite set of places,
- $T = \{t_1, t_2, t_3, \dots, t_n\}$ – a finite set of transitions,
- $P \cap T = \emptyset$ – places and transitions are mutually disjoint sets,
- $F \subseteq (P \times T) \cup (T \times P)$ – a set of edges, defined as a subset of the set of all possible connections,
- $W: F \rightarrow N_1$ – a weight function, defines the multiplicity of edges,
- $C: P \rightarrow N_1$ – capacities of places,
- $M_0: P \rightarrow N_0$ – an initial marking.

This definition includes implicitly defined capacity of individual places, which allows simplifying the following procedure of algorithms for state space generation of Petri Net.

COMPLEXITY IN PETRI NETS

Complexity in Petri Nets can be imagined to several standard problems depending on the particular class of Petri Nets (Esparza, 1998). In general it is possible to consider four basic classes Petri Nets (Murata, 1989, Diaz, 2009), and "the state machine graph" (each transition has exactly one input and one output place), "Marked graph" (every place has exactly one input and one output transition), "Free choice" Petri Nets (each arc from the place is either the unique output or input arc from/to the transition) and unconditional general Petri Net. In these classes of networks can then be define basic types of complexity problems such as reachability, liveness or boundedness. Summary of some results for specific classes of Petri Nets shown in Table 1:

Class of Petri Nets		Problems				
		Reachability	Liveness	Coverability	k-Boundedness	Conservation
State machine graph		NSPACE (log) complete	NSPACE (log) complete	NSPACE (log) complete	(not k-bounded) NSPACE (log) complete	trivial
Marked graph		(nedosažitelné) NSPACE (log) hard	(not live) NSPACE (log) complete	(not coverable) NSPACE (log) hard	(not k-bounded) NSPACE (log) hard	NSPACE (log) complete
Free Choice Petri Nets	Conservative	DSPACE (poly) complete	(not live) NTIME (poly)	DSPACE (poly) complete	DSPACE (poly) complete	Trivial
	Any	DSPACE (exp) hard	(not live) NTIME (poly)	DSPACE (exp) hard	DSPACE (poly) complete	NTIME (poly)
Petri Nets	Conservative	DSPACE (poly) complete	DSPACE (poly)	DSPACE (poly) complete	DSPACE (poly) complete	trivial
	Any	DSPACE (exp) hard	DSPACE (exp) hard	DSPACE (exp) hard	DSPACE (poly) complete	NTIME (poly)

Table 8 – A summary of some complexity results for Petri Net. (Jones et al., 1977)

For each class of Petri Nets are defined the complexity of the problem of reachability, liveness, coverage, k-boundedness and conservativeness. In parentheses complexity of some entries represent detailed specification of the problem. For instance the text (not live) in “Marked graph” network represents the fact that the complexity “NSPACE (log) complete” corresponds to prove that the network is dead (and in other cases – prove that the network is live). From the table is also evident that the definition of certain restrictions in the definition of Petri Nets significantly reduces the complexity of establishing certain features/issues.

COMMON (NAIVE) APPROACH

With the complexities presented in Table 1 relates one of the most basic operations in the issue of Petri Nets, namely the state space generation. Common intuitive approach to solving the problem of generating the state space of Petri Nets can be expressed using the following procedure:

- 1) Create a global dynamic array MARK with dimensions of $M \times 1$ (M = number of places).
- 2) Current marking is added to the current index of MARK and increments the array size and the index by 1.
- 3) Is the current marking live? If yes, proceed to step 4) otherwise 6).
- 4) Fire the active transition.
- 5) Is the current marking in MARK? If so go ahead 3) otherwise 2).
- 6) End of algorithm.

After the execution of such an algorithm is obtained a state space in the matrix of size $M \times |R(M_0)|$ (M - number of places; $|R(M_0)|$ - number of reachable marking from initial marking).

DYNAMIC PROGRAMMING

The principle of dynamic programming is based on the idea of non-redundant optimal algorithm. Dynamic programming works on the base of distribution tasks to subtasks and record partial results, to ensure that certain "way of calculating" will not be counted multiple times.

In terms of generating a state space of Petri Net, the following procedure reflects the principle of dynamic programming:

- 1) Create a global binary M-dimensional array INDEX (M = number of places).
- 2) Create a global dynamic array MARK with dimensions of Mx1 (M = number of places).
- 3) Current marking is added to the current index of MARK and increments the array size and the index of by 1
- 4) Field INDEX is set to 1 in the coordinates of the current marking.
- 5) Is marking live? If yes, proceed to step 6) otherwise 8).
- 6) Fire the active transition.
- 7) If the value of the field on the coordinates of subsequent marking equal to 1, proceed to step 5) otherwise 3).
- 8) End of algorithm.

As in the previous approach, the state space is generated by the procedure represented by a matrix of size $M \times |R(M_0)|$. Both of these approaches (naive approach and an approach based on dynamic programming) can be implemented using a recursive algorithm that works by generating state graph in depth or using an iterative algorithm, which works on the principle of generating a state graph in breadth. Both algorithms entail certain advantages in terms of online verification of certain properties during state space generation of Petri Net. An example might be, for instance: defining "transition rate" matrix in the definition of Markov chains with continuous time, which are used in the analysis of stochastic Petri Nets.

ANALYSIS OF DEFINED APPROACHES

Analysis of the previously introduced approaches aims to define the temporal (time) and spatial (space) complexity of these approaches, in their pessimistic O , optimistic Ω or average Θ form.

COMMON (NAIVE) APPROACH

A common approach for generating the state space of Petri Nets generally have higher time complexity than other approaches, but its spatial complexity will never exceed the size of the set of all reachable marking.

TIME COMPLEXITY

The time complexity of the naive approach is largely influenced by the need to search the partially generated state space and ensure that some marking are no longer included in the field (MARK). The second option is to generate a state space including redundant markings and then clear the field (MARK). This second option has a greater time complexity than the first version (due to the size of the field, which is necessary to search), so will not be considered. Since the state space generation of Petri Net dynamically expand the field MARK, it is necessary to search the space larger by 1 each time, i. e. from value 1 to the value of $|R(M_0)|$. If the size of the state space is expressed as pessimistic version, it can be expressed as $\prod_{i=1}^m C_i$, i.e. it is a product of the capacity of individual places. The calculation after each step scans the incremented field MARK, so the total time complexity of the common (naive) approach to generate the state space is exponential:

$$O\left(\frac{\prod_{i=1}^m C_i * (\prod_{i=1}^m C_i + 1)}{2}\right) \approx O(k^{2m})$$

where k represents a constant whose value is a function of the capacity of individual places.

SPACE COMPLEXITY

One of the relative merits of the naive approach is the actual low memory requirements. However, the most pessimistic variant achieves the complexity:

$$O\left(\prod_{i=1}^m C_i\right) \approx O(k^m)$$

The actual complexity is then dependent on the specific size of the state space, which corresponds to the structure of Petri Nets. Generally, this complexity can be written as:

$$\Theta(|R(M_0)|) = \Omega(|R(M_0)|)$$

where $|R(M_0)|$ represents the number of reachable markings of Petri Net. Generally, the total number of reachable markings is a function of the number of places, transitions, initial marking, capacities and arcs, i. e. $|R(M_0)| = f(P, T, F, W, C, M_0)$.

DYNAMIC PROGRAMMING

An approach based on dynamic programming, characterized in that the portion of high temporal complexity decomposes into spatial complexity and thus more efficient use of the available hardware.

TIME COMPLEXITY

In the analysis of time complexity, it is first necessary to convert the hypothetical size of the state space in the context of M (the number of spaces). Since the number of all possible marking is equal to $\prod_{i=1}^m C_i$, the time complexity will grow exponentially in relation to the number of places, i.e.:

$$O\left(\prod_{i=1}^m C_i\right) = \Theta\left(\prod_{i=1}^m C_i\right) = \Omega\left(\prod_{i=1}^m C_i\right) \approx O(k^m)$$

SPACE COMPLEXITY

Space complexity is closely dependent on the definition of capacity for each place. Due to ignorance associated with the use of potential capacity of individual places should be considered exponential complexity $O(\prod_{i=1}^m C_i) \approx O(k^m) = \Theta(k^m) = \Omega(k^m)$.

The inefficiency of this approach lies in unnecessarily large spatial complexity at low boundedness, i.e. if the initial marking is significantly smaller than the capacity of the respective places. If the conservativeness is unknown, it is impossible to determine whether the relevant capacity is exhausted or not. The spatial complexity could be reduced with known boundedness of places (only base power).

DISCUSSION

Petri Nets are a suitable tool for modelling concurrent, asynchronous, nondeterministic and other complex processes. Their main drawback is the exponential state explosion which causes practical inapplicability of this tool for the analysis of larger problems. One of the relative possibilities to reduce this complexity is to use a number of well-known principles for the formation of specific algorithms. In this paper were presented two types of approaches for state space generation of Petri Nets, namely a common intuitive approach in which the newly generated state is test with a set of already generated states (search for duplicates) and a approach based on the principle of dynamic programming, which allows exponentially reduce the time consuming calculation (but with increased spatial complexity). Advantages of approach based on dynamic programming:

- Time complexity $\cong \sqrt{\text{time complexity of the common approach}}$.
- More efficient use of hardware.

Disadvantages of approach based on dynamic programming:

- Space complexity is orders of magnitude larger than normal (naive) approach.

CONCLUSION

This paper presents basic issues regarding the complexity of Petri Nets, mainly the complexity of the state space generation. Were presented two approaches that differ in the way the newly generated state (marking) are verified (uniqueness). For both approaches was defined the time and space complexity.

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AMBIENT INTELLIGENCE – SOME ETHICAL ISSUES

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ABSTRACT

Ambient intelligence (AmI) is a recent research area with a huge application potential. Its principal role is in deployment of intelligent environments capable of helping individuals surrounded by them in their usual or even unusual activities. In the case of a handicap caused by higher age or health deficiencies such an environment should be able even to enable the user to perform various activities. Any application of the AmI technologies naturally cause a number of questions, namely those of ethical nature, that should potential users take into account and be aware of their risky features. Our paper is focused on contemplation on some ethical and other problems related to a broader deployment of ambient intelligence approaches and solutions.

KEY WORDS

Ambient intelligence, intelligent environments, applications, ethics, privacy.

INTRODUCTION

The concept of ambient intelligence, firstly introduced in the ISTAG research group report (Ducatel et al., 2001), provides a vision of information society of the future, in which maximum emphasis is placed on user friendliness, effective and distributed support of services, reinforcement of the user's resources, and support for interactive work. This vision anticipates that people will find themselves in an environment of intelligent, intuitively usable interfaces incorporated into all kinds of objects. Such an environment will be able to recognize the presence of different individuals, and react to it in a non-disturbing, and often invisible way, frequently fully integrated into a particular situation. Deeper insight into the area of ambient intelligence and intelligent environments can be found, e.g., in (Augusto, 2006), (Augusto, 2010), or (Cook, Augusto, and Jakkula, 2009).

There is also another view of the ambient intelligence. This view can be focused on the fact arising from the relatively simple fact that humans in their environments will be surrounded by various information devices that are totally integrated into humans' everyday lives. These devices will be hidden behind their intelligent interfaces and capable of mutual communication as well as communication with people. The devices can be understood as relatively independent entities with certain degree of intelligence where their intelligence varies from basic one to very complex. They are supposed to co-operate one with another, and all of them are expected to co-operate with humans if necessary. On the other hand, these entities need, in order to be able to co-operate with humans properly, instantly monitoring or supervising all human's activities. And that is potential issue of a number of problems.

