International Institute for Applied Knowledge Management
Refereed Paper Proceeedings - KM Conference 2015 - Katowice, Poland
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Table of Contents

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How to evaluate knowledge within the organization: Research in progress report

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Abstract

Knowledge is people (O'Dell and Hubert, 2011) and knowledge is recognized as the most important strategic asset every organization has. It is very important to identify, capture/acquire, share, reuse and unlearn knowledge. These activities are managed through knowledge management. It is a rather challenging task to assess and evaluate the level of knowledge management in an organization. The Framework for Information System Due Diligence (FISDD) can be used as an approach for different information system (IS) due diligence activities. Similar to information security also knowledge and knowledge management are recently assimilating with IS. We have upgraded the FISDD with a special part of knowledge and knowledge management assessment and evaluation. The aim of the paper is to validate the upgraded FISDD with the objective to be able to effectively identify the knowledge within the organization. Few years ago there have already been some activities in this framework, but there were some limitations of generality and also some limitations in research methodology. The main novelty of the upgraded framework is a new part of the FISDD Status questionnaire collecting the data for knowledge purposes. As the paper is research in progress, it represents our motivation and hypothesis, as well as current status of the research and further steps to disseminate these assessments. The paper presents a literature review of knowledge and knowledge management, especially those dealing with knowledge assessment. Overview of upgrading FISSDD is presented with the steps to choose the most appropriate methodology for the analysis, plans for case studies and draft plans for the following activities. Discussion and areas for further research section summarizes issues regarding existing research and concludes with suggestions of additional activities to enhance the illustrated approach.

Keywords: knowledge identification, knowledge evaluation, knowledge risks

Introduction

Knowledge is people (O'Dell and Hubert, 2011) and knowledge is also the currency of the current economy, a vital organizational asset and a key to creating a sustainable competitive advantage (Ragab and Arisha, 2013, p. 873). Trkman and Desouza (2012) explained the

difference between data, information and knowledge by arguing that data are observed, raw, unanalyzed and uninterrupted patterns with no meaning; information is created through aggregation of data via the application of mathematical statistics, or logical processing techniques, and make sense of by the application of knowledge. While knowledge is the collection of experiences, know how, expertise, and gut instincts that help us make sense of information (Trkman and Desouza, 2012). Knowledge is also a commodity that is not easily shared (De Loez and Petter, 2014). Knowledge is recognized as the most important strategic asset every organization has. It is very important to successfully identify, capture/acquire, share, reuse and unlearn knowledge. This is managed through knowledge management (KM).

Bhatia (2007) explained how important it is to follow a structured method for due diligence activities. In the world there are no standard guidelines for the implementation of IS due diligence activities (Baublits et al., 2005). There are quite a few approaches, standards, methodologies, and best practices for performing these tasks. Delak and Bajec (2013b) carried out various analyses of IS implementation and also indicated possible ways of due diligence delivery. The paper presents the research in progress report describing the upgraded framework for information system, current status and plans for case studies.

The remainder of the paper is structured as follows. In the next section literature review regarding knowledge, knowledge life cycle, KM and due diligence approaches are presented. This is followed by a brief presentation of upgrading Framework for IS due diligence (FISDD) Section four describes the motivation and the research objective, which is followed by a description of the research plan with case study scenarios. Section six presents research's current status. The conclusion outlines the implications of the research its limitation and further possible research activities.

Literature review

Knowledge is people (O'Dell and Hubert, 2011) and knowledge is also the currency of the current economy, a vital organizational asset and a key to creating a sustainable competitive advantage (Ragab and Arisha, 2013, p. 873). There are different definition of knowledge and knowledge models. Knowledge may be categorized into two types: tacit and explicit (Ragab and Arisha, 2013). Polanyi (1966) defines tacit knowledge as personal, context-specific and thus not easily visible and expressible – nor easy to formalize and communicate to others. He also described tacit knowledge as "we know more than we can tell" (1966, p. 4). On the other hand, he refers to explicit knowledge as being transmittable in some systematic language – such words, numbers, diagrams or models. Nonaka and Takeuchi expand Polanyi's tacit knowledge

into two dimensions, technical and cognitive. Technical is often referred to as "know-how" and the other consists of beliefs, ideals, values, schemata and mental models (Nonaka and Takeuchi, 1995). They also described knowledge life cycle with a knowledge spiral that contains the following phases: socialization, externalization, combination and internalization. Drucker (1999) wrote that the most valuable asset of a 21st-century organization will be its knowledge, workers and their productivity. Within the last years, researchers have been analyzing knowledge construction through a variety of new approaches, one of them is e-learning (Koohang et al., 2014) and recent researches regarding infoprocesses, based on knowing how to create new knowledge based on the information learned (Travica, 2014).

Knowledge is also a commodity that is not easily shared (De Loez and Petter, 2014). For each organization is very important to identify, capture, store, share and unlearn its knowledge. The first step in this process, knowledge identification is critical and vital for all further activities. Multiple models of knowledge evaluation in open online communities have been proposed, but a general conceptual framework is still lacking (Babik et al., 2014). One of the most widely cited theories in knowledge management is Nonaka's SECI model, emphasizing knowledge processes of interaction between explicit knowledge and tacit knowledge (Nonaka and Takeuchi, 1995). Knowledge management is concerned with the exploitation and development of the knowledge assets of an organization with a view to furthering the organization's objectives (Christozov and Toleva-Stoimenova, 2014). Their vision regarding activities every knowledge management process includes are: a) creating knowledge via observing, sensing, surveying, finding, analyzing, synthesizing or solving problems via exploring creatively one's own experience, etc; b) capturing and refining addresses identifying the solution as a valuable asset and converting it to a more general, more abstract way of solving problems; c) recording - transforming tacit to explicit knowledge and d) disseminating or transferring explicit knowledge, transforming explicit to tacit (Christozov and Toleva-Stoimenova, 2014). Xi (2013) argued that most enterprises are faced with same problems like limited effective knowledge or knowledge chaos and disorder, which results in enterprises enabling to carry out scientific and reasonable production management decision-making activities. One way to evaluate or assess the level of knowledge management within organizations is a maturity model (Serenko et al., 2014). They demonstrate that the existing maturity models may be successfully adapted to the context of various organizations, including the ones operating in the knowledge-intensive financial sector. Structural capital is the knowledge that the company has managed to internalize and that remains in the organization, either in its structure, its processes or its culture, even when the employees leave (Costa and Ramos, 2014), for this reason they have presented a methodology to prioritize critical intellectual capital elements based on analytical hierarchy process. This methodology represents a particularly effective way of conducting importance of identifying

and prioritizing those intangible elements that are decisive to the success of product innovation initiatives (Costa and Ramos, 2014). Ferreira (2014) argued that with technological evolution knowledge management has assumed a strategic role in the organizations. He explained that the existence of a wiki in an organization should help to promote a culture of knowledge sharing (Ferreira, 2014). New trends in knowledge management advocate the need for convergence between knowledge management and other disciplines (Handzic and Dumic, 2014). They have proposed new model that merges knowledge management with project management. One of their findings was that the model also emphasizes the importance of continuous feedback from projects for innovative knowledge creation (Handzic and Dumic, 2014).

Despite an in-depth review of the literature, no research that would identify and describe weaknesses of individual approaches, could be found. Information technology assessment due diligence framework's developers ascertained: "We found that no conceptual framework or specific tool for evaluating the IT environment of companies being acquired is readily available" (Baublits et al., 2005). Bhatia (2007) adviced a framework with specific domains to be covered within IT due diligence activities. Followed his advices, framework for information system due diligence (FISDD) was created and validated (Delak and Bajec, 2013b). At the framework validation, issues regarding knowledge and knowledge management have been identified and simple framework's upgrade has been presented (Delak and Bajec, 2015a). Ten years after Baublits's published paper there are still a lack of information system due diligence researches and related papers presented by scholars and practitioners.

Upgraded framework for information system due diligence

Based on researches and case studies made in 2013/2014 regarding knowledge and knowledge management evaluation (Delak et al., 2014), the researchers have prepared special subset of FISDD main questionnaire (IS status questionnaireto synthesize important sub-questions which are relevant for knowledge and knowledge management. This knowledge subset of FISDD could be used as a stand alone questionnaire, when the objective is to assess and evaluate knowledge and knowledge management within the organization, or can be used as part of FISDD when objective is to deliver a complete information system due diligence.

The questionnaire has almost 190 questions combined into 5 chapters. Due to the limited size of this article, the full questionnaire can be obtained by a direct request to the authors. Table 1 presents the 1st and 2nd level of questionnaire chapters.

Table 1: Knowledge and knowledge management questionnaire – 1st and 2nd level titles

Description	Number of questions
V.1 Basic information	15
V.2 Knowledge	
A: Types of knowledge	4
B: Knowledge classification	6
C: Knowledge format	4
D: Knowledge identification	7
E: Knowledge capturing steps and use of knowledge	24
F: Conversion of knowledge	7
G: Knowledge retention	11
H: Knowledge sharing	18
I: Protection of knowledge	40
V.3 Knowledge management	
A: Knowledge management program	13
B: Knowledge management capabilities	12
C: Knowledge management approach	4
D: Knowledge management maturity level	5
V.4 Knowledge management Team	8
V.5 Organization's approach to knowledge management	10

As paper describes research in progress the current status of our research is presented further in this paper.

Research objectives

Bhatia (Bhatia, 2007) explained the importance of following a structured method and Framework for Information System Due diligence (FISDD) is an example of such. The aim of the paper is to validate the upgraded FISDD (Delak and Bajec, 2013b), which can be used for different information system (IS) due diligence activities, with the objectives to be able to effectively identify the knowledge within the organization. There have been already some activities at this framework (Delak and Bajec, 2013a), but there are some limitations of generality and also some limitations in research methodology. The main novelty of the

upgraded framework is a new part of the FISDD Status questionnaire collecting the data for knowledge purposes.

The motivation for this work is to get answers to the following two hypotheses:

> H1: With upgraded FISDD identification and evaluation of the knowledge within the observed organization through IS due diligence activities is more efficient.
>
> H2: With the separate and independent part of FISDD, the evaluation of the knowledge and identification of the critical knowledge and also an assessment of the knowledge risks within observed organization, could be delivered in documented and effectively manner.

Both hypotheses have been transferred into the following research questions:

> a) Is it possible to identify and evaluate the knowledge within the observed organization through IS due diligence by upgrading FISDD more efficient?
>
> b) Is it possible to identify critical knowledge and assess the knowledge risks within the observed organization by separate and independent part of FISDD questionnaire and be delivered in a documented and effective manner?

and have been evaluated by observational methods with case and field studies. The paper presents research in progress report, its current status and further activities. Authors have been upgrading framework's IS status questionnaire (FISDD IS Status questionnaire) with a special part of knowledge data capturing. This upgrading FISDD IS Status questionnaire can be used as a standalone questionnaire for knowledge evaluation or can be used as part of complete IS due diligence evaluation.

Research plan

The methodology used is based on the basic open questionnaire (FISDD IS Status questionnaire), data analysis and at the end questionnaire related to the data gathering process. For upgraded framework evaluation we have prepared next steps: pilot test, case study set up ,with next sub steps a) organization selection; b) distribution of the questioners with the instructions how to answer to questions and how to evaluate the risks, c) collection of fulfilled questionnaires, c) feedback data analysis, evaluation of collecting results; d)

preparation of the case study questionnaire, deliver to the participated organization, collection of their feedbacks; e) feedbacks analysis and confirmation or denial of research questions.

We are planning to evaluate this upgraded framework within 25 case studies within different organizations in Slovenia (Central Europe). The selected organization's size will vary from very small (up to ten employees), small (up to 50 employees), middle (up to 300 employees) and large (more than a few thousand employees).

Research status

As paper describes research in progress, the current status of our approach is as follows. The knowledge and knowledge management questionnaire as part of the upgraded FISDD IS Status questionnaire has been created. The pilot organization was selected. The company is present since 1919 and it is one Slovenian largest and most important exporter producing forging parts, hand tools, special machines and tourism. The general IS due diligence has been delivered between March 20th and April 17th 2015. The final report is currently under the way.

The knowledge questionnaire part was fulfilled by the responsible person for the knowledge with some support of the company's IT manager. They have answered to all questions. During the general IS due diligence delivery, we have had also interviewed by the responsible person, who has fulfilled the knowledge part of the questionnaire. We have had also interviewed with the company's innovation manager. The company produced several hundred of innovations per year and some of them became patents.

After receiving the fulfilled questionnaire, we have analyzed the data. Each answer has been converted to a numerical value: 0 – not presence, 0.25 – partial presence, 0.75 – mostly presence, 1 – present.

To evaluate the knowledge management maturity level, we have chosen similar five levels as mentioned by Hsieh et al (2009) as Knowledge Navigator Model Maturity Levels. APQC[1] has also five knowledge maturity levels. Table 2 presents these levels.

[1] APAQ - American Productivity and Quality Center (www.apqc.org)

Table 2: Knowledge management maturity levels

Level	Knowledge Navigator Model Maturity Levels	APQC Knowledge Maturity Levels
1st	Chaotic stage	Initiate stage
2nd	Conscientious stage	Develop stage
3rd	Intermediate stage	Standardize stage
4th	Advanced stage	Optimize stage
5th	Integration stage	Innovate stage

Table 3 presents numerical scores for knowledge maturity levels used within FISDD. The APQC terminology has been used.