In our previous papers (Mikulecky, Olsevicova, and Ponce, 2007) and later on in (Mikulecky and Tucnik, 2013) we tried to analyse the possible risks of ambient intelligence applications and technology as such. In the present paper we intend articulate some ethical and privacy problems, related to the ambient intelligence area, and stress the necessity of their solution.

CO-EXISTENCE OF INTELLIGENT ENTITIES

When taking into account above mentioned artificial entities, co-operating in an intelligent environment, with a certain degree of intelligence and with a mechanism for the initiation of their activity, where the activity should be oriented on certain benefit (or service) to human beings, we are able to investigate the following basic problem issues related to them:

- various types or levels of intelligence of such artificial entities,
- their mutual relationships as well as their relationships with humans,
- their communities (virtual as well as non-virtual),
- their mutual co-existence, collaboration and possible common interests,
- their co-existence and collaboration with humans,
- possible antagonism of their and human interests,
- ethical and social aspects of the previous problems, etc.

All of these are interesting sources of a plethora of serious scientific questions. We shall try to discuss some of them in more detail now.

The first impression from the ambient intelligence concept is, that humans are surrounded by an environment, in which there are microprocessors embedded in any type of objects – in furniture, kitchen appliances (refrigerator, coffee maker, etc.), other household machines (e.g., washing machine, etc.), clothing, toys, and so on. Of course it is depending on the type of the particular environment. Certainly there are clear differences between a hospital environment and a luxurious private house, or a university environment.

It is clear that when speaking on intelligent artificial entities communicating mutually, we could certainly expect a kind of intelligent behaviour of such a community. We can speak about the emergent behaviour of such a community that can be very well modelled as a multi-agent system, serving to some purpose considered to be beneficial for humans. However, the emergent behaviour of such an artificial community can be potentially dangerous – say, if the possible goal of the community differs from the human interests, or if the community is simply unable to serve to the human being goals from various (maybe also technical) reasons. We certainly have to take into account such questions, like:

- How to tune all the emergent behaviour of the particular environment to be able to serve the particular human being goals?
- What to do if the emergent behaviour of the environment is not in accord with the human aims, or even if it is contradictory?
- How the privacy of a particular human in an intelligent environment will be respected?
- Is the particular information about the concerned human safe from being exploited by another person?
- How to evaluate the trade-off between lack of privacy and benefits from being monitored all the time in the case of seniors or handicapped persons?
- How to persuade such a person that certain loss of privacy could be beneficial for her/him at all?

Of course, these are just a few of possible questions which could arise in relation to the first attempts to introduce the ambient intelligence concept into the real life. Some of other issues we will mention below.

PRIVACY OF HUMANS UNDER AMBIENT INTELLIGENCE

The notion of privacy and its content in an environment with ambient intelligence seems to be a very delicate as well as complicated problem. Some authors have already mentioned possible problems and risks in the area (Bohn et al., 2004), (Langheinrich, 2002) or (Nijholt et al., 2004). As a matter of fact, the main common objective against the ambient intelligence concept seems to be, that it is possibly a

basis for a very sophisticated and potentially dangerous surveillance system, in a sense a kind of a new “Big Brother” (or maybe a collection of co-operating little “Big Brothers”).

The personal privacy can be viewed from various standpoints. Privacy is considered to be a fundamental requirement of any modern democracy. According to (Lessig, 2006) it is possible to distinguish among the following motives for the protection of privacy in today's standards:

- *Privacy as Empowerment* – privacy mainly as informational privacy, giving people the power of controlling the publication and dissemination of information about themselves. This leads to a recent discussion, whether personal information is a private property, or intellectual property. From the AmI point of view, especially the right to control the dissemination or exploitation of the information about a particular person, collected about him/her by the intelligent environment, could be endangered seriously. New legal norms in this direction are necessary.
- *Privacy as Utility* – the focus is on minimizing the amount of disturbance for the individual (no unsolicited emails or phone calls). Technologically it is feasible to tailor an intelligent environment so that it is not disturbing for the human surrounded by the environment. However, there could be a complicated task of tailoring the environment to be suitable for two, three, or more persons at the same time. If their goals are contradictory, whom should be the preference given? What should be the rules for that?
- *Privacy as Dignity* – this is not only about being free from unsubstantiated suspicion, but also about equilibrium of information available between two people. The balance (equilibrium) of information between a person and the surrounding intelligent environment could be a serious problem because of their conflicting aims: the environment in a sense “wishes to know” everything about the human in order to serve him efficiently, while for the human it is usually not necessary to be aware what the environment is about. The problem of unsubstantiated suspicion seems to be much more serious one, as the vast information about the concerned person will be collected somewhere in the common memory of the intelligent environment, which can be considered, from the previously mentioned point of view, to be a sophisticated surveillance system. New legal norms are here more than necessary.
- *Privacy as Regulating Agent* – privacy laws and moral norms can also be seen as a tool for keeping checks and balances on the powers of decision-making elite. In an intelligent environment it will certainly be easy to gather information of certain type enabling to limit or prevent the society from certain type of improper behaviour. On the other hand, there should be a subtle borderline between the information necessary for the social prevention and information potentially endangering the human right for privacy.

SOCIAL ACCEPTANCE

As Bohn and his colleagues pointed out (Bohn et al., 2004), the fundamental paradigm of ambient intelligence, namely the notion of disappearing computer (computers disappear from the user's consciousness and recede into the background), is sometimes seen as an attempt to have technology infiltrate everyday life unnoticed by the general public in order to circumvent any possible social resistance. However, the social acceptance of ambient intelligence will depend on various issues, sometimes almost philosophical ones. The most important issue seems to be our changing relationship with our environment. Interesting ideas in this direction can be found also in (Zejda, 2010) or (Vlcek, 2010).

Historically, a few years ago only a couple of people expected personal communicators, but recently the penetration of mobile phones hardly surprises anyone. Some more years ago, computers needed a separate room to be installed. Recently, anyone uses personal computers, PDAs, smart phones, and other kinds of computing devices without any problem. We can extrapolate, that in the near future people would not be surprised by a smart car (first intelligent vehicles of this type already appeared), intelligent house (these are available recently as well), but also by various kinds of other intelligent environments. We can mention intelligent environments helping handicapped people, or intelligent environments in hospitals, or even intelligent academic environment at universities.

We would not be surprised by a broad social acceptance of this new, recently developed phenomenon in a short horizon of a few years. According to (Dryer et al., 1999) “our inevitable future is to become a machinelike collective society. How devices are used is not determined by their creators alone. Individuals influence how devices are used, and humans can be tenaciously social creatures.” Actually, based on our experience, we cannot agree more. However, social consequences that ambient intelligence may have will certainly be addressed in a broad debate and a deep and focused research in near future.

CONCLUSION

Recent technologies help us to preserve data and information and cover more and more aspects of our lives in quite complex yet easily handled ways. All those devices and methods for data collection, capturing, manipulating and reuse bring new challenges that are explored under the context of ambient intelligence; we have technologies that were developed for particular objectives, but also can be combined in new, unanticipated ways or can be applied in formerly improbable contexts.

It is hard to predict the evolution of ambient intelligence environments and it is impossible to try to manage this evolution in any way. One of the possible directions for their further evolution can be based on improving their better adaptivity towards user's requirements (Mikulecky, 2012). When concerning the concept of user adaptivity in relation with smart environments, we should speak more about adaptability of the smart environment, as it is expected that the technologies behind are capable to carry out by itself most of the steps required for an effective adaptation of the whole system to the user's needs. It is necessary to take into account that in the case of a smart workplace it is usually supposed that its user is a person whose main activity is or could be decision making, and that the system should support all the user's activities leading to a good, if not optimal decision.

Therefore, such a smart workplace should, among its other features (Mikulecky, 2012):

- ensure *broad but focused and personalized access* to relevant information and knowledge resources, supporting thus both learning needs of the manager as well as creation of his/her decisions that must be of highest quality;
- offer *as much relief from stress as possible* by avoiding all the usual stressful situations (or more precisely their potential sources);
- ensure *broad and up to date technical support* for all technically based activities in the workplace.

The achievements of ambient intelligence postulate an adequate shift in thinking that concerns also managerial work (Bures and Cech, 2007).

Another possible direction in overcoming some of ethical problems could be based on covering much broader requirements from the various environment users, not only from humans. Certainly animals or plants could have their own requirements to be fulfilled from really intelligent environment (Becerra, Kremer, 2011).

The vision of ambient intelligence is as exciting as the vision of the Golem was nearly five centuries ago, in the times of the Emperor Rudolf II. The lack of idea about real power of Golem is similar to our current lack of knowledge about real possibilities of technologies, resembling groups of little Golems, which will grow up as side-effects or emergent effects of particular Ambient Intelligence subsystems and applications at the moment of their uncontrolled interacting. All that will need a broad debate, responsible and focused research, as well as completely new legislative framework reflecting new achievements in science and technology.

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INTERACTION OF CONSCIOUSNESS AND SYSTEMS IN THE CONTEXT OF SYSTEM THINKING

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ABSTRACT

Paper is focused on non-traditional aspects of system thinking from the consciousness and human attributes point of view. Important aspects of trends and system thinking and human individuality are discussed in the first part of the paper. The second part of the paper is focused on the aspects of consciousness and systems reaction based on the state of consciousness.

KEY WORDS

Consciousness, systems, system thinking.

INTRODUCTION

Let's consider that we have a great need to be able effectively transform several smaller information systems into one large harmonized and unified information system in order to be able to control the whole system effectively. This is often needed when we have several sub systems and also several technologies for different processes in the company, state institution or similar larger scale systems. The idea is pretty nice because we would be able to use one technology and unified principles and platform across all parts of the system in an analogical way to how we use the same operation system as people on other continents (within their localization).

SYSTEM GLOBALIZATION AND CONSCIOUSNESS INTERACTION WITH SYSTEMS

INTERACTION WITH SYSTEMS

The system globalisation focuses on technological aspects and processes very much indeed, but this article is going to focus more on the humans and their interaction with others and also their interaction with machines especially from the point of view of their consciousness, knowledge, ability to correctly interpret data, individual potentials and abilities, etc. The big question is (in case we are able to manage the technological aspects and the deterministic software parts in the whole system) how do we achieve the effective unification of so many aspects among people involved in the system? Every person is an individual with unique knowledge, worldview (Weltanschauung), abilities and talents. As we can observe effect of globalization on fading diversity of cultures, it is necessary to understand system globalisation also as a process that tries to transform problems based on diversity of technologies, processes, attitudes into one unified best acceptable platform for all parts of the system in order to obtain better system's entities' interaction, better control of the system and outstanding compatibility and effective communication among entities.

In order to create unified platform for information system we face the problem that the more universal technological platform we wish to create the less effective it is for specialized parts of the system

(Tung and Chan, 2010). On the other hand the more specialized the platform is for all fields in order to prevent the previous fact the larger and complex the system is and the less usable by all average users the information system is (Mann, 2002). Here come the big enterprise information systems giants with so huge costs and times to deploy it to some large scale enterprises. Can we clearly prove and evaluate correctly the effect and supposed benefit of such a large modification of information system of the enterprise? If we change the technology in a company, how do we manage to adapt all users of such a centralized system? Now why don't we ask why the information system does not adapt itself according to the needs of a company and its users? Because it is architected in a way similar to as buildings are and all users must adapt to the system unless we can spend a lot of money for customization and software modifications.