Table 3: Knowledge management maturity levels within FISDD

Level	Numerical range
1st - initiate	180 - 214
2nd - develop	140 – 179
3rd - standardize	90 – 139
4th - optimize	50 – 89
5th - innovate	15 – 49

The final score for the pilot organization was 91 – standardize or 3rd level.

As the pilot case has shown reliable results, we will proceed with the research plan. Next step is to conduct 25 case studies. Currently we are within sub phase a) organization selection. Our planes are to complete research within next four months.

Discussion

The pilot organization identified that the upgraded framework is mature and prepared for planned next activities - case studies. Currently we are not able to confirm or reject the proposed hypothesis, but we hope that the results will be able to answer to Babik et al. comments that a general conceptual framework of knowledge evaluation is still lacking (Babik et al., 2014).

During already realized research steps we have identified several limitations. First the case studies are planned only within one country – Slovenia, although the FISDD questionnaires are

also available in English as well. Second the planned number of case studies is low in total 25 case studies, but for this research, we have somehow enlarged the samples comparing to our earlier researches. Third the research does not compare this framework with other methods for knowledge management maturity level measurement such as described by Serenko et al (2014). Forth the upgraded framework also does not evaluate intellectual capital as Costa and Ramos (2014) did.

The contribution of this paper is to inform scholars, researchers and others interested about the possibilities to use the upgraded framework as comprehensively or use knowledge part as a standalone questionnaire. As a research progress report, the results of case studies, their analysis and discussion will be presented within another paper.

Conclusion

Farhadi (2009) argued how important knowledge management audit due diligence is, with the aim of explaining the relationship between intangible knowledge (tacit knowledge), assets and inorganic business growth through mergers and acquisitions. He added a new dimension to the area of due diligence in general, as well as special IS due diligences. On the other hand, O'Dell and Grayson wrote "What you do not know will cost you or ruin you" (O'Dell and Grayson, 1998, p. xii): This slogan should note each organization with several objectives. One of them is to identify and evaluate the level of knowledge management you have within your organization. The aim of this paper is to present the research in progress regarding the upgraded framework for information system due diligence and its part regarding assessment and evaluation of knowledge and knowledge management. We have to realize all planned case studies to be able to evaluate and confirm that upgraded framework is suitable for assessment and evaluation of knowledge and knowledge management in observed organization. We have to collect enough data to be able to answer to the research questions. With this upgraded framework and research papers other researcher will evaluate, knowledge and knowledge management within observed organization and give the appropriate information about identifying levels of observed organization. Additionally, further researches are planned for FISDD, as well. The very next activity we have identified is to include knowledge risk management in our framework. The main challenge is to automate the FISDD questionnaire fulfilling by web based questionnaires, and shorten the required IS due diligence on the site – at the organization site - time.

References

Babik, D., Qian, R., Singh, R. and Ford, E.W. (2014). Examining Intersubjectivity in Social Knowledge Artifacts, Proceedings – 20th Americas Conference on Information Systems, Savannah. USA.

Baublits, T., Lee, H.S., Stanis, G., Sundberg, B., Tan Z.-D. Development of an IT Assessment Program for Acquisition, Final Report of the student project in the IT Audit and Security Course at the Red McCombs Business School of the University of Texas at Austin (USA), 2005.

Bhatia, M. (2007). IT Merger Due Diligence – A Blueprint, Information System Control Journal, 1, pp. 46-49.

Christozov, D. and Toleva-Stoimenova, S. (2014). The role of information brokers in knowledge management, Online journal of applied knowledge management., 2 (2). pp. 109-119.

Costa, R. and Ramos A.P. (2014). Designing and Testing an AHP Methodology to Prioritize Critical IC Elements for Product Innovation. Proceedings: 15th European Conference on Knowledge Management, Santarem, Portugal, Vol.1 pp. 223-232.

Delak, B. and Bajec. M. (2013a). Information system due diligence data as an input for knowledge management. Online journal of applied knowledge management. 1 (2). pp. 15-24.

Delak, B. and Bajec, M. (2013b). Framework for the delivery of information system due diligence. Information systems management. 30 (1). pp. 137-149.

Delak, B. , Majewski, G.M. and Damij, N. (2014). How to identify knowledge and evaluate knowledge management in organization – case studies report. Online journal of applied knowledge management. 2 (2). pp. 162-171.

De Leoz, G. and Petter S. (2014). Examining the Moderating Effects of Knowledge Management Enablers on IT Project Team Performance, Proceedings – 20th Americas Conference on Information Systems, Savannah. USA.

Drucker, P. F. (1999) Knowledge-worker productivity: The biggest challenge. California management review, 41 (2). pp. 79-94.

Farhadi, M. (2009) Intellectual Assets & Knowledge Due Diligence. University of Reading - Henley Business School.

Ferreira, V.H.S. (2014). Wiki as a Knowledge Management Tool: The Case of a Non-Profit Administrative Entity, Proceedings: 15th European Conference on Knowledge Management, Santarem, Portugal, Vol.1 pp. 343-352.

Handzic, M. and Durmic, N. (2014). Merging Knowledge Management with Project Management, Proceedings: 15th European Conference on Knowledge Management, Santarem, Portugal, Vol.1 pp. 402-409.

Hsieh, P.J., Lin, B., and Lin, C. (2009). "The construction and application of knowledge navigator model (KNM™): An evaluation of knowledge management maturity,"Expert Systems with Applications, (36:2), pp. 4087-4100.

Koohang, A., Paliszkiewicz, J., Horn Nord, J. and Ramim, M. (2014). Advancing a theoretical model for knowledge construction in e-learning, Online Journal of Applied Knowledge Management, 2 (2). pp. 12-25.

Nonaka, I. and Takeuchi, H. (1995) The Knowledge-Creating Company. Oxford University Press.

O'Dell, C. and Grayson, J. (1998). If Only We Knew What We Know: The Transfer of Internal Knowledge and Best Practice, Free Press, USA, ISBN: 978-0-684- 84474-9.

O'Dell, C. and Huber, C. (2011). The New Edge in Knowledge: How Knowledge Management Is Changing the Way We Do Business, John Willy & Sons, Inc., Hoboken, New Jersey, USA, ISBN: 978-0-470-91739-8

Polanyi, M. (1966). The Tacit Dimension. Routledge and Kegan Paul. London.

Ragab, M.A.F. and Arisha, A. (2013). Knowledge management and measurement: a critical review, Journal of Knowledge Management, 17 (6). pp. 873-901.

Serenko, A., Bontis, N. and Hull, E. (2014). An Application of the Knowledge Management Maturity Model: The Case of Credit Unions, Proceedings – 20th Americas Conference on Information Systems, Savannah. USA.

Trkman, P. and DeSouza, K. (2012): Knowledge Risks in Organizational Networks: An Exploratory Framework. The Journal of Strategic Information Systems, 21 (1), pp. 1-17.

Travica, B. (2014). Think process, think in time: Advancing study of informing systems. Informing Science: the International Journal of an Emerging Transdiscipline, 17, pp. 133-148. Retrieved from http://www.inform.nu/Articles/Vol17/ISJv17p133-148Travica0519.pdf.

Xi, Z. (2013) A Study of the Enterprise Knowledge Management Process Support Strategy in Knowledge Network. WHICEB 2013 Proceedings. Paper 71. http://aisel.aisnet.org/whiceb2013/71.

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Internet of Things (IoT) and Internet of Everything (IoE) in Management

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Abstract

The aim of this paper is short review of the Internet of Things (IoT) and Internet of Everything (IoE) application in management. Special attention is paid on general considerations on Business Model for IoT/IoE. Several examples of IoT/IoE applications in power, remarks on predicted financial results of the IoE application there are presented.

Keywords: Internet of Things, Internet of Everything, Management

Introduction

When I participated in a seminar on Information Society (IS), I have come across the following question: Is the Information Society a real vital society and if so, what will measure its dynamic evolution? I propose to answer this question as follows: Internet as a basic tool enabling to develop IS used the TCP/IP protocol from the very beginning of its operations, which however a few years ago, exhausted possibilities to include new users. After applying a new IPv6 protocol, which enables to include 10^{38} users, that barrier was removed, and this means that the Information Society has received a vital tool, and IPv6 protocol together with Internet of Things (IoT) and Internet of Everything (IoE) have become important signs of the IS vitality.

Contemporary Information Society (IS) generates growing number of data in all part of its activity (Gartner, 2014; Kellog,2014). According to (Gartner, 2014) "each minute users load 48 hours video to YouTube server. During that time 204 mln e–mail, 100,000 registrations in Twitter and arise 600 new Internet pages are executed. Forecasts for 2020 define number of stored 40 zettabytes (Zettabyte=10^{23} bytes=10^{9}terabytes) digital data. Cisco expects $15x10^{9}$ connected devices generating and exchanging data in 2015 (see also Yan et al., 2014; Zielinski 2013). And "the communication is the most energy consuming task on devices" what means that it is necessary to rethink contemporary data management.

The term Internet of Thing was proposed in 1999 by Ashton Kevin who in 22 June 2009 wrote: "The Internet of Things in the real world thinks matter more than ideas" (RFID 1999). The IoT idea implied another concepts like Internet of Service (IoS), Internet of Everything (IoE), Web of

Things (WoT), which of course is IoT, etc. IoT refers to uniquely identifiable objects and their virtual representation in an Internet structure whereas up to date Internet supported human connection only (Zielinski, 2013). When we consider the relations M2M (Man to Man), M2T (Man to Thing), M2P (Man to People), P2P (People to People), and D2D (Device to Device), we ultimately reach the Internet of Everything (IoE) (Zielinski, 2015).

In (Vermesan et al.., 2014) present following definition: "Internet of things (IoT): A global infrastructure for the information society, enabling advanced services by interconnecting (physical or virtual) things based on existing interoperable information and communication technologies".

Vermesan and Friess print also the IERC which states that IoT is "A dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where physical and virtual "things" have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network", see also (Matusiak, 2014).

Digital Agenda for Europe (Arraco, 2014) introduce following explanation: "Internet of Things (IoT) is a technology and a market development base on the interconnection of everyday objects among themselves and applications. IoT will enable an ecosystem of smart applications and services, which will improve and simplify EU citizens' lives".

Challenges in new Business Model for IoT/IoE

In number of printed documents, books, papers, reports one can find many information on possibility of IoT/IoE application in management, unfortunately they are empty of details how to design, develop and imply for operation in real environment. But business model are exception and we will present some issues considered in bibliography, see also (Matusiak, 2014; Matusiak et al., 2015).

Challenges in an area of new business models development arose in the end of XX century and in last few years bibliography on IoT application in this area is growing (Gartner, 2014; Turber et al., 2014; Violino, 2013) and we will shortly present published results. Let we start with short review of contemporary state of researches on that area.

In the study (Bradley et al., 2013) contains presentation of following problem:

- the influence of the Internet on business models to date,
- the economic power of the Internet of things,
- business model patterns in the Internet of things,
- entrepreneurial challenges in implementing Internet of things business models.

In the end of this essay we can find following sentence: “The Internet of Things remains an academically fascinating and rewarding phenomena”. In my opinion it is too pessimistic conclusion, different from another authors.

Conference paper (Turber et al., 2014) addresses the need for a business model type for the Internet of Things, which recognizes the affordances and impacts of digitalization in order to allow companies to truly tap into new business model opportunities. It contains the design and evaluation of a type model, which enables researchers and practitioners alike to capture, visualize and analyze firms’ current and future business model in IoT in a structured and actionable way.

In the end of considerations one can find following conclusions:

- Although many business model approaches exist, a dedicated business model to support business model development for the IoT has not yet been introduced. This gap is in quite contrast to the overall importance of this topic, and in essence, our research approach attemps to address this need.
- The specific feature of our IoT business model type can be seen in the fact, that it incorporates (a) digitization-driven market paradigms and (b) the architecture of digitized objects as their driving agents. Another benefit is the applied design science research method, which allows for developing the model closely linked with theory and practice.

Business model design under the transition from company specific business models towards networked and more comprehensive ecosystem business models is presented in (Westerlund et al., 2014). In particular, the study focusses on the challenges that hinder the emergence of IoT business models.

The technological platform forms the core of a business ecosystem which is “economic community supported by a foundation of interacting organizations and individuals”. A business ecosystems includes customers, lead producers, competitors and other stakeholders what means that it contains diversity objects (it is expected 50 billion device by 2020). Unstructured ecosystems (lack defining underlying structures and governance, stakeholder roles, and value-creating logics) results that may not be appropriate or required participants in an emerging ecosystem, for example IoT operators or potential customers could be missing. Pursuing new business opportunities demands opening new relationships in new industries, or extending existing relationships, takes time and challenge for managers. The unstructured IoT ecosystem result in the need for IoT-specific model choices and articulate the integrated value for stakeholders.

In that paper exists suggestion that managers need to shift their focus from ”the business model of a firm” to “ecosystem business model” which has three interpretation in literature; in

this paper understand as different views of the same phenomena. This interpretation is argued that an ecosystem business model is composed of a set of value pillars anchored in ecosystem, which focus on both the firm's method of creating and capturing value as well as any parts of the ecosystem's method of creating and capturing value of the ecosystem. Many telecommunication vendors and operators, as well as IoT platform vendors (e.g. M2M platform vendors) try to articulate the value of the IoT by using this approach to design their business models. However, the resulting business models are often biased toward the vendor and lack drivers for shared value as one of the explicit components.

That study is important because it call for a major shift in business model research. It is argued that business model should not be broken down into a number of unconnected components in the way of the majority of previous business model research. Instead, studies should focus on investigating ecosystem business models and the way these models generate and capture value through different value flows. That way, the concept of business model, which is traditionally associated with a single organization's business model, could be replaced with the term "value design" which is better suited to ecosystem.

Miscellany on IoT/IoE in management

Power. Continuing considerations of paragraph 2 one can find in (Matusiak et al., 2015) following studies:

- development Business Model (BM) for support e-balance project with following tasks: building the future with ICT solutions, more efficient (energy) system, better environment, balancing the energy, defining new paradigm, new business model,
- application of IoE for limitation data flow between dispatcher and devices installed in Low-and Medium voltage Smart Grid (SG).

In (Matusiak et al., 2014) is presented idea of IoT application for synchronization specialized devices (Phasor Measuement Unit – PMU) located in selected SG nodes and IoT trends in Europe.
Internet of Everything. (Bradley et al., 3013) present following Key Insights:

- The Internet of Everything is not the Internet of tomorrow, it's the Internet of today.
- Global executives anticipate job growth and wage increases as a result of IoE, along with improvements in information security.
- Technology infrastructure and tools are essential, but it's the innovative application of technology that will separate winners from losers in IoE.

- Data is ubiquitous and no longer differentiator.
- In 2013 CISCO predicted $14.4 trillion in "IoE at Stake" migrating among private-sector companies and industries being driven by five areas (Arracade, 2013):
  - asset utilization ($2.5 trillion),
  - employee productivity ($2.5 trillion),
  - supply chain and logistics ($2.7 trillion),
  - customer experience ($3.7 trillion),
  - innovation, including reducing time to market (3.0 trillion).

Others. It is worth of mention two following subjects:

- Safeguarding information (Rozenfeld, 2014) with special attention paid to "device security must be at the heart of Internet of Things development" (Arracade, 2014).
- Cloud Computing and IoT/IoE enable easer manage Big Data (Pepper, 2014; Turber et al., 2014).

Final remarks

Considerations in the paper are a base for following remarks:

- IoT and IoE are modern information tools which applied in designing, manufacturing, and operational activity – save money, electrical energy and implies new organization.
- Though in many papers and reports one can find assurance concerning high revenues generation when apply IoT or IoE in business but review of the cited bibliography implies conclusion that it needs many affords on the way to high benefits.
- It has to remember, that IoT and IoE in specific cases cannot be easy applied (Karimi et al., 2014).

References

Arracuda, Device Security Must Be at the Heart of Internet of Things Development. Retrieved from http://www.information-age.com/technology/security/123458246/device-security-must-be-heart-internet-things-development.

Bradley J., Loucks J., Macaulay J., Noronha A., Internet of Everything (IoE) Value Index. How Much Values Are Private-Sector Firms Capturing from IoE in 2013? White Paper, CISCO. Retrieved from http://internetofeverything.cisco.com/sites/default/ files/docs/en/ioe-value-index_Whitepaper.pdf

Gartner, Says the Internet of Things Will Transform the Data Center. Retrieved from http://www.gartner.com.newsroom/id/2684616.

Karimi K., Atkinson G., What the Internet of Things (IoT) Needs to be a Reality. White Paper Freescale ARM, 1-16, 2014.

Kellogg T., Why HTTP Won't Work for IoT. EDN Europe, 10 Nov. 2014. Retrieved from http://www.edn.com/electronics-blogs/eye-on-iot-/4437056/Why-HTTP-Won-t-Work-for-IoT.

Matusiak B. E., Modele biznesowe i zarządzanie na rynku energii. Konferencja Naukowa „Energetyka Prosumencka w Wymiarach Zrównoważonego Rozwoju", 03.11.2014, Gliwice.

Matusiak B. E., Zieliński J. S., Internet of Things in Smart Grid Environment. Rynek Energii, 3/(112)2014, 115-119.

Matusiak B.E., Piotrowski K., Zieliński J.S., Internet of Things in E-balance Project. Rynek Energii, 1/(116)2015, 98-103.

Pepper R., Global IT Report Identifies Key Policies for the Internet of Everything. Retrieved from http://blogs.cisco.com/gov/global-information-technology-report-2014.

Rozenfeld M., The Value of Privacy. Safeguarding Your Information in the Age of the Internet of Everything. IEEE – The Institute 2014. Retrieved from http://theinstitute.ieee.org/technology-focus/technology-topic/the-value-of-privacy

Turber S., Smiela Ch., A Business Model Type for the Internet of Things. Twenty Second European Conference on Information Systems, Tel Aviv 2014.

Vermesan O., Friess P., Internet of Things – From Research and Innovation to Market Deployment. River Publishers, Denmark, 2014.

Violino B., The 'Internet of Things' Will Mean Really, Really Big Data. InfoWorld, July 2013.

Westerlund M., Leminen S., Rajahonka M., Designing Business Models for the Internet of Things. Retrieved from http://timreview.ca/article/807, 2014.

Yan Z., Zhang P., Vasilakos A.V., A Survey on Trust Management for Internet of Things. Journal of Network and Computer Applications, Vol. 42, June 2014, 120-134.

Zieliński J.S., Zarządzanie danymi w inteligentnym systemie elektroenergetycznym, [in:] D. Jelonek i T. Turek (ed.), „Wiedza i technologie informacyjne w kreowaniu przedsiębiorczości", Sekcja Wydawnictw Wydziału Zarządzania Politechniki Częstochowskiej, Częstochowa 2013, 32-41.

Zieliński J. S., Internet of Everything (IoE) in Smart Grid. Przegląd Elektrotechniczny, 3/2015, 157-159.

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E-commerce adoption in the Polish commercial insurance sector

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ABSTRACT

The following article has two main objectives. On one hand it aims at describing the basic ways of Polish insurance companies engagement in e-commerce in the recent years and evaluating the existing situation regarding this matter. On the other hand it raises questions regarding the subject matter of e-commerce and related technologies based on the use of the Internet and their influence on the development level of insurance companies in Poland. These issues might be quite important especially because nowadays it seems that in Poland most companies from the insurance sector are still functioning in a traditional way. In consequence this means that their customers are served typically by their own offices and eventual, other external structures (e.g. insurance agents, brokers and other dealers).

Keyword: E-commerce, E-business, Polish insurance market, Internet.

RESEARCH SCOPE

In comparison to the insurance industry, many economy sectors are using Internet in a much more organized and complex way, developing faster toward more sophisticated e-business and e-commerce strategies.

For this reason the author poses the following research hypotheses: e-commerce based on the Internet and on online services offers development opportunities for insurance companies.

In relation to the pursued objective and accepted hypothesis the following research questions should be scrutinized and eventually answered:

- what opportunities offers e-commerce for insurance companies?
- why is the insurance sector in Poland using e-commerce solutions only in a limited way?

In order to answer the raised questions it seems that several research methods should be used. Most of all induction and deduction methods as well as comparisons with other economic branches.

In addition, one should use various literature resources on the issues of insurance theory, issues related to the development of e-commerce as well as references describing both of the mentioned issues directly.

The identification of the mentioned issues and improvement of knowledge in this area should support the development of e-commerce as well as expanding the scale of profits made at the microeconomic and macroeconomic level by using this form of trade in the polish insurance sector.

INTRODUCTION

Nowadays the processes of liberalization and globalization of markets and economic activities (Acocella, 2002, p. 11) are accelerated by the rapid development of information and communication technologies (ICT). In consequence it caused that many companies, more courageously enter the world of e-business and e-commerce.

It should be noted that so far, there is no universally accepted definition of e-business. In the literature it is presented either as a synonym of e-commerce (Norris & West, 2001, p. 16) or as a much broader concept than e-commerce (Szpringer, 2000, pp. 22-26; Wagner, 2004). In this paper the latter approach is adopted, which means that e-business covers any kind of economic activity that is undertaken on the basis of computer networks (Kaapke et al., 2001, s. 22; Wikipedia, e-business, 27.01.2015).

While the issue of e-commerce is truly reflected by two complementary definitions:

- e-commerce is the use of the Internet, digital communications and information technology in order to enable the process of buying and selling,
- e-commerce is a realization of all stages, or at least the important ones, of the transaction between the seller and the buyer via electronic media (Gersch, 2000, p. 2).

On the basis of these definitions, we can assume that e-commerce is realized between the trade contractors that use interactive, electronic media, such as the Internet at least in the basic stages of the ongoing transactional process. Other sources define it even simpler as “trading in products or services using computer networks” (Wikipedia, e-commerce, 27.01.2015).

Regardless of the professional nomenclature, the development of e-business and e-commerce does not occur evenly between different countries as well as across various sectors of individual, national economies (cf. Kuczera, 2012, pp. 200-209)

In Poland the development of Internet applications in business was hindered primarily by the technical limitations of network bandwidth, which caused congestion and delays in data transmission. However, the rapid development of transmission techniques as well as large investments in infrastructure had dropped most of the obstacles that have prevented the existence of companies in the Internet in the desired size and shape.

This fact was one of the reasons, that insurance sector (next to the banking sector) in many well-developed countries, was one of the pioneers in the use of e-commerce and a key driver of development new economy sector (Kotylak S. 2014, p. 75). Additionally insurance industry, because of its importance in economic growth and public health is one of the most active sectors in financial services (Meshkat et al, 2012, p. 641). In Poland, however, insurance companies were not very interested in getting into the area of e-commerce. The importance of the Internet as a distribution channel is heavily questioned. It is pointed out that insurance policies are so-called "low-interest products", which means that individuals do not normally think about finding out about insurance and concluding insurance contracts, especially on-line without any special assistance. Further obstacles may include: product complexity requiring individual consultation, security reservations as well as different priorities set by the insurers (Lilischkis, 2003, p. 11).

In consequence online insurers have not acquired significant market shares in Poland. However with the general increase regarding e-business as well as e-commerce use from the side of potential customers, a few insurance companies are developing their own on-line sale systems and Internet applications. But amongst those which are trying to do it, many make it in a limited extend, developing only selected on-line tools and often even not pursuing any clear market strategy.

BASIC E-COMMERCE STRATEGIES FOR INSURANCE COMPANIES

Observation of e-commerce utilization on the Polish insurance market shows that the companies business activities could be measured by the way of e-commerce engagement and by the method of implementation of e-commerce added-value chain. According to the first factor, one can divide insurance companies selling services only through electronic channels, acting in traditional way and setting up separate organizational units that are providing services with electronic channels only and such that are doing business in both, traditional and electronic way, within one organization, with different grade of internal coordination of these activities. Regarding the method of implementation of e-commerce added-value chain, one can

divide companies to those which are concentrating only in selected segments of the added-value chain and such that are implementing e-commerce in the whole chain.

Combination of the two, above mentioned, ways of measuring business activities of companies implementing e-commerce, allows to distinguish four basic e-commerce strategies. The figure number 1 shows the four basic e-commerce strategies pursued by the companies on the insurance market.

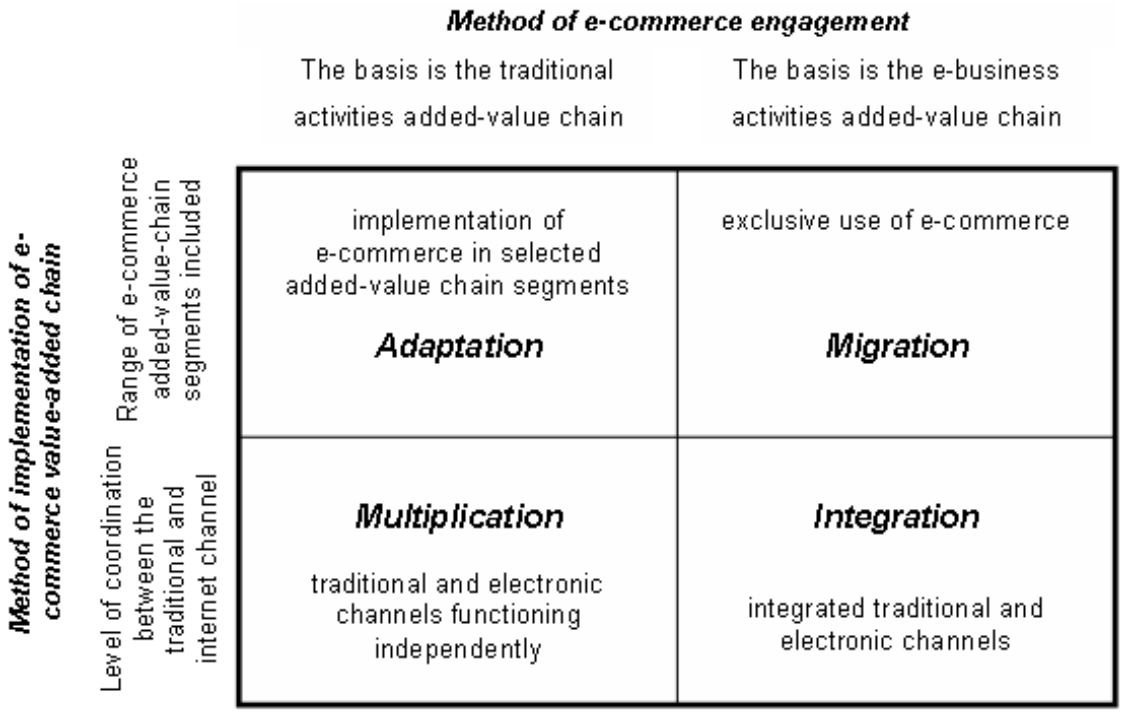

Figure 1. Basic strategies of e-commerce implementation.