If we have such a deterministic system we have to face its effectiveness variability due to human factor. When humans interact with the system, the system is suddenly less deterministic, because every person has individual knowledge and may interpret information differently according to one's knowledge, worldview and other unique aspects. Computers literacy is another important aspect of human-computer interaction.

Many trends tend to formulate internal processes of enterprises where people are involved in quite a rigid way and the role of people is often tried to be architected in a very pinioning way, so the variety of ones actions limit often to only one way of how to behave. This degrades the people to machine like behaviour and the evolution speed of the enterprises is somehow frozen and depends on the management and architects only. Self-organization of systems is not welcome in current trends.

OUTER WORLD CHANGES AND CONSCIOUSNESS

Our consciousness uses our mind and body to interact with the outer world and in the information systems we interact with people and machines. We use the tools of outer world (chock, speech, text, computer, machines...) to interact with other people's consciousness and secondarily we wish to modify and change the outer world according to our needs so we can continue to use our body as a tool for communication and interaction with the outer world. Now we need to understand computers, data, information and other things in the outer world as tools or codes for communication among people's consciousness. Information system is also of such a kind. Information system has neither consciousness nor human intelligence. It is supposed to be among all other purposes an effective tool for managing, controlling, etc. The paradox of these days is that we systematically build pinioning (trusing) systems that help in many ways but at the expense of creativity, evolutionary adaptability and human consciousness's freedom. The big problem is that live evolves and humans adapt themselves and modify the outer world so they continue walking on their evolutionary paths. It could be very handful if the information system would be able to behave in the similar way but unfortunately this is not happening. The only best practice is to use upgrades, updates and hot fixes or in case of unsatisfaction switching to other software products comes as a possible solution.

If we start to build company processes and we create information system in order to face strong competition among companies then we should admit, that the functionality of the company becomes less or more dependent on such an information system. The information system influences the evolution of the company and we may say that it forms the future of the company in some way. Innovation and flexible changes may be less achievable in strong, huge and rigid software and we can often hear in the software development team of such a systems, that implementing something new harps on problems due to the software architecture of the information systems because we cannot predict all the future needs of modifications when creating the software architecture in the first step. More effectively software development in iterations may come with smoother development but still we define the system as static state of reality (with some dynamic behaviour) but our consciousness works much more adaptively.

Most of current information systems help very much indeed with storing data and serve greatly as additional resource for our brain in terms of supporting machine, database, calculation or source of information rather than intelligent system that would be worth depending on in terms of letting the system decide. All current intelligent systems are still very far away from true complex understanding

of problems (Brixí and Brixí, 2009). This seems to be still dominant of humans (Rosický and Pavlíček, 2012).

Very dramatically important and yet not well known ability to change systems behaviour just by consciousness of people and their state of spirit achieved for example by meditation is planned to be deeply researched based on very important discoveries in Hagelin et al (1999) and similar experiments. The principle that consciousness is possible to use to influence the systems behaviour is very important for future large scale systems management and is planned to be explained on the theoretical basis.

The important steps to achieve deeper knowledge of these principles is to examine how and why the number of people during meditation influence for instance number of crimes (Hagelin et al 1999) and what factors are the ones that enlarge the effectiveness of such a system management with meditation and changed state of consciousness involved. New approach of interaction of consciousness and systems may be revealed in the author's later publication.

The key idea is that consciousness influences soft systems where humans are included. We can agree that based on (Hagelin et al 1999) global consciousness of group of people influences other people. Now the question is: can matter/machine be influenced by global consciousness as well? Probably in much less effective way but experiments from Global Consciousness Project (Global Consciousness Project, 2012) show that some influence is detectable.

Similar effect was detected on individual basis in our experiments which were based on difference between statistically theoretical values of probability of guessing correct button generated by computer compared to real measured values when user used intuition and believed that the results will be better than theoretical value.

Hypotheses are $H_0: \pi=1/3$ for three buttons runs and $H_0: \pi=1/6$ for six buttons run with $H_1: \pi > 1/3$ for three buttons runs and $H_1: \pi > 1/6$ for six buttons run.

The test criteria used are described in following formula:

$$u = \frac{p - \pi_0}{\sqrt{\frac{\pi_0(1 - \pi_0)}{n}}}$$

Significance level $W_{0.05} \{u; u \geq u_{0.95}\}; u_{0.95} = 1.645$.

The experiments results are shown in the following Table 1.

Test run number	1	2	3	4	5	6	7
Number of steps in the test run	1000	83	100	142	389	234	2564
Successfully guessed	193	38	45	57	148	91	899
Number of buttons	6	3	3	3	3	3	3
Test criteria value u with critical value 1,645	2.234	2.406	2.475	1.721	1.972	1.803	1.857
Measured average score	0.193	0.4578313	0.45	0.4014085	0.3804627	0.3888889	0.350624
Theoretical probability	1/6	1/3	1/3	1/3	1/3	1/3	1/3

Table 1 - Seven tests of human prediction of randomly generated button

(First test was run with six buttons, other with three buttons)

More detailed results will be eventually published in the 2013 2nd International Symposium on Computer, Communication, Control and Automation (3CA 2013) in Singapur.

Our experiment shifts the topic of global consciousness influence on individual consciousness with noticeable experiment results of measured shift (deviation) from the theoretical values.

CONCLUSION

We may understand the role of knowledge, information, data and management in terms of Rosický and Brixí (2008) or similar attitudes, but we definitely need to better understand the role of consciousness within all life processes. On one side we have senses and the outer reality but on the other side we definitely need our consciousness to be able to perceive all existence. We may say that the self-existence awareness is quite bounded with our consciousness in terms of our body in the outer reality. If consciousness of somebody is always present in the perception of outer reality we may better understand why systems can be influenced by the consciousness itself when great ability to control ones' consciousness. Understanding the need of information transfer and classic management tools is different so new approach to large systems management needs to be made to include the role of consciousness in the management properly. Some efforts that lead to research methods that may give some empiric date based on previous topics may be found in Heaton, Schmidt-Wilk and Travis (2004), but no complex scientific theory describing interaction of consciousness and systems still needs to be done.

Because consciousness is involved in all systems where humans are involved, it is always wise to take consciousness interaction with systems into account when trying to look at large scale systems in terms of system globalization, control and information management.

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VISUAL CRYPTOGRAPHY, THE MODEL VS. REALITY

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ABSTRACT

This paper deals with our practical experience on the implementation of the interesting concept of visual cryptography. The way to obtain a well-working and functional output sample is, despite the relatively simple theoretical concept, not easy and brings many issues. We bring the description of such issues, as well as the steps needed to succeed, resulting into the systematic concept and simple design that everyone should be able to follow to create a functional sample of cryptographic shares.

KEY WORDS

Visual cryptography, cipher, random number generator, software, compatibility, DPI, print.

INTRODUCTION

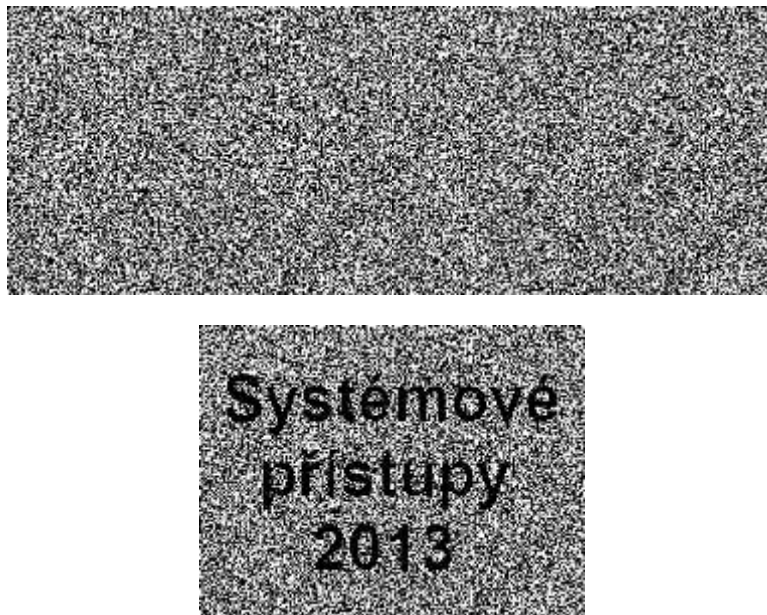
Visual cryptography (Naor, 1994) is quite interesting and relatively simple concept of data encryption, which, in a reasonable volume and/or size, can be partially implemented even without the use of the computers. The recipients of the messages simply use their copies of the symmetrical encryption key being printed on a plain sheet of a paper or a transparent foil in the form of the decoding grid. In the most simplified and partially modified form, the whole process can be, in a non-mathematical way, described as follows: any pictorial message (or a text encoded as an image) consisting just from black and white dots, i.e. the bitmap of one-bit depth, is split into two shares, where the first share (the symmetric key) is generated as an entirely random grid of black and white dots (random noise) and the second share is computed to superimpose with the first random one to recreate the original message. One can clearly see the analogy with the well-known Vernam cipher (Shanon, 1949), which is considered, when used correctly, to be unbreakable. Observing the superimposing of the shares as the simple logical operation, we have created the analogue form of the OR function, as we are unable to eliminate two superimposed black dots (opposite to the desired property of the XOR function in the digital cryptography). In our process, the “white” information is partially lost (as a result of OR), leaving the random noise in the originally white area, while the “black” information is preserved completely. The initial model proposed by Naor and Shannon (Naor, 1994) coped with this issue by encoding each pixel of the original message by special 2x2 matrices, leaving the encoded “white” information still as a random noise, this time being, however, deterministically defined. In our model we will use the simple one-bit model without the matrices, which, described later, we will show as more practical.

THE IMPLEMENTATION

The need of the practical model rose up while teaching the classes of the Theoretical Informatics. We needed to show the shares, ideally as encoded prints, that students can touch and explore the properties of the visual cryptography. Despite of the decoding being described as a pure analog process, it remains evident the creation of the shares must be done using the computer.

PROBLEM ONE – THE APPLICATION TO GENERATE THE SHARES

No matter how easy and well documented the methods of the visual cryptography are (as already mentioned), we did not succeed to find out any suitable software application to create the desired form of the print output. There are many applications to demonstrate the principles of Steganography, i.e. hiding the information into any digital picture (Zelenka, 2003), but there is no freely available software utility for visual cryptography. The only Matlab addin (Algorito, 2011) did not fit to our needs; hence we had to create completely new application.



Picture 9 – two shares and the decoded message, encoded using visual cryptography

PROBLEM TWO – INTEGRATED DEVELOPMENT ENVIRONMENT

First version of the application was written in the Microsoft Visual Studio 2012 - Visual Basic on the author's private home commuter running Windows 7 and the .NET framework 4.5. Moving the project to the author's office computer at the university during the same time period (spring 2013), the Windows XP operating system was still installed there with no support of the .NET framework 4.5. Hence the installation of the Microsoft Visual Studio 2012 on the office computer was impossible, resulting in the installation of previous version of Microsoft Visual Studio 2010, which, logically, was incompatible with the Visual Studio 2012 code. Except some minor parts, the whole application was rewritten from scratch.