Source: B. Birkhofer, E-Commerce als innovativer Absatzkanal. Ein entscheidungsorientiertes Modell, Rosch-Buch, Schesslitz 2001, p. 118.

The strategy of adaptation is often seen by companies as a first step of e-commerce introduction. This strategy allows at least a partial use of the e-commerce potential in existing traditional activities. By including e-commerce solutions, the current value chain is enriched with new tasks and activities. This option is designed to introduce e-commerce into the framework of existing activities in such a way, that on one hand to offer additional, innovative services and on the other hand to ensure better use of existing potential as well as to improve economic results.

Also the multiplication strategy bases on the existing company traditional value chain. Current competencies and business models are used and subsequently moved to manage the new channel. This option is targeted at the existing potential of the company and carrying out in its activities the smallest possible change. Companies using this strategy, tend to use the Internet mainly to coordinate its sales network and provide their customers with relevant information and services in the pre-sale and post-sale service.

The main challenge here is to assign each channel relevant, different roles, so that in the resulting multi-channel system, potential conflicts would be mitigated. The classic method for preventing the emerging conflicts between different sale channels is to dedicate the new channels to the needs of specific, selected groups of customers, positioning them under a different name, and offering via those selected channels only – so called – simple insurance services (e.g. travel insurances).

The integration strategy, as the third of the highlighted e-commerce strategies requires the full implementation of e-commerce value chain and its strong coordination with the existing activities executed in the traditional manner. Integration of the traditional channels with the Internet, allows customers to use, in particular phases of the transaction process, solutions that best suits them. This should lead not only to raise the level of customer satisfaction from the service system offered to them, but also to better exploit the potential of traditional and electronic channels .

Fourth of the listed strategies, the migration strategy, brings the most profound changes in comparison to the existing business. The aim of this strategy is to move the entire business to the area of e-commerce and provision of services only within that area.

In the case of a migration strategy companies introducing electronic channel can assign to it various functions. The business reality shows that the insurers either offer their own products or present products from different companies in many cases also providing a direct comparison of these products via Internet. In the first case the customers are able to pursue the entire transaction process (pre-phase, sales and after sales) only via the Internet channel. In contrast to that, the companies acting as a comparison websites can act in two respects. Either the other phases of the transaction process are being realized by the traditional system of presented products supplier or they are ensuring the possibility to pursue the remaining phases of the transaction via Internet channel and/or the traditional channel.

Regardless of the way of finalizing the eventual transactions, the two last strategies are directly associated with taking the market role of an intermediary linking, through electronic channels, providers of products with parties interested in acquiring them.

On the Polish market one can already find some examples of this type of companies. Ipolisa.pl, Polisowo.pl or Ubezpieczeniaonline.pl are the most important ones.

Most of these companies have a common feature - the main sales channel are insurance agents and not the Internet. The network serves only to contact the customer, show them the offer of different companies and subsequently to compare them. Poles treat Internet comparison primarily as a tool that offers the opportunity to check the prices. The growing website traffic does not translate directly into increased sales. Only every fiftieth Internet user, who checks the prices, decides to purchase insurance policies (Dziennik Gazeta Prawna, 10.01.2011).

Relatively recently also some new Internet portals appeared, which offer the possibility to compare products from various companies and to purchase direct on-line insurances. These are: Rankomat.pl, Wygodnie.pl and Inceco.pl and all began to function at the end of the year 2009 and the beginning of the year 2010.

Despite the fact, that such intermediary or comparison portals have a big development potential and in (rather distant) future might play an important role on the market, they currently do not have, in contrast to traditional companies, bigger market shares in the Polish insurance market.

Therefore the article will focus on the ways of e-commerce implementation and utilization by traditional insurance companies functioning in Poland.

WAYS OF E-COMMERCE UTILIZATION BY TRADITIONAL COMPANIES FUNCTIONING ON THE POLISH ECONOMIC INSURANCE MARKET

At the end of September 2014 there were 26 companies providing life insurance and 31 companies providing non-life insurances, functioning on the polish market (KNF, 3/2014). In comparison to that at the end of 2010 there were 30 (in 2006 - 32) companies providing life insurance and 33 (in 2006 - 35) companies providing non-life insurances (KNUiFE, 4/2006; KNF, 4/2010). In this matter the situation looks relatively steady. The small decrease regarding the number of companies is most of all a consequence of a few recent mergers.

Nowadays a standard for all companies is having their own website mostly ending with "pl" or "com.pl". This means a progress according to the situation on the Polish insurance market in 2003. Researches showed that in 2003 about 13% of insurance companies functioning in Poland didn't have their own websites (Kaczała, 2006, p. 232; Kaczała, 2004; Handschke & Kaczała, 2004, pp. 176-177). However, the complexity as well as functionalities of each, individual websites vary. Among these websites one can find very simple sites, which presents only the most important information as well as much more sophisticated ones. The more sophisticated,

beside having many information about the company itself, its affiliates, partners and products, also offer much wider possibilities than just the search of information (e.g. premium calculation, using a specially designed calculators, on-line insurance purchase, filling out on-line applications such as the notification of injury, sending requests for on-line services or the possibility of direct consultations with agents or other advisers through the internet channel).

These types of opportunities, however, offer only some of the companies operating on the Polish insurance market. Most companies have only a simple and uncomplicated sites which main task is to provide brief information about the company and its products.

Additionally, most of the companies, which offer the opportunity to purchase insurance through the internet are offering only a few types of on-line insurances. The most popular include travel, house and car insurance.

Table No. 1 shows companies on the Polish insurance market, which already in 2006 offered the opportunity to purchase insurance through the on-line channel and the situation regarding that issue at the end of October 2010 and at the end of September 2014).

The information contained in Table 1 indicate the dominance of companies offering the possibility to carry out a full non-life insurance transactions using the electronic channel over the companies that offer this form of transaction regarding life insurance. However, companies involved in selling non-life insurance, nowadays, mainly focused on the sales of the three listed in the table kinds of insurances: travel, house and car.

Only two companies (Generali TU S.A., SIGNAL IDUNA Polska TU S.A.) offer with the use of on-line channel other types of insurance. Benefia TU offered on-line life insurances on their Benefiadirect website until the end of September 2014, when the part of company dealing with life insurances (Benefia Życie) merged with another insurance company functioning on the polish market – namely compensa Życie. It should be added that, there would be an even greater disparity in this respect if the tables would include some companies, that started its businesses after the year 2006, which nowadays offer the possibility to purchase on-line insurance – e.g. Liberty Direct or AXA direct.

Most companies sell insurances with the use of their own, main website (e.g. MTU, Generali, Hestia, Link4). However, others have a separate unit specifically dealing with on-line insurances (for example Benefia has a separate internet page www.benefia24.pl intended only to serve customers on-line).

Particularly noteworthy are the company STU Ergo Hestia and Signal Iduna, which offer relatively widest portfolio of on-line insurance products. Moreover, Hestia posted on its home page a questionnaire for users, which helps them, after answering a few simple questions, to

find out what insurance protection they most likely need and what insurance cover the company can offer them. In addition, Hestia created:

- a simple on-line shop called "sklep internetowy" where potential customers could purchase some insurances offered through the Internet. It should be also mentioned that a link to the on-line store could be found on the main webpage of the company but it was poorly exposed. The author uses a past form, because in January 2015 the on-line shop "disappeared" from the website. During a phone conversation with an agent the author received a confirmation of the fact that the on-line shop has been closed down. This action was justified by a desire to maintain the highest possible quality of services;
- an electronic after-sale service called "eKONTO", where customers can, to some extent, manage their policies and process on-line payments. However, customers can not buy any insurance policies with the use of this system. In order to do that they have to contact company's agents.

Most companies on the polish insurance market are expanding their on-line sale offer, but there are also such companies like InterRisk SA or Warta, which have abandoned insurance sale through electronic channels. As for the end of 2014 it seems that the company InterRisk SA has done it permanently. Even though Warta returned to offer their insurances via a brand new, own online sales system (a separate website) in 2013 (after a few years of break), it is difficult to indicate the reason for such behavior. It can be assumed that effects of such approach are multidirectional and can lead from one side to deterioration of the image of the company, which in comparison to other companies using the Internet, might be seen as a less modern company. On the other side it may lead to reduction of attractiveness level for customers, especially for the younger generation more interested in products available on the Internet. Moreover, most probably a limited ability to improve the profitability of the company not benefiting from relatively inexpensive electronic channel may occur.

Table 1
Companies offering on the Polish insurance market on-line shopping and types of insurances that can be purchased in this way (as of end of October 2006, the end of October 2010 and the end of September 2014)

Non-life insurances												
Other types of insurances			**Car insurances**			**Property/house insurances**			**Travel insurances**			
IX/2014	X/2010	X/2006	IX/2014	X/2010	X/2006	IX/2014	X/2010	X/2006	IX/2014	X/2010	X/2006	
No	No	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	**TU Allianz Polska S.A.**
No	Yes – life insurance	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	**Benefia TU Majątkowych S.A.**
No	No	Yes – mainly third party	No	No	No	No	No	No	No	No	No	**Interrisk S.A. (earlier TUiR CIGNA STU S.A.)**
No	Yes – general liability insurance	Yes – general liability insurance	No	No	No	No	Yes	Yes	No	Yes	Yes	**STU Ergo Hestia S.A.**
Yes – accident insurance	Yes – accident insurance	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	**Generali TU S.A.**
No – only life insurance premium	No – only life insurance premium	No	Yes	Yes	Yes	No	No	No	No	No	No	**Link4 TU S.A.**
No – only on-line claims	No – only on-line claims	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	**MTU Moje Towarzystwo Ubezpieczeń S.A.**
No – only on-line claims	No – only on-line claims	No	Yes	Yes	No	No	No	No	No	No	No	**PZU S.A.**
Yes – ski and water sports	Yes – ski and water sports	No	No	No	No	No	No	No	Yes	Yes	Yes	**SIGNAL IDUNA Polska TU S.A**
No	No	Yes – SME's protection	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	**TUiR WARTA S.A.**
Life insurances												
IX/2014				X/2010				X/2006				
Yes – individual time limited life insurance - Acti OCHRONA, individual				Yes – individual time limited life insurance - Acti OCHRONA, individual				Yes – life insurance and birth insurance				**MACIF Życie TUW**
No – only the possibility to see the data of contracts concluded on-line in recent years with the use of the				No – only the possibility to see the data of contracts concluded on-line				Yes – time limited life and endowment insurance linked to insurance capital funds				**TUnŻ WARTA S.A.**

Source: Own researches based on the analysis of websites of insurance companies functioning on the Polish insurance market.

In consequence all the above mentioned issues lead to a major weakening of company's market position.

Regarding the life insurance sector, currently, such possibility offers only one company, namely Macif TUW Life. However this company is continually expanding its range of electronic sale. Moreover one other company - Link4 - offers the possibility to calculate premiums for offered life insurances but without the possibility to purchase those insurances on-line through on-line. In order to do acquire insurance protection, the customers have to order an appointment with an company's employee and subsequently finish the transaction in traditional way.

It should be noted, however, that very often the life insurances are characterized by a relatively higher complexity than many so-called "simple" property insurances (e.g. travel insurances). This may partly explain the relatively smaller interest in using e-commerce by the companies functioning on the life insurance market in Poland.

Presenting the activities of the polish insurance companies in developing e-business and e-commerce strategies, one should mention a quite small activity regarding those issues by the largest insurer on the domestic market - PZU. This company began on-line and phone policies selling at the end of 2008 (Dziennik Gazeta Prawna, 10.01.2011. However the company sells online only car insurance and allows their customers to complete the transaction via an separate dedicated website. In consequence, we can say that, PZU strategy is characterized by a relatively slow and gradual entry into the e-commerce market, lack of information disclosure about phone and on-line sales activity and also by deliberate reduction in on-line sales advertising spending in relation to the previously planned spending for this purpose (Rzeczpospolita, 16.12.2009).

The conservative approach of PZU according to the on-line channels development may result from the fact, that this requires creation of new insurance products for this sales channel as well as price reduction of policies sold with the use of electronic channels.

It is also likely that the development of direct sales systems may face the resistance of some of the salesman and partners of a very extensive, own, traditional sales network. The slow development of e-commerce in PZU may also be a result of lack of belief in the possibility of gaining significant market power in, this already relatively well the developed, segment.

Regardless of the way of engagement in e-commerce as well as the type of insurance offered, companies should strive to develop and enhance their own websites. The biggest problem of

the owned by insurance companies web pages in recent years was the fact that they often didn't provide value to potential customers. Today, the situation has certainly improved in that regard, but appropriate navigation became the problem. Websites have become larger and more complex. They also have more value, but it is harder for users to find what they need.

For many insurance companies that want to provide on-line information to users searching for insurance policies, there is often a lack of basic information about the customers rights or these information are not in conspicuous places (for example, in a place where users are asked about the type of required insurance coverage).

Moreover, many websites of insurance companies do not retain the basic principles of usefulness regarding the continuation of a process (e.g. process of buying on-line insurance) by a potential customer (World Street Journal Polska, 5.01.09). The basic principles of utility regarding the purchase of insurance coverage by electronic means is to provide for potential customers a sense that there is a high probability that they are able to complete its task and the current information on the progress of their purchase process.

DISCUSSIONS AND CONCLUSIONS

Taking into account past actions and results obtained through the use of electronic channels, it is almost certain that in the near future e-commerce will be widely used in the provision of business insurances. It is therefore important to enter this modern business segment and to allow advanced transformation of companies' processes and internal structures complying with the requirements of e-business. One should also remember that the possible use of the full potential of e-business and obtaining the added value offered by this type of activity also requires a belief from the side of the potential users.

Therefore companies seeking competitive advantage in developing e-commerce strategy should not only think over what general opportunities can e-commerce offer, but also consider what kind of specific on-line instruments for customers should be developed. However, this question is an issue that eventually needs to be scrutinized in an subsequent article. Regardless of that, it seems almost certain that the first comprehensive approach to e-business will create a so-called "win-win " situation, which means benefits fort both sides – the company as well as for the customers.

REFERENCES

Acocella N. 2002. Zasady polityki gospodarczej, Wydawnictwo Naukowe PWN, Warszawa;

Birkhofer B. 2001. E-Commerce als innovativer Absatzkanal. Ein entscheidungsorientiertes Modell, Rosch-Buch, Schesslitz;

Biuletyn kwartalny KNUiFE, Rynek ubezpieczeń 4/2006;

Biuletyn kwartalny KNF, Rynek Ubezpieczeń 4/2010;

Biuletyn kwartalny KNF, Rynek Ubezpieczeń 4/2014;

Dziennik Gazeta Prawna from 10.01.2011;

Gersch M. 2000. E-Commerce: Einsatzmöglichkeiten und Nutzungspotenziale, Arbeitsbericht CCEC 1 Nr. 82 des IUU, Institut für Unternehmungsführung und Unternehmensforschung, März 2000;

Handschke J., Kaczała M. 2004. Badania empiryczne – wykorzystanie Internetu w zakładach ubezpieczeń w Polsce: Założenia badań. In: Internet w działalności ubezpieczeniowej w Polsce ze szczególnym uwzględnieniem dystrybucji edited by. J. Handschke, Katedra Ubezpieczeń AE w Poznaniu, Poznań.

Wikipedia 2015. http://en.wikipedia.org/wiki/E-commerce [online access 24.01.2015];

Wikipedia 2015. http://en.wikipedia.org/wiki/Electronic_business [online access 24.01.2015];

Kaapke A. et al. 2001, E-Commerce-Center Handel: Die Begriffe des eCommerce, Frankfurt am Main;

Kaczała M. 2006. Internet jako instrument dystrybucji ubezpieczeń, praca doktorska, AE w Poznaniu, Warszawa;

Kaczała M. 2004. E-biznes w zakładach ubezpieczeń działających na rynku polskim – wyniki badań. In: Materiały ogólnopolskiego seminarium naukowego „Znaczenie Internetu dla zakładów ubezpieczeń działających na polskim rynku, Katedra Ubezpieczeń AE w Poznaniu, Poznań;

Kotylak S. Comparative analysis of cultural and creative industries in selected cities in Turkey and Poland
In: Market in the modern economy : management – processes. ed. N. Drelukiewicz, A. Memepel-Śnieżyk, A. Sokół, A. Sołoma, Bratysława 2014;

Kuczera K., 2012. Infrastruktura, usługi i potrzeby jako elementy spójnego kształtowania społeczeństwa informacyjnego tworzącego warunki zrównoważonego rozwoju, in: Handel wewnętrzny, lipiec-sierpień 2012, tom III;

Meshkat L., Farkhondehnia F., Bagheri Z., Alihoseini O., Sanayeimatak S., Esmaeili M., Mostafalo M., Ebadati H., Masaratbakhsh M., 2012. Electronic Insurance and its application in e-commerce, in: Interdisciplinary Journal of Contemporary Research in Business, December 2012, vol 4, no 8;

Lilischkis S., 2003. ICT and E-Business in the Insurance and Pension-Funding Sector in the EU, empirica Schriftenreihe, Report 01/2003, Serie: e-Business;

Norris M., West S. 2001. E-biznes, Wydawnictwa Komunikacji i Łączności, Warszawa;

Szpringer W. 2000. Handel elektroniczny – konkurencja czy regulacja?, Difin, Warszawa;

Rzeczpospolita (Banki & finance) from 16.12.2009;

Wagner F., 2004. E-biznes w instytucjach finansowych w Europie. Czynniki sukcesu – czynniki porażki (na przykładzie strategicznego znaczenia Internetu dla działalności ubezpieczeniowej). In: Materiały ogólnopolskiego seminarium naukowego Znaczenie Internetu dla zakładów ubezpieczeń działających na polskim rynku, Katedra Ubezpieczeń AE w Poznaniu, Poznań 18 maj 2004;

Word Street Journal Polska from 5.01.09.

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Proposal of procedure of creating ontology of business knowledge

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Abstract

Economic indicators provide much information concerning functioning of an enterprise. Their usefulness depends also on comprehension by decision-makers existing between indicators structural and semantic connections. More and more attention is paid to the use of semantic technologies as a solution which can be used to search and acquire unique information. In literature development of Business Intelligence systems towards using semantic search is describe. One of the main artefacts to create a semantic network is the ontology. There are many methods describing the procedure of creating ontology for information solutions. So far there is no single standard of design and creating ontology recommended by everyone. The article presents the approach to creating ontology of business knowledge, which can be implemented in the Business Intelligence system.

Keywords: ontology, ontology of business knowledge, procedure of creating an ontology, Business Intelligence system.

Introduction

The decision making in the enterprise is based among others on the analysis of its activity and a variety of economic and financial indicators. Between these indicators there are various hierarchic and semantic connections. Analysis of semantic relations often has essential impact on formulation of accurate conclusions from the economic analysis assessing the functioning of an enterprise. To make optimal decisions, managers need very specific information, which is a result of comparing or combining indicators that occur at different points in time. Data to these analyses come from different sources. Current Business Intelligence (BI) systems provide large spectrum of reports presenting economic and financial information in various structures and contexts. These are production reports showing basic indicators allowing the valuation of business enterprise activities, demand reports and exception reports related to specific activities. However existing BI solutions are designed primarily for users who are able to understand the business data models (see: Raden, 2007).

Managerial staff expects information systems to not only provide aggregate values in the form of economic and financial indicators but also to show dependencies and relationships between

indicators. Today the development of new BI systems is oriented towards BI 2.0 (described in: Nycz 2013; Nelson, 2010; Raden, 2007; Roebuck 2012; Sell, Cabral, Motta, Domingue, Pacheco, 2008). One of the main part of modern BI systems is the ontology (see inter alia: Nelson, 2010) which can support understanding dependencies and relationships between economic and financial indicators.

We are carrying out research on the use of visualization methods in searching business information (especially in BI systems) basing on a semantic network. One issue of this research is use of semantic technologies such as topic map standard [ISO/IEC 13250:2003], which allow visual model of knowledge representation. The usefulness of created topic map in BI systems depends on the correctness of the constructed ontology of business knowledge. Ontology is inter alia the basis of collecting and searching data in semantic network. In this approach the special attention is paid to the role of the visualization of a semantic network which is not only a tool for presenting data, but also provides an interface allowing interactive visual searching information (see inter alia: Grand, Soto, 2010; Wienhofen, 2010).

The aim of this article is to present a proposal of the method of creating ontology of business knowledge used in information systems for managers. The article is structured as follows. The next section presents overview of methods of creating ontology. Then there is a description of a proposed method of creating ontology of business knowledge. This concept of the presented method is based on: (1) a critical analysis of literature, (2) built ontologies of economic and financial indicators, which were realised during the period 2010-2012.

Overview of methods of creating ontology

In literature many different definitions of ontology can be found. A wide review of this issue is presented in: (Dudycz, 2013, pp. 58-64; Noy, McGuinness, 2005; Smith, 2010). However, there is no universally used one in information technology. Most often quoted definition of ontology formulated by T. Gruber is: „[ontology] is an explicit specification of a conceptualization"(Gruber 1993, p. 907). Ontology can be also defined as a graph of organized semantic topics, where nodes are distinguished topic, whereas edges denote existing relations between them. During designing ontology for given field following criteria described by T. Gruber should be obeyed: clarity, coherence, extendibility, minimal encoding bias and minimal ontological commitment (Gruber, 1993, pp. 908-909). Constructing ontology always denotes analysis and organizing knowledge concerning specific field noted in formalized structure.

There are many methods describing the procedure of creating ontology for information solutions. Among methods listed in literature, the following are worth noting (more widely

characterized inter alia in: Dudycz, 2013; Gomez-Perez, Corcho, Fernandez-Lopez, 2004; Noy, McGuinness, 2005):

- METHONTOLOGY (based on the standard IEEE 1074-1995) – is used to build ontology from scratch. This method is based on main operations defined by process of software development and by methodology of knowledge engineering.
- Noy and McGuinness' method – was proposed by its' authors as a textbook for developing ontologies. This approach is based on creating examples, followed by iterative process of evaluating and improving them.
- On-To-Knowledge – allows building ontology for knowledge management systems. It was developed during the project of the same name financed by European Union, which aim was to apply ontology to information accessible electronically in order to easily manage knowledge in big scattered organizations. In this method created ontology depends largely on applications, in which it will be used.
- SENSUS – proposes connecting topics specific for given field (or domain) in order to create bigger ontologies and limiting those topics that aren't essential for new ontology. The basic assumption of this method is to share knowledge, as it assumes the same base ontology for all newly created ontologies concerning given field.
- UPON (Unified Process for ONtology building) – is marked by use-case driven and iterative and incremental character. Therefore it is also described as incremental method of ontology building.
- Ushold and King's method – was developed basing on experiences gained by its authors during project Enterprise Ontology, which consisted in creating ontology for modeling enterprise processes. This approach was used inter alia to create KADS and IDEF systems, and also was developed by IBM as BSDM.

So far there is no single standard of design and creating ontology recommended by everyone, because it is dependent on its application and the needs of specific users (see inter alia in: Noy, McGuinness, 2005).

Method of creating ontology of business knowledge

Based on the analysis of existing methodologies and completed research (the scheme of this research is presented inter alia in: Dudycz, 2012), a method of creating an ontology of business knowledge has been proposed (see also: Dudycz, 2013, pp. 135-142). In Figure 1 the process of designing ontology of this method is presented. In this method (called Dudycz's method), the following stages are distinguished:

1. Definition of the goals, scope, and constraints of the created ontology. While creating an ontology, assumptions about the created model of knowledge have to be provided. That requires an answer to the question: what will the created ontology be used for? The result of this stage is a definition of the extent of developed ontology and its required level of detail.
2. Analysis of the existing ontologies of business knowledge. This stage involves checking and answering the question: can existing and available ontologies be used in entirety or in fragments in developed ontology? The result of this stage is identification of possible fragments of existing ontologies to be used in the next stage.
3. Conceptualization of the ontology. This is the most important stage of creating ontology of business knowledge, because it is the most important stage in creating a model based on ontology (see inter alia: Almeida, Barbarosa, 2009). It includes the identification of all concepts, definition of classes and their hierarchic structures, modelling relations, identification of instances, specification of axioms, and rules of reasoning. The result of this stage is built ontology's model of the defined field of business knowledge.

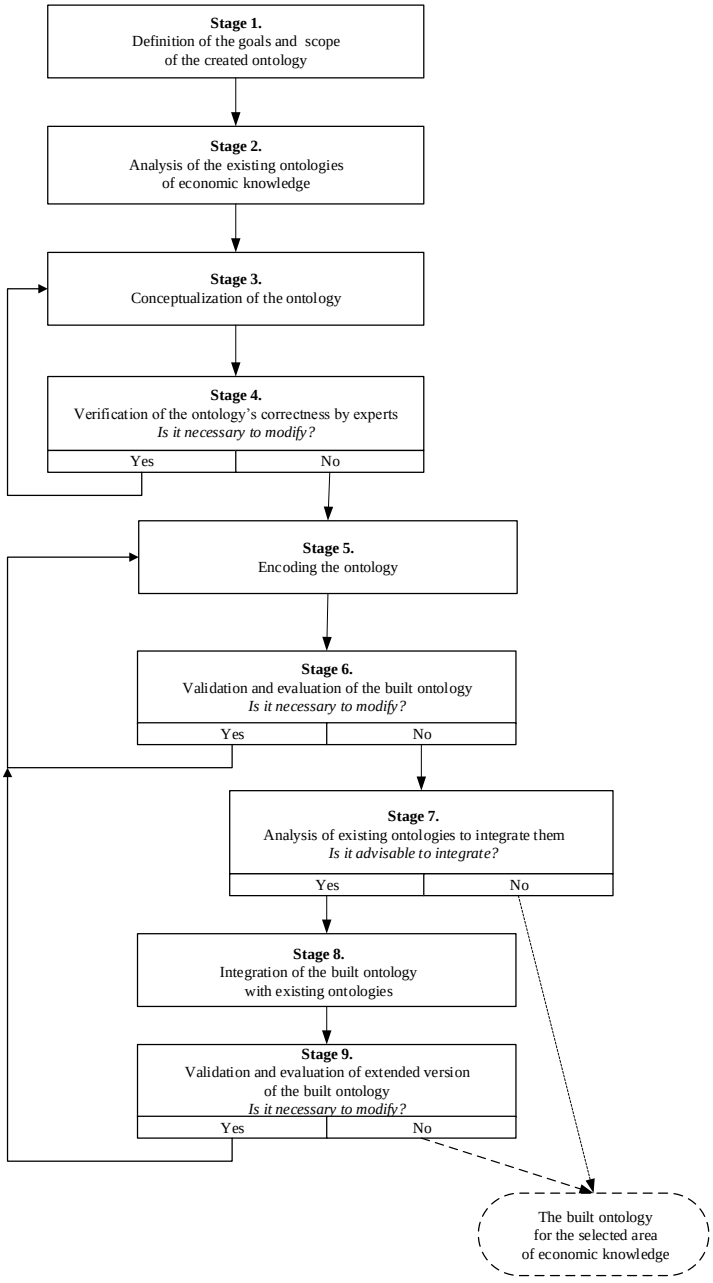

Figure 1. The process of designing ontology of business knowledge

Source: own elaboration (see also: Dudycz, 2013, p. 137).