PROBLEM THREE – WHEN RANDOM IS NOT RANDOM

While debugging the code, various bugs and errors are explored and removed from the code. The surprising moment arose, when, unintentionally, the generator of the first random share was run twice (instead of generating the first and the second share) and such two shares were superimposed. One would expect, that combining two random shares, generated using the **If Rnd() > 0.5 Then** condition would result in a "darker" but still random noise. However, the obtained image has been significantly different, when darker black stripes appeared (and this was not caused by the program error). We show part of the image as a Picture 2. More interestingly, adding another random share produced even darker stripes during each new pass. The explanation of this phenomenon is quite simple. Microsoft uses the linear congruent generator (LCG) for the **Rnd()** function, such generator having a period of 2^{24} , i.e. generating aperiodically 16 777 216 different random numbers from the zero to one interval. Due to the nature of the generator there are so called subcycles, returning not exactly the same

numbers but numbers somehow “close” to those already generated. That’s why the comparison to the value 0.5 would give the same result at the same position on the share, if the period of the generator is divisible by the size of the grid, which in our case was 512 pixels initially.

It is not a purpose of this paper to discuss the properties nor the tests of LCG as those are well described in the literature (Knuth, 1997). However, it is worth to mention that randomness is elementary principle of cryptography as well as of the creation of cryptographic keys, where any predictability would be fatal. Microsoft is well aware of this not-so-good LCG properties, stating in the `Rnd()` documentation: „Because the **Random** statement and the **Rnd** function start with a seed value and generate numbers that fall within a finite range, the results may be predictable by someone who knows the algorithm used to generate them. Consequently, the **Random** statement and the **Random** function should not be used to generate random numbers for use in cryptography.“ (MSDN, 2013a). For cryptographic purposes they did implement the whole `RandomNumberGenerator` class (MSDN, 2013b).



Picture 2 – the result after superimposing two random shares

We may notice that the discussion thread was added by the author of this paper to the Microsoft development forum (Brebera, 2013), including the sample code to generate the described behavior, the sample outputs and the interesting graphical output of the whole 16 million random numbers arranged in the 4096x4096 grid.

For our purpose the described property of the LCG does not directly affect the randomness of the share. Still we think this is worth to mention as someone else may face the same or similar problem.

PROBLEM FOUR – SIZE DOES MATTER

Although probably not visible on the first sight, the resolution of the sample shares showed in Picture 1 is just 320x240 pixels. Compared this size to the resolution of nowadays computer monitors and memory capacities, this size may be thought as truly minimal, yet practically this size is very hard to implement. We can see a perfect and sharp image on the LCD panel, where each pixel is clearly bounded, but the problem immediately arises when producing such image as a print output. As a dimensions of a standard A4 paper are 279 millimeters of width and 210 millimeters of height (landscape), each printed pixel is smaller than just one millimeter, that is to say the resolution slightly above 25 DPI (dots per inch). We have tested that to superimpose such two shares to decode the message is quite impossible as we have to align the shares with less than one millimeter accuracy, where even a small shift causes the immediate distortion of the image. For practical application the resolution of about 12 DPI is ideal, i.e. each printed pixel is about 2 millimeters in size producing the final A4 share (or grid) of 150x100 pixels. As we have noted in the first paragraph, the initial idea was to encode each pixel using 2x2 matrix. In that case the effective resolution of the grid would be just 75x50 pixels resulting into the possibility to encode just a small amount of information.

We may also note that nowadays laser printers usually have the resolution of 600 DPI, theoretically being able to print the whole cipher (grid) of 150x100 pixels in the dimensions of about 8x6 millimeters. The result will be perfectly sharp and totally useless. We will discuss the final grid magnification in the next paragraph.

PROBLEM FIVE – WYSIWYG

Well known anagram in the title states “what you see is what you get”. For many years this is standard description of the situation when user of the computer should receive the printed outputs in the very same fashion as he or she can see on the screen of the computer. In the case of the printing the grids we do, however, face another problem of the practical implementation. Because our application generates its outputs as PNG images, the first idea to print such output is to use any already installed graphical software. We face the situation of having the 150x100 pixels image which we need to print out such it covers the whole side of an A4 sheet of paper. Unfortunately, all the graphical software suites implement various kinds of image extrapolation (as we need to magnify our image) causing the final output to be very smudgy (or somehow “out of focus”) simply because the initial one-pixel dot is magnified not to the perfect square, rather to some form of rounded dot. Such final printed grids do work, however bringing very fuzzy results. We have tried many applications, all with unsatisfactory results. Eventually we have created a non-trivial procedure, which on the other hand provides a desired result. The author of this paper will gracefully thank for any improvement suggestion.

- create new MS Word *.docx document (MS Word 2010)
- insert a picture of the first share
- use the ribbon tab Format/size to change the size of the image to cover the area of the paper
- export the document into *.pdf file (Save as...)
- use the Adobe Reader to open the new document and to print it

It is impossible to print out the image directly from the MS Word, as such program will extrapolate the image in the very same way as the graphic utilities do. Exporting the file into *.pdf file causes no extrapolation – the pixels are magnified as perfect squares.



Picture 3 – extrapolated and sharp print output, magnification of the upper left corner of Picture 1

THE LAST PROBLEM – PAPER OR FOIL

The original idea was pretty simple. After printing the two shares of the cipher on plain paper and after superimposing the two papers together, one can see the papers through the light and easily decipher the hidden message. Such a solution was found totally inadequate immediately after the first attempt; although the paper is partially transparent, the contrast of the lower (second) share is very low and the resulting image is very faint. Another logical step would be to use the combination of the transparency foil and the plain paper. From the time we used the overhead projectors instead of today’s data projectors we do luckily have a reasonable amount of transparencies left. Yet just one attempt was enough to see this method does not work at all. The transparency foil (at least the type we have used) is made of a plastic that shrinks while being thermally fixed in the laser printer. The distortion is not big, as it is just about 2 millimeters per 297 millimeters of foil length, but exactly these are the 2 millimeters of size of one grid point. This immediately implies the impossibility to exactly superimpose the underlying paper with the first share and the transparency foil with the second one. Eventually, we did print both shares onto two transparencies (both shrinking the same way) and we use plain white paper as the underlying layer to these foils. This gives a perfect and sharp result;

moreover, without the paper, the deciphering can be well demonstrated using the already mentioned (and a bit obsolete today) overhead projector.

CONCLUSION

The practical implementation of visual cryptography brings many issues and obstacles, starting with the choice of the appropriate development environment, through the safe choice of the random generator, the size of cipher grid and the size of the print output, to the properly chosen printing media and the printing methods. Scholar papers usually describe just the theoretical parts of the models, yet they do not bring any implementation instructions. We have practically demonstrated the possibilities of the visual cryptography and today we do have many of the print samples we successfully use during the courses.

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FUTURE DEVELOPMENT OF SYSTEM SCIENCE

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ABSTRACT

This article deals with the question of how the system science and system approach as such may develop in the future. I think we can find an analogy between the development of system approach and the development of the movement of phenomenology. The effort to deal with the things themselves and not with their reductions and abstractions was common to both of them. This effort resulted in both of them in stressing the role of subject in structuring the experience. The system science ended up in plenitude of approaches stressing the organizing role of the respective subject. Phenomenology didn't sink into such relativism or perspectivism as from the beginning it tried to find independent features of the experience. However in phenomenology it was from the beginning clear that it is not possible to get unbiased information on the consciousness which recently resulted in the effort to deal with phenomena that don't show themselves totally and are not within the power of the subject. I think system theory can develop in this direction as well and study systems the systematicity of which is in permanent danger because their development is sometimes not predictable and may revolutionize our ideas about them. The only true approach to them is respect and tolerance. The system science would then learn how to perceive and treat something which may always surprise us.

KEY WORDS

System science, cybernetics, second order cybernetics, phenomenology, experience, subject

SYSTEM THINKING

System thinking developed in the 30s as a reaction on reductionism and mechanism. Reductionism consists in the fact that any problem, object or occurrence can be reduced or decomposed into basic undividable elements. To analyse means to break up everything into elements, to explain the behaviour of these elements or parts and summarise the behaviour of the whole as behaviour of the parts. The presupposition that understanding of the whole can be received by understanding of the parts is typical for this way of thinking. This approach was typical for the sciences of modern times which analysed parts of the problem or one aspect of it only. The reductionism is to some extent necessary as it allows grasping and understanding of complex problems and their solution. The price we pay for reductionism is that we lose something out of sight. However the reduction may not reduce the substance of the system. If that happens the elements or approaches seem to be related externally only.

Mechanism is based on the idea that any behaviour may be explained by causally working processes. Any relation among objects may be explained by repetitive relation of cause and effect. Mechanistic thinking is too schematic and often mixes time or space coexistence and causality. Causality often has the form of linear causality where the causality is unidirectional; every factor has an influence independent of other factors, its influence doesn't change. (Bureš, 2011)

Foerster (2003a) adds to causality deduction as another obstacle hindering the development of system thinking. Something that cannot be explained - for which we cannot show a cause or for which we have no reason - we do not wish to see. Something that cannot be explained cannot be seen.

The system approach is a reaction to it which tries to respect the system as whole which is more than its elements. I think we can characterize the mechanistic and reductionist approach as objectivist. It considers the parts as independent particles without any deeper sense which are just combined together to form a sum. The new systemic perspective respects the unique sense of the whole. The system approach doesn't ask where the sense of the whole comes from, it takes it as finished, but in any case discoverable and describable sense. In any case the system approach is closer to the way we perceive things. We don't see them as compositions of elements, we see them as wholes. Take the example of the man. He consists of parts, but for us the whole is most important, his life, his personality. It is true we can decompose him into smaller elements, but we add something to them which makes the elements into one whole. And many other things are also considered wholes and not just aggregates of parts. The holistic sense is something that transgresses the parts. Another principle of system approach is that it shows individual perspectives are insufficient and we live in a world where every perspective is valid, but not absolutely, relatively only.

SECOND ORDER CYBERNETICS

The origin of the holistic sense was not a problem in the beginning of cybernetics. However it started to interest some people, e.g. Heinz von Foerster, Humberto Maturana, Gordon Pask, Ranulph Glanville, and Paul Pangaro and others in the 60s and 70s. H. von Foerster characterizes the second order cybernetics as a theory of the theory: "a brain is required to write a theory of a brain. From this follows that a theory of the brain, that has any aspirations for completeness, has to account for the writing of this theory. And even more fascinating, the writer of this theory has to account for her or himself. Translated into the domain of cybernetics; the cybernetician, by entering his own domain, has to account for his or her own activity. Cybernetics then becomes cybernetics of cybernetics, or second-order cybernetics." (Foerster, 2003b, p. 289)

Foerster (2003a) states there is a cognitive blind spot, a delusion within objectivity. He characterizes the delusion as a supposition that the properties of the observer shall not enter the description of his observations. Foerster asks how it would be possible to make a description if not the observer were to have properties that allows for a description to be made. The claim for objectivity seems illusive for him. What we must do is to ask about the properties of the observer. What we must do is to deal with observing and not only with the observed. The first order cybernetics deals with observed system whereas the second order cybernetics is the cybernetics of observing systems. Gordon Pask (1969) distinguishes two types of cybernetics. In the first one the observer enters the system by stipulating the system's purpose. In the second-order stipulation the observer enters the system by stipulating his own purpose. He deduces from that that the second order cybernetics allows the observer to stipulate his purpose and be autonomous. Otherwise somebody else will stipulate the purpose for the observer.

Foerster (1969a) uses two propositions to describe the second order cybernetics. He uses Maturana's theorem that "Anything said is said by an observer." and supplements that with his thesis "Anything said is said to an observer." The theses connect three concepts: the observer who is able to make descriptions, the language which connects the two observers. This connection establishes the concept of a society – the two observers constitute the elementary nucleus for a society. One cannot say which concept was the first and which was the last. We need all three.

To summarize the difference we can say the first-order cyberneticist studies the system as passive, objectively given that can be freely observed, manipulated and taken apart. The second-order cyberneticist works rather with an organism or social system and recognizes that system as an agent which interacts with another system – the observer. Observer and observed cannot be separated and the result of the observation depends on their interaction. The observer is a cybernetic system which constructs a model of the observed model. That is why second-order cyberneticists stress the role of epistemological, psychological and social aspects.

MULTIPLE PERSPECTIVES

However what happened after 1960 was a development of multiple perspectives in system science and cybernetics. Charles Francois (1999) remarks that after 1960 it becomes quite difficult to spot every

innovator and to place her or him within the general landscape of systemics and cybernetics. That is quite correct and is related to the orientation of the new science. If it is the observer who stipulates his own purpose and we may also say point of view then every observer can have his own perspective and see the system differently. The observation is perspectival – what a person sees depends upon his or her background.

A synoptic view at the difference between first and second order cybernetics shows Umpleby (2001).

Author	First order cybernetics	Second order cybernetics
Von Foerster	Cybernetics of observed systems	Cybernetics of observing systems
Pask	Purpose of a model	Purpose of a modeller
Varela	Controlled systems	Autonomous systems
Umpleby	Interaction among the variables in a system	Interaction between observer and observed
Umpleby	Theories of social system	Theories of the interaction between ideas and society

Chart 1 – Comparison of first and second order cybernetics

In general all the authors of the second order cybernetics stress the importance of the observer, but the specific perspective each of them has is different and so their cybernetics is in its content different.

We must say the development of cybernetics was gradual. It actually went from engineering cybernetics through biological cybernetics to social cybernetics. Many earlier second order cyberneticists were biologists which influenced their thinking. They had to fight their approach through the hard system thinkers who respected the wholeness of the system but still saw it mechanistically. The founder of system science L. von Bertalanffy was a biologist and was inspired in his system thinking by biological phenomena. H. von Foerster was also inspired by biological functioning of the brain. Gordon Pask was a psychologist who was interested in learning. Maturana - another big cybernetic - was a biologist. Von Glaserfeld also stressed the living character of systems. A natural step forward would be the social system science or social cybernetics which would consider the cultural aspect of man. Some steps towards it were made by N. Luhmann, F. Geyer, Umpleby and others. (François, 1999)

Umpleby (2001) shows his version of cybernetics development:

View	Engineering Cybernetics	Biological Cybernetics	Social Cybernetics
Epistemological view	A realist view: knowledge is a picture of reality	A biological view: How the brain functions	Pragmatic view: Knowledge is constructed to achieve human purposes
Key distinction	Reality vs. scientific theories	Realism vs. constructivism	Biology of cognition vs. observer as a social participant
Task to be solved	Construct theories which explain observed phenomena	Include observer within the domain of science	Explain the relationship between natural and social sciences
What must be explained	How the world works	How an individual constructs reality	How people create, maintain and change social systems through language and ideas
Key assumption	Natural processes can be explained by scientific theories	Ideas about knowledge should be rooted in neurophysiology	Ideas are accepted if they serve the observer's purposes as a social participant

Chart 2 – Three versions of cybernetics

ANALOGY BETWEEN SYSTEM SCIENCE AND PHENOMENOLOGY

The development of system science strikingly resembles the development of continental philosophy in the 20th century, namely phenomenology. This movement appeared at the beginning of the 20th century as a reaction to both scientific thinking and subjectivism. They were considered branches of scepticism and relativism. Scientific thinking tries to deal with facts in the sense of empirical data only. This means reduction of sense to facts and atomic data. We can only connect them into some aggregates, but without any sense that would transcend them. The emphasis on experienced data reduces the importance of the connection between them which may be considered arbitrary and controversial. That is why reality consists of these data only. Phenomenology was an attempt to connect the activity of the subject with the response of the object. However Husserl still remained bound to the tradition he criticised and tried to find the origin of the sense making acts in the subject and believed it could be described in all its aspects. This resembles the development of system sciences which criticised the classical sciences for their reductive approach and appraised holistic sense of objects. In its further development the second order cybernetics also stressed the observer's role and the dependence of system on him. An important concept in phenomenology is intentionality which means directedness toward something in the world, the property of consciousness of or about something. In Husserl's point of view phenomenology is the study of the structure of experience or consciousness ranging from perception, thought, memory, imagination, desire, linguistic activity etc. There are various grounds or enabling conditions of intentionality including embodiment, bodily skills, cultural context, language, social background etc. Experience was studied by reflection on experiences as we experience it – we proceed from the first point of view.

The development of phenomenology showed that Husserl's expectation to develop a science of the phenomena can't be fulfilled as both the phenomena and the consciousness are not as clear and

unambiguous as they seemed. I think the development of phenomenology shows a possible future for system science. It won't be called science, but maybe system theology not because it would be directed towards God, but towards something we don't have under our control and which transcends us.

NEW IDEAS IN PHENOMENOLOGY AS A POSSIBLE FUTURE FOR SYSTEM THINKING?

The phenomena that should be studied in the new development of system science should be those that express respect for autonomous and independent development of system structures that are not constructed by the self and its activity. This approach shows a direction towards ethical respect for the world and its systems. In other words the systems construct themselves in front of the spectator and he should respect it. The basic phenomena are spontaneous construction of the sense, body experience, the demand of the other, and donation (Tengeley, 2006). These phenomena have no relation to classical objectivity. Objectivity is calculated and predictable, but these phenomena not.

Let me try to address two aspects, namely body experience and spontaneous construction of the sense together as they were treated by Merleau Ponty. According to Shusterman, 2005 Merleau Ponty agrees to the deficiencies of our body (illnesses, injury, fatigue, ageing etc), he sees them as necessary conditions for our perception of the world. Merleau Ponty wants to restore our contact with the things themselves and the world as they are given to us before knowledge and reflection. He stresses the importance of spontaneity that is characteristic for such perception. This original consciousness was forgotten as the reflective thinking considered it insufficient for everyday activities and substituted representations for them. Merleau Ponty criticises representations as unnecessary and inaccurate. For example the passing through an open door can be explained in terms of visual representations of open space, of the door frame, of my body's movement. But usually we don't have any such conscious representations when passing through the door. Merleau Ponty argues these representations are reflective theoretical explanatory notions falsely imposed onto original experience. In addition to that they can't explain how they are sorted out from other irrelevant representations and synthesized in successful perception. The unreflected intentionality silently and spontaneously organizes our world of perceptions without explicit thinking. To show the power of this level of perception Merleau Ponty describes it as marvellous, miraculous and magical.

The demand of the other comes originally from E. Levinas, but can be extended to other areas as the being (Heidegger), god (J.L. Chrétien) or life (M. Henry). The generalization of the concept can be found at J. L. Marion who speaks about donation without the necessity and even possibility to identify the giver. This area provides more questions than answers and tries to deal with phenomena in a non-metaphysical way. Because of the subtlety and delicacy of this way I'd prefer to deal with the Levinasian treatment of the other (Waldenfels, 2004). Levinas is almost obsessed with the otherness of the other. The other manifests itself not as something given, but as something which interrupts our course of living. The real bewildering effects of the face of the other lose their urgency if face is taken as something too real or too sublime. The whole experience becomes estranged. In his book *Totality and infinity* (1969) Levinas shows the ground contrast in which the other can be understood. Totality is the reign of the same, everything exists as part of a whole or case under a law. Everyone is violently reduced into anonymity. This totality is contrasted with infinity of the other whose otherness cannot be compared with any order. Levinas expresses that exteriority or transcendence happens 'in the face of the Other' (Levinas, 1969, p. 24), requiring a new 'thinking in the face of the Other' (Levinas, 1969, p. 40). We can say about the face only what it is not or that is not something at all.

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CONCLUSION

I think system science needs a new impulse to be able to answer the demands and questions of our time. Our world is too complex to show striking similarities among systems. The second order cybernetics remains in its study of observers. A possible new area of research could be the study of systems which are out of our control. There is an obvious relation to ethics which deals with the treatment of the independent free other. And I think that is what we need to experience the world in its independence and autonomy and let it evolve all its traits.

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KNOWLEDGE THEORIES AND MENTAL FUNCTIONS

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ABSTRACT

The article highlights the growing importance of human and social capital (so called non-material capital) and the fact that the higher the income category of the country is, the greater the importance in its economy the human and social capital has (for countries with the highest income per capita the share of non-material capital on the total capital is more than 80%).

The aim of the paper is to draw attention to the need for a holistic approach to individuals as well as to the potential problems of mental models. On the basis of the analysis of the knowledge theory the authors complete the idea by the familiar way: from DATA through INFORMATION and KNOWLEDGE to the SYSTEM INTELLECT in the spiritual WHOLENESS. The authors demonstrate that the sequence: data – information – knowledge – intellect can be supplemented with: scientific knowledge and discoveries – principles – theories – innovations of paradigms (of science).

KEY WORDS

Data, mental models, knowledge, tacit knowledge, knowledge capital.

INTRODUCTION

Thinking in general and especially the systematic thinking is connected to the person, or, taking into account the synergy of team interaction - to a group of people. Physical and non-physical means of human thinking are to a certain extent substituted by IT. In this article the authors are not going to discuss the mysterious human soul as known scientists (e.g. Grof, Jung, Halík) have already done. Parallels could be drawn with mental picture of the reality, mental models or principles of primary orientation in the problem of existence in steadily rationalizing picture of a mental map. Somewhere, where psyché cooperates with brain or in material projection of a team on paper or any other graphical carrier.

Persons use their psychological functions in combination and vice versa because they think in a visionary way perceiving less or better the reality or feeling all connections.

The authors do not assess, whether psychologists are more or less systematic. However, the concept of conscious and unconscious is scientific (Jung) and is described as the integrity of psyché of a person and at the team level. Analogically, people dispose of machines, which contain data in electronical memory and with the means to revoke them back to the operational zone for real-time processing. Thus, as in managerial decision-making, there always has to be a person at the beginning and at the end of a process.

We do not know, how the Creator and evolution created (the soul of) human, however, the people create knowledge theories in that way these theories are able to cover even some indelible relationships of knowledge products of the particular individual.

KNOWLEDGE CAPITAL IN ORGANIZATION MANAGEMENT

In today's world it is not the volume and quality of natural resources or production capacities that are of biggest importance for the creation of wealth, but people and their knowledge. The totality of knowledge that an organization can dispose of and their practical application are the intellectual capital of the organization, which together with material resources create its total (market) value.

Table 1. Wealth in different countries by income levels in 2000 (per capita) presents the share of asset types (natural resources, production and intangible assets) in total wealth.