4. Verification of the ontology's correctness by experts. In this stage, the constructed ontology is verified by experts who did not participate in the process of conceptualization. The experts verify the correctness of topics' definitions, taxonomic topics and relational dependencies between topics. The aim of this stage is to answer the question: is it necessary to modify the ontology' model developed for the chosen part of business knowledge? If the answer is yes, ontology should be improved by repeating previous stage, and if it is no - next stage should be carried out. The result of this stage is the built ontology.
5. Encoding the ontology. The built ontology is described in the formal language or editor of ontology. The result of this stage is the encoded ontology.
6. Validation and evaluation of the built ontology. In this stage, the encoded ontology is checked to ensure it meets the needs of the users (e.g. the managers). Validation is carried out in two areas. Firstly, validation of usefulness and correctness of the created ontology by experts. Secondly, the validation of predefined use cases is carried out. That requires an answer to the questions: (1) will the created ontology be useful for the users (the managers) who will use it? and (2) is it necessary to modify the encoded ontology for the selected part of business knowledge? If the answer is yes, ontology should be improved by repeating previous stage, if it is no – next stage should be carried out. The result of this stage is correct ontology of the chosen part of business knowledge.
7. Analysis of the existing ontologies of business knowledge to integrate them with the built ontology. This stage consists of an analysis of the existing ontologies of business knowledge to answer the questions: (1) is it possible to integrate the built ontology with existing and available ontologies? and (2) will the integrated ontologies be useful as a model of knowledge representation for the users (the managers)? If the answer is yes, it should go to the next stage, if it is no – the creation of the ontology for the selected area of business knowledge is finished.
8. Integration of the built ontology with existing ontologies. At this stage the created ontology is integrated with chosen ontologies. The result of this stage is extended version of the built ontology.
9. Validation and evaluation of extended version of the built ontology. In this stage, validation and evaluation are carried out in two areas. Firstly, the validation of predefined use cases is carried out. Secondly, the evaluation of the usefulness of extended version for the users (the managers) is realized. The aim of this stage is answering two questions. Firstly, is it necessary to modify the extended version of ontology? If the answer is yes, ontology should be improved by repeating the fifth stage; – otherwise second question should be answered: will the extended version of ontology be useful for the users (the managers) in acquiring

knowledge from information system? If the answer is yes, this version of ontology should be recommended, if it is no – the version of ontology before integration should be recommended.

The presented method is characterized by iterative design. Iterative design is commonly used in the development of human computer interfaces, because allows to identify any issues before the user interface is put into wide use. The iterative design of ontology is important in the presented method, because the created ontology should be useful to the users (especially for managers).

Building ontology always denotes analysing and organizing knowledge. The important stage in the described method is the conceptualization of the chosen part of business knowledge. The process of conceptualization of an ontology is an intellectual activity of organizing knowledge acquired from a given domain knowledge. This is carried out by the person, either an expert or in collaboration with an expert, responsible for creating the model of knowledge without the support of automated tools (see inter alia: Almeida, Barbarosa, 2009, p. 2036). Based on a critical analysis of literature (inter alia: Gomez-Perez, Corcho, Fernandez-Lopez, 2004; Noy, McGuinness, 2005) and completed research (the description of conceptualization of ontology of Return on Investment indicator and multidimensional early warning system for production enterprises in: Dudycz, 2010; Dudycz 2011), the following phases in the conceptualization of the ontology of business knowledge are shown:

1. Identification and definition of all topics. A topics' list is determined by experts in a given domain of business knowledge. These topics include, beside their names, also their synonyms and descriptions.
2. Creating a taxonomy of topics. Specification of taxonomic relations between distinguished topics and defining classes and subclasses. In general, these relationships describe the topics generalization.
3. Identification and definition of all relations. All types of existing relations between topics, except the taxonomic relation defined in the previous step, are listed.
4. Modelling of relations between topics. All individual relationships existing in the ontology are listed. The description of relation includes the name of the relationship, the name of the source topic and the name of the target topic.
5. Description of the constant values. Any constant values among topics identified in the first step of this procedure should be described. The specification of this topic should include a value, the type of value, etc.

6. Description of the axioms. If it possible to identify an axiom in the ontology, the axiom should be described. The specification of the axiom should contain: name of this axiom, description in informal and formal language (e.g. using mathematical logic), topics and relations associated with this axiom.
7. Description of functions and rules. The specification of functions and rules should contain: name, formula, input, output, initial and final conditions, definition of operations, and interpretation.
8. Description of instances. It should identify and define the data source for the topics. The description contains the name of the topic and the source of its instance.
9. Description of use cases. Use case describe demonstration analyses of economic or financial topics occurring in this ontology. This step should be realized, if the built ontology will be applied in the information system.

Presented process of the conceptualization of the ontology of business knowledge is closest to the conceptualization in METHONTOLOGY. In the first stage of the research related to the creating of ontology of business knowledge we analyzed a process of a conceptualization in existing methods. The conceptualization in our method is based on METHONTOLOGY, however, we decided to modify this process. Except of a similar approach to the conceptualization of the ontology, our proposed method of creating ontology of economic knowledge is completely different from the METHONTOLOGY.

Comparison of methods of creating ontology of business knowledge

Methods of creating ontology listed in this paper are difficult to compare, because they are dedicated to specific fields and/or specific needs of users. These methods have a different number of stages (from 3 to 9), which are of varying degrees of detail. Because the important stage in the methods of creating ontology (especially for business knowledge) is the conceptualization of ontology, we decided to compare the methods according to this stage. We have identified the important features of a method, which can be used to create ontology of business knowledge used in information systems. These are:

- type of relations – there should be a possibility to define taxonomic and semantic relations, because between economic and financial indicators there are various hierarchic and semantic connections;
- instances – there should be a possibility to define the data source for the topics, because creating ontology used in information system;

- axioms/ functions/ rules – there should be a possibility to define axioms, functions or rules, so ontology can be used in inferring from data from information system;
- use cases – there should be a possibility to describe examples of using created ontology in economic or financial analysis.

In addition, we found that the method of creating ontology of business knowledge should use the iterative approach. It is necessary iterative approach, because the created ontology should be useful to the users (especially for managers). We carried out a comparison of methods to build ontologies due to the 4 characteristic of the conceptualization stage of ontology and one characteristic of the process of creating ontologies. Comparison of the methods of creating ontology is presented in Table 1. The presented comparison of selected methods of creating ontology shows that the proposed method in this article has all the required characteristics. These characteristics are especially important in case of creating ontology of business knowledge. The presented comparison shows that two methods (METHONTOLOGY and On-To-Knowledge) can also be considered.

Table 1. Comparison of selected methods of creating ontology

Name	Conceptualization of ontology				Iterative design
	type of relations	instances	axioms function	use cases	
METHONTOLOGY	Taxonomic and semantic	Yes	Yes	No	Yes
Noy and McGuinness' method	Taxonomic	Yes	No	Yes	Yes
On-To-Knowledge	Taxonomic and semantic	Yes	Yes	No	Yes
SENSUS	Taxonomic	No	No	No	No
UPON	Taxonomic and semantic	No	No	Yes	Yes
Ushold and King's method	Taxonomic and semantic	No	No	No	No
Dudycz's method	Taxonomic and semantic	Yes	Yes	Yes	Yes

Source: own elaboration.

Conclusions

The main contribution of this paper is the demonstration of the procedure of creating ontology of business knowledge. The results of the research on using presented method of creating ontology of business knowledge, despite their initial character, can be considered as quite significant. Many extensions and applications of this work are possible. The proposed method of this paper has become the basis for the definition of the major steps of building an ontology during the realized project called "the Intelligent Dashboard for Managers" (this project is described briefly in inter alia: : Korczak, Dudycz, Dyczkowski, 2013). In this project, six ontologies were built covering economic and financial areas: Cash Flow at Risk, Comprehensive Risk Measurement, Early Warning Models, Credit Scoring, the Financial Market, and General Financial Knowledge (see inter alia: Korczak, Dudycz, Dyczkowski, 2013). The economic and financial ontologies were implemented in the extended TETA Business Intelligence system. Integration creating ontologies of business knowledge into the BI systems assures (Korczak, Dudycz, Dyczkowski, 2013, p. 1114):

- support for the definition of business rules in order to get proactive information and advice in decision-making;
- a semantic layer describing relationships between the concepts and indicators;
- relevant information according to the different kinds of users that can be found in an organization;
- effective usage of existing data sources and data warehouse structure.

This can provide a motivation for the creation of new ontologies of economic and financial indicators and building application which is an important step toward using the semantic search in Business Intelligence systems. Presented process of designing ontology in this point requires further work verifying its usefulness in creating ontology of business knowledge. The use of a ontology of business knowledge seems to be a promising extension for Business Intelligence systems. It not only should improve the efficiency of analysis, but also increase the capacity of understanding of economic and financial data.

References

Almeida M. B., Barbarosa R. R. (2009). Ontologies in Knowledge Management Support: A Case Study, Journal of the American Society for Information Science and Technology, no. 10 (60), 2032-2047.

Dudycz H. (2013). Mapa pojęć jako wizualna reprezentacja wiedzy, Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu.

Dudycz H. (2012) An Attempt of the Heuristic Evaluation of Visualization in Searching Economic Information in Topic Maps, CAiSE 2012 International Workshops Gdańsk, Poland, June 2012 Proceedings, Lecture Notes in Business Information Processing 112, M. Bajec, J. Eder, Eds., Springer-Verlag Berlin Heidelberg, 130-142.

Dudycz H. (2011). Approach to the conceptualization of an ontology of an early warning system, Information Systems in Management XI. Data Bases, Distant Learning, and Web Solutions Technologies, P. Jałowiecki, P. Łukasiewicz, A. Orłowski, Eds., Warsaw University of Life Sciences, no. XI, 29-39.

Dudycz H. (2010). Conceptualization of Ontology of Return on Investment in Order to Generate it in Topic Map Standard, [in:] Advanced Information Technologies for Management – AITM'2010, J. Korczak, H. Dudycz and M. Dyczkowski, Eds. Wrocław University of Economics Research Papers, 2010, no. 147, 87-100.

Gomez-Perez A., Corcho O., Fernandez-Lopez M. (2004). Ontological Engineering: with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web, London: Springer-Verlag.

Grand B.L., Soto M. (2010). Topic Maps, RDF Graphs, and Ontologies Visualization, Visualizing the Semantic Web. XML-Based Internet and Information Visualization, V. Geroimenko, C. Chen, Eds., London: Springer-Verlag, 59-79.

Gruber T. R., (1993). Toward principles for the design of ontologies used for knowledge sharing", International Journal Human-Computer, Studies 43, 907-928.

Korczak J., Dudycz H, Dyczkowski M. (2013). Design of Financial Knowledge in Dashboard for SME Managers, Proceedings of the 2013 Federated Conference on Computer Science and Information Systems. Annals of Computer Science and Information Systems, M. Ganzha, L. Maciaszek, M. Paprzycki, Eds., Polskie Towarzystwo Informatyczne, IEEE Computer Society Press, Warsaw, Los Alamitos, CA, vol. 1, 1111–1118.

Korczak J., Dudycz H., Dyczkowski M. (2012). Intelligent decision support for SME managers – project InKoM, Business Informatics, J. Korczak, H. Dudycz, M. Dyczkowski, Eds., Wrocław University of Economics Research Papers, no. 3 (25), 84-96

Nelson G.S. (2010). Business Intelligence 2.0: Are we there yet?, SAS Global Forum 2010, Retrieved May 10, 2014 from http://support.sas.com/resources/papers/proceedings10/040-2010.pdf.

Noy F. N., McGuinness D.L. (2005). Ontology Development 101: A Guide to Creating Your First Ontology. Retrieved April 15, 2012 from

http://www.ksl.stanford.edu/people/dlm/papers/ontology101/ontology101-noy-mcguinness.html

Nycz M. (2013). Business Intelligence 2.0 as a Support Technology for Decision-Making Process in a Modern Enterprise, Refereed Proceedings of Knowledge Management Conference June 26-28, 2013, Novi Sad, Serbia, J. Yerby, Ed., International Institute for Applied Knowledge Management, Middle Georgia State College, 2013, 13-22.

Raden N. (2007). Business Intelligence 2.0: Simpler, More Accessible, Inevitable, Retrieved March 21, 2012 from http://www.informationweek.com/news/software/bi/197002610

Roebuck K. (2012). Business intelligence (BI): High-impact Strategies - What You Need to Know: Definitions, Adoptions, Impact, Benefits, Maturity, Vendors, Emereo Publishing.