Country by income levels	Natural resources		Production assets		Intangible assets		Total wealth	
	USD	%	USD	%	USD	%	USD	%
Countries with low income	1 924	25,54	1 174	15,59	4 434	58,87	7 532	100
Countries with medium income	3 496	12,66	5 347	19,36	18 773	67,98	27 616	100
Countries with high income	9 531	2,17	76 193	17,35	353 339	80,48	439 063	100
World	4 011	4,18	16 850	17,58	74 998	78,24	95 860	100

Source: Vlastní výpočty a zpracování podle CZESANY, Slavoj, JOHNSON, Zdenka. Ekonomický cyklus, hospodářská politika a bohatství zemí. Praha: Oeconomica, 2012, p.176.

Table 10 – Wealth in different countries by income levels in 2000 (per capita).

The table 1 reflects the following trend: the higher the income in a country is, the higher the importance of human and social capital (the so-called intangible assets) will be. In countries with low income in 2000 intangible assets accounted to 58.87% of the total wealth, while in high income countries to 80.48%.

The management practices, which bring desired results with effective performance, can be considered a pragmatic feature of organization management. Public institutions have normative output and limited inputs. It is necessary for the style management of a public institution to correspond to that of a competitive one. Ordinary and managerial work has to be effective and flexible as well. And these qualities are beared by persons, professionals. It is difficult to apply the approaches of leadership in contrast to a non-creative bureaucratic stereotype. However, it is necessary to take into account soft methods of work and management. Quality management can only be implemented there, where the knowledge management is applied with employees, who are striving for personal development.

While hiring new employees, the HRs have to deal with the risks, which are stipulated by impossibility to assess the qualities of applicants, which are hidden in their tacit knowledge and mostly in their usability in a certain activity.

The human potential of public organizations employees, professionals and managers in governmental bodies is based on the lifelong learning, actualization of normative knowledge and personal development. The quality of the personal development of an employee is not of ordinal character, but it is necessary to pay our attention to the optimal composition of the team within the functional and homogenous department. The human personality is characterized by the fact that some of the people's mental functions are developed more at the expense of inferior functions. That is why the composition of a team requires some of its members to possess perception and feeling, while the others to dispose of thought and intuition.

MENTAL MODELS AND PROJECT MANAGEMENT

An ability to create some mental vision both a rational engineering and creative open to originality and visionary usability of ideas is included among determinants of people's behavior in working environment.

Theoreticians and Methodists view mental models in various ways such as "inner representation of the real world" (Mildeová, Vojtkov, 2003), surroundings of human system as a vision leading towards the solution of particular problem. Human talent can be applied together with assiduousness only. Metaphor seems to be very particular only when there are conditions for the innovative idea to materialize as for the tools of appreciation and as for the result, i.e. work.

In case of bridge construction competition the project developing the idea which is a mental model of top-ranking architect will win. Project principles can be used even in a state bureaucracy in which a hierarchy: idea - conceptual design – approval – change of processes, can lead to improvement and modernization of public sector section.

A few dozen years ago the following was pronounced: "the picture of the world around us we have in our mind seems to be just a model," – J.W. Forrester verified this idea in computer modeling of "system dynamics" in the course of many applications. Simulating various prognostic models such as the town development or some national economy branch is as to result relevance dependent on data quality and availability. Apart from objective statistics it is a matter of expert tacit knowledge but under the conditions of the right algorithm development of relationship. Then the significant value can be improved or saved by professional interpretation of talented author and experience of system synthesist.

According to Senge (Senge, 1990 in Mládková, Jedinák, 2009, p. 254) there are mental models "visions, presumptions and stories modeling our behavior". They are also the main reason why people reject to adopt new ideas, change themselves and adapt, may be thanks to some fear of losing their security. Mental models affect even the way of individual's perception of the world and the way of his responding to various stimuli. They also affect his ability to cooperate and learn. Mental models affect an individual, his way of behavior and perception of real world. The two individuals having various mental models perceive and describe the same event in a different way because they pay attention to different details and facts. Potential problems of mental models lies in both they can be incorrect or they exist in our mind only and we are not aware of them.

Excursus into the knowledge theory contributes to finishing our ideas: from data across information and knowledge to system INTELLECT in the spiritual WHOLENESS.

TO SOURCES OF KNOWLEDGE THEORIES

According to Berllinger (In Zuzák, 2011, p. 120) "information helps to comprehend relationships, the knowledge of the system and wisdom of principles." Fleming (In Zuzák, 2011, p. 120) points out the fact the total of data is not information, the total of information is not knowledge, the total of knowledge is not intellect and the total of wisdom is not the truth. So the total cannot be understood as some summation of all its parts because it is synergic.

While the basis of data and information control lies in IS/IT processes and systems, the purposive work with holders of knowledge, i.e. employees of the firm is the basis of knowledge management. A task of knowledge management is to ensure some transformation of individual knowledge of the particular employee into the societal knowledge that is shared within the firm. So this way the prime objective, which is the ensuring the employees will have the right knowledge in the right time, could be reached. This helps to run the firm more effectively. Knowledge in a real time?

Krninska (2010) in connection with tacit knowledge and its theoretical basis from the wholeness viewpoint points out the fact the quantic physics claims through its string theory that the world consists of a large quantity of substance, but it still has its qualitative aspect.

	Explicit knowledge	Tacit knowledge
MICROSPACE ⁹ -human subject	Primacy of personal cognizance	Primacy of personal incognizance (out of cognizance) ¹⁰
INTER - and MACROSPACE – human societies	Primacy of social cognizance	Primacy of social incognizance (out of cognizance)
Source: KRNINSKÁ, Růžena. Tacitní znalosti a teoretická východiska jejich výkladu v souvislosti s podnikovou kulturou a regiony, s. 70-75. Sborník konference University Tomáše Bati, Zlín 20.5.2010. Rozvoj tacitních znalostí.		

Table 2 – Tacit knowledge and its theoretical basis from the wholeness viewpoint

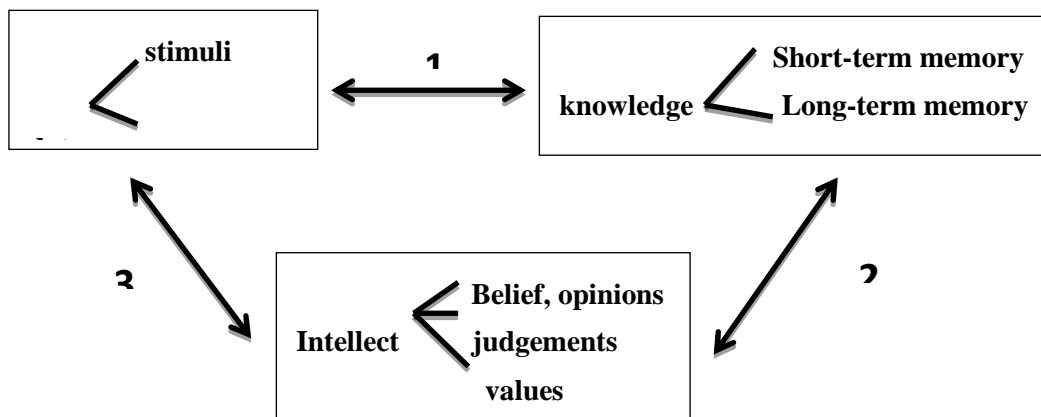
While we perceive a large amount of substance as some visible and easy perceptible world around us as it is connected with sensory perception and intellectual analysis in our cognizance above all, then our feeling and intuition can be connected to a qualitative feature of these wavelengths making a kind of information arrays. This information can be connected to our unknowing side and so we are able to transform them through certain techniques into our cognizance.

John Wheeler (Braden, 2009, p. 44) highlights the significance of influence of the around world when he says that “no elementary phenomenon is not a phenomenon until it is observed (or recorded)”.

Scheme 1. The interactive system of forming knowledge and various sharing processes describes the interactive system of forming knowledge including participating processes and presents the fact that every new knowledge is a result of certain interaction between an individual and his inner and outer environment. In this interpretation knowledge is a result of specific structuring of data depending on own perceiving of the world.

⁹ The human individual (microspace) is in the interaction with interspace (i.e. minor community such as business organization, company, firm, region) or with the whole global society (macrospace). In connection with this interpretation every human individual (and their community) has his witting and unwitting side.

¹⁰ Heffernenová (2008) uses rather the term out of cognizance in the sphere of incognizance and all its levels. Source: Krninská Růžena. Tacitní znalosti a teoretická východiska jejich výkladu v souvislosti s podnikovou kulturou a regiony, p. 70-75. Sborník konference University Tomáše Bati, Zlín 20. 5. 2010. Rozvoj tacitních znalostí.



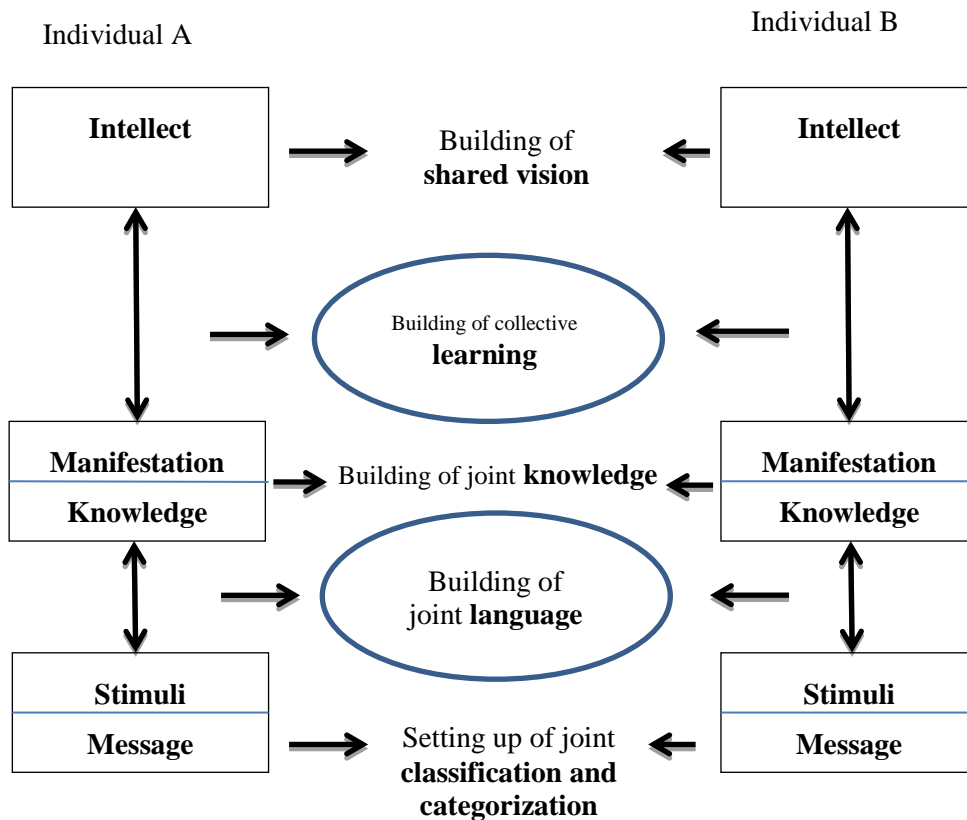
1 Heuristics, regulation / Structuring

3 Direct perception

2 Belief, opinions / judgements / values

Scheme 1 – Interactive system of knowledge forming¹ and various participating processes (Amin, Cohendet, 2004)

Scheme 2. Interaction among individuals in forming knowledge presents mutual affection between two individuals. Building of shared vision is possible only on the basis of creating some joint classification and categorization, i.e. joint language and on the basis of joint knowledge that is processed in collective learning.



Scheme 2 – Interaction among individuals in forming knowledge (Amin, Cohendet, 2004)

The wholeness attitude to employees in a globalized knowledge society requires all differences of inner and outer environment to be taken into consideration. These differences are influenced with the traditions, thinking style and life in various parts of the world.

CONCLUSION

Witting and unwitting pictures present panels of wholeness thinking in a dominant or relatively minor mental function of human being. Principles emerged within system sciences contribute to the knowledge of collective cognizance making successively defragmentation of so far disorder knowledge bringing in order possibly. Both technological media and especially people appear to be material holders of this phenomenon. The hierarchy of data – information - knowledge – wisdom can be filled in: scientific knowledge and discoveries – principles – theories – innovation of paradigms (sciences).

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THE IMPACT OF SOCIAL NETWORKS ON PERSONAL DATA

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ABSTRACT

With the explosion of social media in the past decade, it is now easier than ever before to share information with friends and family. To see how an old friend has been, phone calls and face-to-face meetings are no longer required. One can simply send a friend request in Facebook, follow him on Twitter, and or add him to a Google+ Circle. Information can then be easily shared though updates in Facebook, Tweets and pictures. But as more and more people take on to social medias to keep friends and family informed about their lives, security and privacy concerns have emerged. Because of the huge amount of information and the type of information that is available in social networks, the line between what was once considered public and private has become blurry. This paper analyzes the impact that social media has on privacy in terms of the vast information available in social media, who has access to that information, and how that information is being used.

KEY WORDS

Social media, Privacy, Personal data

INTRODUCTION

As more people have access to the Internet the amount of people using social networks have increased. According to the Central Intelligence Agency (Central Intelligence Agency, 2012), as of 2010 there are 2.1 billion Internet users worldwide, and a large amount of the time spent online is spent on social sites. In the United States, a report by the Nielsen agency showed that people who access the internet via a personal computer, spend 20 percent of their total online time in social networks sites like Facebook and Twitter, and 30 percent for those who access the internet through their mobiles (Nielsen, 2012). The amount of active users in the various social networks continues to increase. At the time of writing Google+ counts with 135 million active users (Google, 2012); Twitter has 200 million monthly active users (Rodriguez, 2012); and in October 2012, Facebook has over 1 billion monthly active users and 584 million daily active users (Facebook, 2012).

Individuals who join social networks often do so without giving serious thought as to who exactly has access to the information that they share. There is a sense that the information that they share is private and available only to them and their friends, but that is not always the case. By default, Facebook makes most of its users' data available not only to other Facebook users, but to the entire Internet (Mattmckeon.com, 2012). Unless the user changes the default security settings in his or her profile, sensitive data such as their date of birth, wall posts, and photos are available to anybody with Internet access to see. According to the Consumer Reports, almost 13 million users had never changed their profile's default settings or were not aware of them. (Conusmer Report, 2012) Leaving the default setting can often lead to negative consequences.

KNOWN CASES

In the past years there have been cases of people who have had to deal with the consequences of making certain information public in social networks. (Böhmová & Malinová, 2013) In 2007 Kevin Colvin, a bank intern, missed work because of a family emergency, but was later fired after the employer realized, thanks to a picture in Colvin's Facebook profile, that the "family emergency" had in reality been a Halloween party. (Gawker.com, 2012) In a similar case, Nathalie Blanchard, a Canadian woman who had been diagnosed with major depression was on work leave and was receiving monthly payments from an insurance company. But in 2009 the insurance company stopped sending the payments after an insurance agent saw pictures of her having fun at the beach and in a stripper club in her Facebook profile (Huffington Post, 2009). And in 2011, the sexuality of two college students was outed to their fathers after the choir's president added them to the university Facebook's Queer Chorus group. (Fowler, 2012) As put by American Civil Liberties Union attorney Chris Conley, "users are often unaware of the extent to which their information is available, and if sensitive info is released, it is often impossible to put the cat back in the bag." (Fowler, 2012)

But even those who are not members of social networks are also feeling the impact that social networks have on privacy. The personal information of those individuals that have decided to opt-out of social networking can still end up in social networks through the updates made by their family relatives and friends. For example a person, who decided to have a party at his home, invites a few friends over. Some of those friends will be active members of some social network and can tag their exact location as well as upload photos of the house and of the host. This is what happened to Nick Bilton from the New York Times, who held a dinner party, and while he had not share any details about the party, people found out about the party through the social networks. As he explained, "you don't have to be [part of social networks], since other people can announce your location, and share pictures and videos of you, conveniently tagged with your name for anyone to find quickly." (Bilton, 2012) With the large amount of active members in the various social networks, it is almost impossible for someone's photo not to end up on them or to have their name and location tagged in a post.

Social networks can also be used for other purposes than to keep connected with friends and family relatives. Employers are now using social networks as part of the background check process of future employees. According to a survey done by Careerbuilders.com, which was completed in 2009, 45% of employees reported using social networks to research future employees, and 11% would start in the near future. (Haefner, 2009) Some of the reasons given for not hiring a candidate included the posting of "provocative or inappropriate photographs or information," candidate's postings about drinking or drug usage, and candidate's bad-mouthing their previous employer, co-workers or clients. College admission officers are also resorting to social media to research the applicants. According to a Kaplan Test Prep survey (kaptest.com, 2012) conducted this year, 27 percent of college admission officers used Google and 26 percent used Facebook as part of the applicants' review process. The Internal Revenue Service also scans social networks, according to a 2009 training manual, to "assist in resolving a taxpayer case," and the Department of Homeland Security can friend people to investigate any fraudulent activities. (Consumer Report, 2012) It used to be that online communications and other activities, for the most part, had little consequences in real life because users could remain anonymous. With the addition of social networks, however, that is no longer the case since a lot of online activity can be traced back to the user.

Privacy concerns are not only in regards to the tendency of individuals to divulge very personal details online, but also in the type and amount of information that social networks gather. Social networks get most of their revenue from advertisement that is targeted to a specific group, and one way to achieve this is by gathering as much data as possible from their users. The more information a user shares, the more information that could be gathered about him or her which results in a better-targeted advertisement. As explained by the founder of the Center for Digital Democracy, a consumer group, Jeff Chester, "Facebook has purposefully worked to erode the concept of privacy by disingenuously claiming users want to share all of their personal information." (Consumer Report, 2012) It can be argued that the users' desire to have control over the information that they share online, as far as what can be made public and what should remain private, and the social network's revenue model are at opposite ends.

Facebook also gathers data through its social plugins, which are used by other websites. These plugins take the form of a “Like” or “Recommendation” button. According to Consumer Reports, the plugins records the visitor’s IP address and the date and time of his or her visit to that specific website, even if the visitor does not click on any of the plugins, and even if the he or she is not logged in into Facebook. (Consumer Report, 2012) As of 2010, more than 2 million sites have added Facebook’s social plugin, as part of their website. (Crum, 2010) Privacy watchdogs are concerned that over time, the data that is gathered can be compiled to establish a clear link between the IP addresses and the data that is gathered.

SOCIAL MEDIA AND POLITICS

Users can use their social media credentials to gain access to service of third party websites. For example, a user is no longer required to sign up or register to post a comment in a blog or forum, he or she can simply click the “Login With Facebook” option and use his or her Facebook email address and password to post that comment. The percentage of websites that have integrated Facebook plugins continues to increase, and as of the time of writing 25.38 percent of the top 10,000 websites uses them. (Builtwith.com, 2012) This raises several privacy concerns, such as divulging the user’s identity and data stored in social networks to third party websites, makes it harder to pinpoint a breach of data, and allows the third party websites to gather their own information on the user. (Kontaxis, 2012) As more and more websites decide to integrate Facebook plugins, it is harder and harder to surf the Internet without revealing one’s identity.

Third party applications also share and gather information about a user. When a person uses a Facebook app, such as a game, the maker of that app has access to that person’s information stored in Facebook. According to Consumer Report, information can include, the user’s name, list of friends, and even information shared between friends. (Consumer Report, 2012) And according to a survey conducted by the same organization only 37 percent of users have used Facebook’s privacy setting to customize what kind of information can be gathered by the apps. In the recent presidential race, both President Barack Obama and Mitt Romney used the power of social media to gather information about potential volunteers and supporters. Mitt Romney’s campaign promised to divulge his choice of vice-president through a mobile app, and while the app was a failure, it was successful at collecting the user’s information, such as their email address. (Mazmanian, 2012) In the case of President Barack Obama, the campaign gained access to the user’s Facebook data and information on their Facebook friends for those people that liked the “I’m in” Facebook page. (CQ Researcher, 2012) It is not clear for what purpose the gathered data could be used or for how long it could be stored.

SOCIAL MEDIA AND CONTROL

As a way to have more control over their online information, users have pushed for more transparency on the data that social networks gather on them. Max Schrems, an Austrian student requested Facebook to hand him over all the data that it had gathered on him. The file was 1,222 pages long, and as reported by the New York Times, “it contained wall posts he had deleted, old messages that revealed a friend’s troubled state of mind, even information that he didn’t enter himself about his physical whereabouts.” (Sengupta, 2012) The Facebook file of Philip Markoff, a suspected killer, also contained detailed personal information. According to Consumer Reports, his file “included copies of his wall posts, page after page of photos, a list of the exact times he logged in, his IP addresses...as well as his list of friends.” (Consumer Report, 2012) Some social networks such as Facebook and Twitter have now given their users the option of downloading an archive of their online data.

Because of the large sum of data that is gathered through social networks, privacy advocates are pushing for legislation that would protect users’ personal data. The United States, unlike European countries, has weaker legislation that protects the users’ personal information when they go online. In 2011, Malcolm Harris, an active Twitter member and member of the Occupy Wall Street movement was arrested for obstructing traffic. As part of the investigation, the New York County District Attorney’s Office issued a subpoena to Twitter requesting “any and all information” that it had on

Harris (Chapa, 2012). Failure to do so could result in fines for Twitter, so in 2012 it complied. Privacy watchdog worry that there is a lot of data stored in social networks that could be easily obtained with just a subpoena, which bypasses the courts and the user himself. And because the data is stored in a third party software and not the user's personal computer, the 4th Amendment does not offer the same protection against unreasonable search and seizures. (Chapa, 2012)

When requesting information through a subpoena, the government bypasses the user by issuing the subpoena to the service provider. Leaving the user out of the loop shows the limited control that users have over their online data. As put by Harris,

everyone else is getting to say why that information should be disclosed, and at each level the user, who should be recognized for having a real interest in the proceedings, has been denied or ignored...the appropriate person to stand before the court and address these issues is the person whos communications are at stake and the person who really has privacy intersts in those communications. (Chapa, 2012)

Most users message friends and update their status on social networks without giving much thought as to where the information is stored, and who has access to that information. They fail to understand that deleting a picture or private message from their profiles, does not mean that that picture and message are gone forever; they are still stored in the provider's server, which can to be accessed by different people, including the government.

Experts argue that legislation has not kept up with the pace of social networks, and it is unclear how user's data can be gathered, for what purpose, and who should have access to that data. There are no clear guidelines on how social networks should protect the data of its users. In 1986, congress enacted the 1986 Electronic Communications Privacy Act (ECPA), which was aimed at protecting unauthorized government access to user's online data, but some argue that this act has become outdated because of the explosion in online data. According to the Digital Due Process Coalition, the ECPA "can no longer be applied in a clear and consistent way, and the personal information generated by today's digital communication services might no longer be adequately protected." (Chapa, 2012) With so much data being stored in third party servers, it is time for Congress to enact legislation that can appropriately address the privacy concerns of living in a social network age.