Sell D., Cabral L., Motta E., Domingue J., Pacheco R. (2008). Adding Semantics to Business Intelligence, Retrieved September 05, 2012 from http://dip.semanticweb.org/documents/WebSpaperOUV2.pdf.

Smith B. (2004). Ontology and information systems, State University of New York at Buffalo, Department of Philosophy, Ontology, Retrieved January 12, 2013 from http://ontology.buffalo.edu/ontology.pdf

Wienhofen L. W. M. (2010). Using Graphically Represented Ontologies for searching Content on the Semantic Web, Visualizing the Semantic Web. XML-Based Internet and Information Visualization, V. Geroimenko, C. Chen, Eds., London: Springer-Verlag, 137-153.

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Institutionalization of information and knowledge management in U.S. joint and Army doctrines

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Abstract

The aim of the paper is to analyze the institutionalization of information and knowledge management in U.S. joint and Army doctrines and publications. U.S. military capstone and keystone joint publications as well as key U.S. Army doctrines are scanned to identify the elements of information and knowledge management concepts and discuss their assumptions. The quantitative and qualitative analyses of the content of U.S. joint and Army publications are main data elicitation methods. The analysis encompasses only unclassified publications, officially approved for public release and unlimited distribution online. The study shows that information management is more frequently mentioned in U.S. military doctrines than knowledge management. Detailed issues concerning information management are covered by the special series of Army regulations. Moreover, the U.S. Army institutionalizes the concept of knowledge management in the field manual on knowledge management operations. Similarly, the solutions for effective Lessons Learned systems are established in related U.S. military publications.

Keywords: information management, knowledge management, data, information, knowledge, Lessons Learned, military doctrine.

Introduction

Information management and knowledge management are the concepts widely established in contemporary management research and business practice. As observed by Becerra-Fernandez and Sabherwal (2010, p. 18-19), there are two approaches to explain the differences between information and knowledge. According to the first one, knowledge is considered to be the highest level of the cognitive hierarchy including data and information. Declaring themselves as the opponents of such a simplistic view, Becerra-Fernandez and Sabherwal (2010, p. 19) define knowledge as "justified beliefs about relationships among concepts relevant to that particular area". They acknowledge the reference to the work by Nonaka (1994, p. 15) who explains the difference between information and knowledge in the following way: "information is a flow of

messages, while knowledge is created and organized by the very flow of information, anchored on the commitment and beliefs of the holder".

Traditionally, the research in the field of information and knowledge management is focused on business organizations. Nevertheless, the armed forces may also be interesting examples of information management and knowledge management implementation and their contribution to the organizational success. The study by Lis (2014) confirms that the Nonaka's seminal model of organizational knowledge creation (cf. Nonaka, 1991; Nonaka and Takeuchi, 1995) is well applicable to military military organizations. On the other hand, the armed forces have contributed to the development of effective knowledge management systems and tools such as Lessons Learned systems (cf. Weber et al., 2000; Weber et al., 2001; Hallet et al., 2009; Jabłoński and Lis, 2012) and After Action Reviews (Davenport and Prusak, 1998, p. 8-9; Garvin et al., 2008, p. 112). As observed by Byrne and Bannister (2013, p. 90):

> [i]nformation and knowledge are the most valuable resources to any military while paradoxically also becoming the new 'fog' of modern war. The modern operating environments […] require military leaders to process exponentially increasing amount of information fed to them by myriad of sensors in the field. Identifying the relevant information and knowledge to enable faster, better informed decisions is a challenge.

Therefore, the armed forces so eagerly responded to emerging concepts of knowledge management (cf. Lepak, 2009) and learning organization (cf. Wheatley, 1994; DiBella, 2010). Adapting the assumptions of knowledge management to the military context McIntyre et al. (2003, p. 38) define the concept and discuss its requirements describing knowledge management as:

> a strategic approach to achieving defense objectives by leveraging the value of collective knowledge through the processes of creating, gathering, organizing, sharing and transferring knowledge into action. It requires processes that are robust and reliable within operational contexts, content and intellectual assets that are focused, precise, reliable with suitable levels of recall, and knowledge creation and conversion processes that match the pace of operations.

The role played by information and management in military decisions making processes is detailed by the U.S. Army doctrine publication on unified land operations which states that: "[i]nformation management helps commanders make and disseminate effective decisions faster than the enemy can" while "[k]nowledge management enables commanders to make informed, timely decisions despite the uncertainty of operations" (ADP 3-0, 2012, p. 3.2).

Military organizations often declare that they highly value organizational knowledge and they strive for becoming learning organizations. For instance, Hutson (2011, p. 48-49) cites the NATO Bi-Strategic Commands Information and Knowledge Management Vision (2007), which reads that "the NATO Military Structure will transform into a Knowledge Centric Organization (KCO) that deliberately and systematically exploits NATO information and expertise, and proactively manages its information and KM processes". Similarly, as stated in the U.S. Army field manual for knowledge management operations, the Army aims at transformation into a knowledge-based organization, which integrates "best practices, the most effective and efficient method of achieving any objective or task, into operations and training" (FM 6-01.1, 2012, p. 1.13).

The development of contemporary military organizations is driven by the operational capability-based approach (cf. Gocuł, 2013, p. 25-28; Wojtan, 2014, p. 35-45), which resembles the assumptions of the resource-based view (RBV). According to the military way of developing operational capabilities, any capability consists of the following functional components described by the DOTMLPFI acronym: doctrine, organization, training, materiel, leadership, personnel, facilities and interoperability (JP 1-02, 2010, p. A-51, cf. Joint Analysis Handbook, 2007, p. 43-44). It means that military doctrines make one of the building blocks of any operational capability. From the knowledge management perspective, military doctrines, which define organizational routines, rules and procedures to be implemented in the armed forces, may be considered as the outcomes of the institutionalizing phase within the organizational learning process (cf. Crossan et al., 1999) or the products of knowledge combination according to the SECI model (cf. Lis, 2014, p. 69-71).

The aim of the paper is to analyze the institutionalization of information and knowledge management in U.S. joint and Army doctrines and publications. U.S. military capstone and keystone joint publications as well as key U.S. Army doctrines are scanned to identify the elements of information and knowledge management concepts and discuss their assumptions.

The quantitative and qualitative analyses of the content of U.S. joint and Army publications are main data elicitation methods. The analysis encompasses only unclassified publications, officially approved for public release and unlimited distribution online.

The U.S. military doctrines include two main categories of publications: joint-level publications issued by the U.S. Joint Staff, applicable to joint operations grouping the troops of two or more services and service-level publications (Army, Air Forces, Navy, Marine Corps and Coast Guard) issued by service headquarters. The hierarchy of joint publications consists of three levels: capstone publications, keystone publications and other doctrine publications. The Doctrine for the Armed Forces of the United States (JP 1, 2013) is the capstone publication for the hierarchy of 81 joint doctrines (as of January 05, 2015). The level of keystone publications comprises 6 documents related to joint personnel support (JP 1-0, 2011), intelligence (JP 2-0, 2013),

operations (JP 3-0, 2011), logistics (JP 4-0, 2013), operation planning (JP 5-0, 2011), communications system (JP 6-0, 2010). These publications establish doctrinal foundations for key functional areas. All remaining 74 documents which are categorized as doctrine publications provide detailed regulations for narrow issues.

The collection of U.S. Army publications includes five categories of documents related to administrative issues, technical issues and equipment, doctrine and training, engineering and medical support. From the perspective of information and knowledge management, the categories of publications of primary interest are: Army doctrine publications (ADPs), Army doctrine reference publications (ADRPs) and field manuals (FM) among doctrine and training publications, and Army regulations (AR) within the administrative area.

Information and knowledge management (IKM) in U.S. joint doctrine publications

The study of the institutionalization of information and knowledge management concepts within U.S. joint doctrine publications consists of two steps. First of all, the quantitative analysis of keywords frequency in these publications is conducted. Secondly, the qualitative content analysis of selected doctrines is applied.

Due to the scope of information and knowledge management concepts, the analysis is focused on capstone and keystone doctrines which are scanned to identify the following keywords: data, information, knowledge, information management and knowledge management. The results of this operation are presented in Table 1.

Table 1. Keywords related to IKM in U.S. joint doctrine publications

Publication	Data	Information	Knowledge	Information Management	Knowledge Management
JP 1	3	104	22	5	0
JP 1-0	78	101	0	1	0
JP 2-0	95	441	14	1	0
JP 3-0	18	250	36	5	0
JP 4-0	34	107	2	2	0
JP 5-0	31	197	15	5	0
JP 6-0	99	577	13	26	0
Total	358	1777	102	45	0

The data gathered in Table 1 show that the knowledge management concept is not explicitly mentioned in any of U.S. joint doctrine publications under the study. Within analyzed documents there are 45 references to information management, while more than half of them is included into the joint communications systems doctrine (JP 6-0, 2010). As regards the levels of the cognitive hierarchy (data, information, knowledge) stratified in the pyramid of knowledge (cf. Davenport and Prusak, 1998, p. 1-6), information is the most often cited element. Nevertheless, it should be mentioned that in some cases, the word "information" in studied doctrine publications is used to make a reference to some other documents or issues rather than to denote a level of the cognitive hierarchy. Among the publications under the study, information is most often mentioned in the documents related to communications system (JP 6-0, 2010), intelligence (JP 2-0, 2013) and operations (JP 3-0, 2011). Doctrines on communications system (JP 6-0, 2010), intelligence (JP 2-0, 2013) and joint personnel support (JP 1-0, 2011) are the documents which most frequently refer to data. As regards knowledge, it is most often cited in the joint operations doctrine (JP 3-0, 2011) and the joint capstone doctrine (JP 1, 2013). Taking into account the results of quantitative analysis presented above, from the perspective of information and knowledge management, the most interesting joint publications to be studied in detail include the doctrines on joint intelligence, operations and communications.

The joint intelligence doctrine (JP 2-0, 2013, p. I.1-I.3.) explains the relationships of data, information and intelligence in the context of operational environment. The analysis shows that the doctrine considers intelligence as the equivalent of knowledge in the generic model of the cognitive hierarchy. According to the doctrine statements, data collected from the operational environment are processed into information which is analyzed to produce intelligence. The joint intelligence process includes the following categories of intelligence operations as: planning and direction, collection, processing and exploitation, analysis and production, dissemination and integration, evaluation of intelligence quality and feedback (JP 2-0, 2013, p. I.6).

The joint operations doctrine (JP 3-0, 2011) focuses the attention on creating shared understanding which is necessary for commanders to make good decisions. In the cognitive hierarchy established by the doctrine, shared understanding corresponds to the knowledge level in the generic model of the knowledge management hierarchy. The doctrine (JP 3-0, 2011, p. III.12) defines information management as "an essential process that receives, organizes, stores, controls, and secures organization's wide range of data and information in a manner that facilitates availability to relevant users, while concurrently preventing inadvertent disclosure of sensitive or proprietary information". Moreover, the joint operations doctrine highlights the significant role of knowledge sharing to create shared understanding.

Among operations series of joint doctrine publications, the doctrine on the joint task force headquarters focuses its special attention on information management issues. The doctrine (JP 3-33, 2012, p. IV.14) enumerates information management, together with the commander's decision cycle and the headquarters battle rhythm, among the processes of predominant importance for efficient and effective management of the operations of any joint task force headquarters. In order to support the joint task force commander and his/her chief of staff and staff directors, the following bodies and functions responsible for information management may be established: information management officer, joint information management board, joint data network operation cell, joint information management cell, staff directorate IM representatives and component command information management officers, request for information (RFI) managers (JP 3-33, 2012, p. D.4-D.9). According to the U.S. military experience the key processes and procedures for effective information management are: commander's critical information requirements (CCIR), request for information (RFI), the daily battle rhythm of the headquarters, reports, orders and distribution, briefings and meetings, multinational procedures and systems (JP 3-33, 2012, p. D.9-D.12). As regards the joint communications system doctrine (JP 6-0, 2010), information management is listed among global information grid components, together with: a warrior component, global applications, computing, communications, foundation and network operations. In this context, information management role is aimed at "controlling and prioritizing of information through its life cycle: creation or collection, processing, dissemination, use, storage and disposition" (JP 6-0, 2010, p. II.2).

Information and knowledge management (IKM) in U.S. Army doctrine publications

Similarly to U.S. military joint publications, the key Army doctrines are scanned to identify the following keywords: data, information, knowledge, information management and knowledge management. The results of this operation are presented in Tables 2 and 3.

Table 2. Keywords related to IKM in U.S. Army doctrine publications

Publication	Data	Information	Knowledge	Information Management	Knowledge Management
ADP 1	0	8	10	0	0
ADP 2-0	3	87	3	0	0
ADP 3-0	0	8	3	1	1
ADP 4-0	0	9	4	0	0
ADP 5-0	0	31	6	0	0
ADP 6-0	1	60	9	3	3
ADP 7-0	0	3	17	0	0
Total	4	206	52	4	4

As regards U.S. Army doctrine publications (ADPs), information management and knowledge management are explicitly cited 4 times: three citations in ADP 6-0 (2012) and one in the doctrine on unified land operations (ADP 3-0, 2011). In all the cases information management and knowledge management are listed among the functions of staffs. As stated in ADP 6-0 (2012, p. 8), within the section on the philosophy of command, "[s]taffs use information and knowledge management practices to assist commanders in collecting, analyzing and dissemination information".