In the past years there has been a push for protecting the amount of data available in social networks. As mentioned above Facebook and Twitter now allowed their members to download a history of the data that they have shared online. At the time of writing, Facebook updated its security settings, which made them easier to find and simpler to understand, and when users login to Facebook there is a message on top of their newsfeed asking users to "please take some time to review who can see your stuff." And in September 2012, California Governor Jerry Brown enacted legislation that made it illegal for employers and universities to ask for social networks users for their email and password. (Sabaté, 2012) But there is still need for stronger legislation at the federal level to ensure that users' data is protected from unauthorized access.

CONCLUSION

Social media is here to stay, as more and more people use them in their daily lives. With every Facebook update, every tweet, and every photo uploaded the amount of data gathered by social networks has exploded. But as shown above, sometimes there is a thing as too much sharing, or sharing carelessly, which have had negative consequences on some users. People have lost their job, health insurance benefits, and have lost control over their most personal secrets because of information divulged in the social networks. Even the privacy of those who decide to opt out of social networking is infringed upon because of the way that social networks, such as Facebook's social plugins, gather data and because of the constant updates of friends and family. Employers, universities, and other government organization are now using social networks as part of background check on people. The gathering of data is no longer limited to the social networks themselves, but has expanded to third party members such as app developers and websites that allow users to login with their social network credentials. To add on top of that, the United States has weak legislation that protects how user's online data can be gathered and how it can be accessed. Until stronger legislation is enacted, and cases

are settled in courts it is unclear how social networks should protect the user's data. Before updating their Facebook status, or Tweeting party pictures, people should really think who has access to that information and how it could be used. As put by Jon Kleinberg, Professor of Computer Science at Cornell University, "when you're doing stuff online, you should behave as if you're doing it in public – because increasing, it is." (Lohr, 2010)

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EFFECTS OF NEW MEDIA ON U.S. POLITICAL CAMPAIGNS

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ABSTRACT

New forms of media have always affected United States presidential elections. Long ago, the introduction of new inventions such as the radio and the television changed how candidates could communicate with the public. These technologies allowed people to feel closer to the candidates than ever before. The most recent form of new media, which is still evolving now, is social media. Social media sites are allowing politicians to send immediate updates regarding anything from political issues to what they are eating for dinner, allowing people to feel a personal connection to them. Using social networking tools, politicians are able to target their “friends” or “followers” with messages directly to them. Furthermore, it allows them to target the younger voters who are extremely active on social media websites. This new campaigning technique is quickly proving it will be an integral part of all future elections.

KEY WORDS

Social media, US elections, 2008

INTRODUCTION

The first traces of social media becoming a major factor in politics occurred in the 2004 presidential election. This election was the first time when all major candidates had at least one website, and many had multiple websites and blogs (University of Washington, 2004). Howard Dean showed some good success raising money and awareness with his internet campaign, but social media was not enough to support him throughout the process. However, the time between 2004 and 2008 elections brought the expansion of Facebook and the birth of Twitter and YouTube. By 2008, Facebook had 44.3 million users, Twitter had 3.4 million users, and there were 121.4 million online video viewers (Dugan, 2012). With such a huge audience, social networking became a primary target in the 2008 election.

TARGETED MESSAGE

Social networking sites such as Facebook and Twitter have enabled politicians to send direct messages to the public. This has become a very cheap and effective way for politicians to market themselves. The messages target certain people based on anything from their location to pages they have liked on Facebook or people you follow on Twitter (Goodale, 2011). Furthermore, political marketers can gain access to email addresses, phone numbers, Facebook friends, and any other information on Facebook through data mining. Having phone numbers and email addresses gives the campaigners more forms of media to market to and connect with the voters. Data mining has also led to a marketing technique called microtargeting, which political campaigns use to “analyze data about voters and make subsequent decisions about whether to target voters with marketing based on their analysis” (Buran, 2013). This allows them to save time and money by avoiding people who will not sway their vote.

VOTERS' INVOLVEMENT

Social networking has been a particularly successful way for political campaigns to get their supporters more involved. For example, by simply tweeting or posting a status about a rally coming up, all of their followers on social media are able to join in and help if they want to. In 2008, Barack

Obama took this idea one-step further by making his own social networking website, my.barackobama.com, or MyBO. Steve Hildebrand, the man behind the Obama campaign's strategic decisions, said MyBO was "designed to help supporters connect with one another and organize in their own communities" (Barajas, 2009). Bringing the people together throughout the country was a big goal for the Obama campaign. This feeling of involvement and contribution carried over into the fundraising as over 70 million personal fundraisers donated via the internet (Finney, 2012). "80 percent of the 639 million dollars raised came from donations that were 20 dollars or less" (DragonflyEffect, 2013). DragonflyEffect also reported that one way Obama encouraged people to donate was through his "Dinner with Barack" events. The Obama campaign hosted two of these events, which brought in four selected donors of any amount to sit and have dinner with Barack while discussing political issues that mattered to them. The events were broadcasted on YouTube and eventually went viral. Seeing Obama sit down with everyday people brought his campaign to the personal level in many voters' eyes.

YOUNG VOTERS

The group that was arguably most affected by the social media campaign in 2008 was the younger generation. These are the biggest users of social networking, so they were heavily exposed to Obama's 2008 internet campaign. Steve Hildebrand called them the "millennial generation" which consisted of 75 million Americans between the ages of 12 and 29 (Barajas, 2009). These under 30 voters have long been known for not showing up when it counts on Election Day. Steve Hildebrand and the Obama campaign used social media to challenge the young voters to make an impact, and sure enough, they did. According to CIRCLE (The Center for Information & Research on Civil Learning & Engagement), "An estimated 23 million young Americans under the age of 30 voted in the 2008 presidential election, an increase of 3.4 million compared with 2004." CIRCLE also reported that it was the first time since before 1992 that over 50% of under-30 Americans voted. This increase was huge for Obama, as the 18-29 age group had 68% Obama votes, by far the highest percentage of Obama votes compared to other age groups (CIRCLE, 2008). The Obama campaign was most definitely the winner among the young generation, in part due to his commitment to social media as a marketing technique.

LASTING EFFECT

This social media in politics does not only affect the campaigns of politicians, but their stay in office as well. These connections on social media usually stay connected throughout the presidency, allowing the president to further establish personal connections with followers, as well as build his following throughout the term. For example, in March 2012, just seven months before the election, Obama had 12.5 million Twitter followers compared to Mitt Romney's 350,000 (Kessler). This allowed Obama to jump start his 2012 campaign with direct messages, phone calls, and emails to his 2008 supporters leading them to his website of "events, volunteer opportunities, and ways to donate money" (Mehta, 2011). Obama again did not let off the gas pedal with his social media approach in 2012. By August 2012, "the Obama campaign posted nearly four times as much content as the Romney campaign and was active on nearly twice as many platforms. Obama's digital content also engendered more response from the public-twice the number of shares, views and comments of his posts" (Pew Research, 2012). Romney was never catch up to Obama's social media campaign. It may be that the disadvantage he started at was too much to overcome, given that Obama was the previous president and already had millions of followers, or it may be that this market was not one of his primary targets, but regardless Obama was able to continue his success online and follow up with another victory on Election Day.

Barack Obama was the perfect candidate for the 2008 social media election. At the time, everybody was ready for change given the state of the economy and the war that we had been in for several years. On top of this, the social views and standards of people were changing. Thoughts about same-sex marriage, abortion, and other social issues were becoming more liberal in America. Obama came off as the young, hip president who would be able to make significant changes in the country. He gained the trust of the public, which had been lacking under the previous administration, through his

incredible speaking and perhaps more importantly, his personal connection to the people through social media. The public, especially young people, really embraced Obama because they felt they had more in common with him than other politicians. He seemed to take the nation under his wing, bringing people together through social networking websites. People loved getting instant updates from Twitter or Facebook about important events. I believe that this brought higher interest to the campaign as a whole because people would strike up conversations at work or wherever they were when the updates broke. Before this campaign, they had to be sitting in front of the TV or listening to the radio to hear such breaking news updates. Jon McCain also gave an effort to get involved in social media, but it never took off the way Obama's did. This was most likely because young people were more supportive of Obama. As noted earlier, Obama had over twice as many votes as McCain from under-30 voters. These people are the ones that carried the Obama social media campaign by sharing, retweeting, and making videos go viral. This sort of involvement is another big thing that Obama had going for him in 2008. He would an inspirational status or tweet, and his friends and followers would do the rest for him, spreading the message to everyone they knew. The messages and advertising spread like wildfire for Obama's campaign.

MILLENNIAL GENERATION

Steve Hildebrand and the Obama campaign's targeting of the "millennial generation" may have been one of the smartest things they ever did. It was known that the democrats had just lost the past two elections, and in order for that to change, they would either have to change the minds of previous voters or get new voters. They chose to target the new voters who very likely either never voted or voted only once because it is much easier to change the mind of someone who is new to politics than someone who has voted one party their entire life. Another advantage Obama had with the millennial generation was their social values. Very few young people in America followed McCain's beliefs of being opposed to gay marriage, civil unions, and abortion. Obama was able to market this in his favor and got many of these young voters' support. Soon, there was no doubt that the under-30 voters were behind Obama; the only question was whether they would actually cast their votes. Additionally, this target was a terrific base for starting a social media campaign. During the time of the election in 2008, I was 16 years old. Though I was not too interested in politics yet, I was an active member on Facebook and saw the effect this election had. People were constantly posting quotes from candidates, videos of their speeches, or ranting about their personal opinions. The Obama campaign was particularly successful from what I saw, considering most of my friends were the young adults that were strong Obama supporters. Many people even changed their profile picture to one of Obama's slogans "Yes We Can". This continued until Election Day, when many people began posting statuses such as "I voted today". These constant reminders and seeing people you know voting is likely a big factor as to why more young people voted than in previous elections.

TOO MUCH INFORMATION

One thing that the social media campaigns have working for them at the moment is the amount of information that they can receive about the voters. Through their data mining of Facebook, Twitter, mobile phone applications, and even Google, they can find out almost anything they want. While it may already be too late for many, I suspect that future generations of young Americans will refute against this. Privacy has become an issue of many people's concern recently, especially towards the government. For now, most people do not even realize that their phone numbers, email addresses, Facebook friends, and Google searches are being traced through data mining. However, if that information becomes more public, which it surely will someday, people will stop using the applications which give this information out. Although the people may be against this sort of privacy invasion, it works wonders for the marketing campaigns and they will continue to use it to their advantage. One has to wonder what other tactics these political campaigns could use that go even beyond data mining. Only time will tell of course, but with technology increasing every day, there is no telling what information they may be able to track by the next election.

CONCLUSION

With the first social media election of 2008 behind us, there is no looking back from here. Being able to reach out to the masses with tweets, Facebook statuses, YouTube videos, and other forms of social media as often as they like is a fantastic new tool. It makes voters aware of what is going on with the campaign, allowing them to hear about local events or fundraising opportunities. This is also the best way to reach the young American voters, which have recently proven they will get involved and could be crucial to future elections. Presidential candidates will forever use any medium to deliver their message that they can get their hands on; and with social media being a cheap, effective source, they will certainly keep using it.

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