Information is the most often cited element of the cognitive hierarchy within the Army doctrine publications under the study (206 citations). Nevertheless, similarly to U.S. military joint publications, the word "information" in studied doctrine publications is often used to make a reference to some other documents or issues rather than to denote the level of the cognitive hierarchy. Knowledge is mentioned 52 times, whereas data are referred to only 4 times.

Table 3. Keywords related to IKM in U.S. Army doctrine reference publications

Publication	Data	Information	Knowledge	Information Management	Knowledge Management
ADRP 1	0	5	26	0	0
ADRP 2-0	75	502	35	1	5
ADRP 3-0	0	65	16	2	2
ADRP 4-0	11	57	6	5	0
ADRP 5-0	3	160	14	2	3
ADRP 6-0	21	213	55	12	16
ADRP 7-0	0	11	5	0	0
Total	110	1013	157	22	26

As regards Army doctrine reference publications (ADRPs), all the items under the analysis are more often listed in ADRPs than in ADPs. The knowledge management concept is listed explicitly 26 times, and information management – 22 times. In both cases, the Army doctrine reference publication on mission command (ADRP 6-0, 2012) is the publication of the top number of citations. The same applies to the frequency of references to knowledge. For data and information, the Army doctrine reference publication on intelligence (ADRP 2-0, 2012) is characterized by the top number of citations.

The qualitative analysis of the contents of ADPs and ADRPs highlights the role of information and knowledge in combat power, decision making processes, and mission command. Then, it focuses the attention on the comparative analysis between information management and

knowledge management within the military context. Finally, Army information systems are discussed.

ADRP 3-0 (2012, p. 3.1) enumerates information among the elements of combat power (remaining elements include: leadership, mission command, movement and maneuver, fires, sustainment and protection). In ADP 5-0 (2012), judgment to information and knowledge available to the commander is mentioned to be the key success factor for making timely and effective decisions which are the prerequisites for any successful operation. Therefore, commanders strive for developing and maintaining the situational awareness which is defined as "the product of applying analysis and judgment to relevant information to determine the relationships among the operational and mission variables to facilitate decision making" (ADP 5-0, 2012, p. 5). As such, situational awareness seems to be similar to the construct of knowledge within the generic civilian cognitive hierarchy.

Information is considered to be one of the antecedents of the science of control defined as "the systems and procedures used to improve the commander's understanding and support accomplishing mission" (ADP 6-0, 2012, p. 8). Therefore, information management and knowledge management are listed among four primary staff tasks together with: the conduct of the operations process, inform and influence activities and cyber electromagnetic activities (ADP 3-0, 2011, p. 13; ADP 6-0, 2012, p. 10). As highlighted in the Army doctrine publication on mission command:

> [c]ommanders determine information requirements and information priorities by establishing commander's critical information requirements. Commanders and staff interpret information received to gain understanding and to exploit fleeting opportunities, respond to developing threats, modify plans, or reallocate resources. Staffs use information and knowledge management practices to assist commanders in collecting analyzing, and disseminating information. This cycle of information exchange provides the basis for creating and maintaining understanding (ADP 6-0, 2012, p. 8).

The Army doctrine reference publication on unified land operations (ADP 3-0, 2012) makes an explicit distinction between knowledge management and information management highlighting the role of these two concepts in the military decision making process. As stated in the publication under the study: "[k]nowledge management enables commanders to make informed, timely decisions despite the uncertainty of operations" while "[i]nformation management helps commanders make and disseminate effective decisions faster than the enemy can" (ADP 3-0, 2012, p. 3.2). The Army doctrine reference publication on mission command (ADRP 6-0, 2012) provides official definitions of both terms and details their roles. Knowledge management is defined as "the process of enabling knowledge flow to enhance

shared understanding, learning and decision making" while information management is described as "the science of using procedures and information systems to collect, process, store, display, disseminate and protect data, information, and knowledge products" (ADRP 6-0, 2012, p. 3.5). As regards the concept of knowledge management, its assumptions are detailed in the U.S. Army publication by the field manual on knowledge management operations (FM 6-01.1, 2012).

According to the Army doctrines, information management activities are supported by information systems consisting of computers (hardware and software), communications equipment and all necessary procedures for collecting, processing, storing, displaying and disseminating information. The Army information systems, together with: personnel, networks, processes, procedures, facilities and equipment, make up a mission command system in order to support commanders in conducting operations (ADP 6-0, 2012, p. 11-12).

Besides ADPs and ADRPs, information management issues are detailed in Army regulations, memorandums, manuals and pamphlets. Their scope encompasses the issues of: information and data management programs, information security, recordkeeping, IT systems, publishing program, official correspondence management and information in operational environments. What needs to be highlighted, the special category of Army regulations (series 25) is focused on information management issues.

The foundations of the Lessons Learned program are set up both on the joint (CJCSI 3150.25E) and Army (AR 11-33, 2006) levels. Respective publications define responsibilities in the field and provide necessary procedures. Instructions and Army regulations are supplemented with manuals (CJCSM 3150.25, 2011) and handbooks (Establishing a LL Program, 2011) translating the concept of Lessons Learned into techniques and tools useful for all military personnel from rank-and-file soldiers to general officers.

Conclusions

The concept of knowledge management is not explicitly mentioned in any of U.S. joint capstone and keystone doctrines. It appears seldom in Army doctrine publications (ADPs) while Army doctrine reference publications (ADRPs) are characterized by moderate frequency of references to knowledge management. The concept of information management is relatively frequently mentioned in U.S. joint publications, moderately in ADRPs and seldom in ADPs. In both cases, the concepts of information management and knowledge management are most often cited in publications related to missions command (series 6-0). What is a strength of the U.S. military publications under the study, there are Army regulations, field manuals and other lower-level

documents which establish detailed procedures and policies for information management and knowledge management.

In the study of U.S. military joint publications, two important aspects of information and knowledge management should be emphasized. First of all, data, information and intelligence are discussed in the context of operational environment (cf. JP 2-0, 2013), which corresponds with acquiring, processing and using data, information and knowledge about the organizational environment and the industry in business organizations. Secondly, creating shared understanding necessary for commanders to make good decisions is highlighted (cf. JP 3-0, 2011).

The analysis of Army doctrine publications shows the role of information and knowledge in combat power, decision making processes, and mission command. Moreover, these documents compare the concepts of information management and knowledge management within the military context. Finally, the doctrines analyze the issue of information systems.

The study shows that both the concepts under the study are institutionalized in U.S. joint and Army publications. Information management seems to be better grounded in analyzed publications than knowledge management which is confirmed by outcomes of both quantitative and qualitative analyses. Nevertheless, it should be emphasized that the field manual on knowledge management operations (FM 6-01.1, 2012) and all the publications related to Lessons Learned provide troops with necessary theoretical foundations as well as policies and procedures for practical implementation of the knowledge management concept.

Summing up, the outcomes of the analysis provide a valuable case study both for the researchers dealing with the issues of institutionalization of information and knowledge management concepts in contemporary organizations and practitioners interested in lessons learned and best practices from the field. The findings may be particularly useful for the armed forces and hierarchical organizations in other countries. Simultaneously, information and knowledge management concepts in military organizations seem to be interesting areas for further scientific exploration, especially in regard to the lessons from the implementation of doctrinal assumptions into training and military operations.

References

ADP 1 (2012). The Army, Washington: Headquarters Department of the Army. Retrieved February 12, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adp1.pdf.

ADP 2-0 (2012). Intelligence, Washington: Headquarters Department of the Army. Retrieved February 12, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adp2_0.pdf.

ADP 3-0 (2011). Unified Land Operations, Washington: Headquarters Department of the Army. Retrieved February 12, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adp3_0.pdf.

ADP 4-0 (2012). Sustainment, Washington: Headquarters Department of the Army. Retrieved February 12, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adp4_0.pdf.

ADP 5-0 (2012). The Operations Process, Washington: Headquarters Department of the Army. Retrieved February 12, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adp5_0.pdf.

ADP 6-0 (2012). Mission Command, Washington: Headquarters Department of the Army. Retrieved February 12, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adp6_0_new.pdf.

ADP 7-0 (2012). Training Units and Developing Leaders, Washington: Headquarters Department of the Army. Retrieved February 12, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adp7_0.pdf.

ADRP 1 (2013). The Army Profession, Washington: Headquarters Department of the Army. Retrieved February 22, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adrp1.pdf.

ADRP 2-0 (2012). Intelligence, Washington: Headquarters Department of the Army. Retrieved February 22, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adrp2_0.pdf.

ADRP 3-0 (2012). Unified Land Operations, Washington: Headquarters Department of the Army. Retrieved February 22, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adrp3_0.pdf.

ADRP 4-0 (2012). Sustainment, Washington: Headquarters Department of the Army. Retrieved February 22, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adrp4_0.pdf.

ADP 5-0 (2012). The Operations Process, Washington: Headquarters Department of the Army. Retrieved February 22, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adrp5_0.pdf.

ADRP 6-0 (2012). Mission Command, Washington: Headquarters Department of the Army. Retrieved February 22, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adrp6_0_new.pdf.

ADRP 7-0 (2012). Training Units and Developing Leaders, Washington: Headquarters Department of the Army. Retrieved February 22, 2015 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/adrp7_0.pdf.

AR 11-33 (2006). Army Lessons Learned Program (ALLP), Washington: Headquarters Department of the Army. Retrieved February 15, 2015 from http://armypubs.army.mil/epubs/pdf/r11_33.pdf.

Bi-SC IKM Vision and Strategic Concept (2007). Allied Command Operations & Allied Command Transformation.

Becerra-Fernandez, I., Sabherwal, R. (2010). Knowledge Management: Systems and Processes, New York: M.E. Sharpe, Inc.

Byrne, B., Bannister, F. (2013). Knowledge Management in Defence. Defence Forces Review 2013, 71-91. Retrieved March 25, 2014 from http://www.military.ie/fileadmin/user_upload/images/Info_Centre/documents/Annual_Reviews/DF_Review_2013.pdf.

CJCSI 3150.25E (2012). Joint Lessons Learned Program, Joint Chiefs of Staff. Retrieved February 20, 2015 from http://www.dtic.mil/doctrine/doctrine/jllpb/cjcsi3150_25.pdf.

CJCSM 3150.25 (2011). Joint Lessons Learned Program, Joint Chiefs of Staff. Retrieved February 20, 2015 from http://www.dtic.mil/doctrine/doctrine/jllpb/cjcsm3150_25.pdf.

Crossan, M.M., Lane, H., White, R. (1999). An Organizational Learning Framework: From Intuition to Institution, Academy of Management Review, 24(3), 522-537.

Davenport T.H., Prusak L. (1998). Working Knowledge: How Organizations Manage What They Know, Boston: Harvard Business School Press.

DiBella, A.J. (2010). Can the Army Become a Learning Organization. Joint Force Quarterly, 2010, 56, 117-122. Retrieved February 28, 2014 from http://www.dtic.mil/dtic/tr/fulltext/u2/a515164.pdf.

Establishing a Lessons Learned Program: Observations, Insights and Lessons (2011). Fort Leavenworth: Center for Army Lessons Learned. Retrieved February 28, 2014 from http://usacac.army.mil/cac2/call/docs/11-33/11-33.pdf.

FM 6-01.1 (2012). Knowledge Management Operations. Washington: Headquarters Department of the Army. Retrieved March 25, 2014 from http://armypubs.army.mil/doctrine/DR_pubs/dr_a/pdf/fm6_01x1.pdf.

Garvin, D.A., Edmondson, A.C., Gino, F. (2008). Is Yours a Learning Organization? Harvard Business Review, March, 109-116.

Gocuł, M. (2013). Strategiczne uwarunkowania funkcjonowania i rozwoju Sił Zbrojnych RP. In: J. Wołejszo, A. Lis, R. Reczkowski (Eds.), Innowacja i synergia w Siłach Zbrojnych RP, Vol. 2, Bydgoszcz: CDiS SZ, 13-36.

Hallet, M., Mota, M., Pinot, J.H., Smack, M., Soegaard, P. (2009). Introduction to the NATO Lessons Learned Capability. The Three Swords Magazine, 16, 38-45. Retrieved February 28, 2014 from http://www.jwc.nato.int/media/three-swords-magazine/118-issue-no-16.

Hutson, P. (2011). Information and Knowledge Management: Framing the Challenge. The Three Swords Magazine, 19, 46-49. Retrieved February 28, 2014 from http://www.jwc.nato.int/media/three-swords-magazine/121-issue-no-19.

Jabłoński, J., Lis, A. (2012). Lessons Learned System as a Tool of Managing Organizational Knowledge: The Case of Military Organizations. In: A. Nalepka, A. Ujwary-Gil (Eds.), Business and Non-profit Organizations Facing Increased Competition and Growing Customers' Demands, Nowy Sącz: Wyższa Szkoła Biznesu – National Louis University, 163-186.

Joint Analysis Handbook. (2007). Monsanto: Joint Analysis and Lessons Learned Centre. Retrieved February 04, 2015 from http://www.jallc.nato.int/newsmedia/docs/Joint_Analysis_Handbook_3rd_edition.pdf.

JP 1 (2013). Doctrine for the Armed Forces of the United States. Retrieved January 30, 2015 from http://www.dtic.mil/doctrine/new_pubs/jp1.pdf.

JP 1-02 (2010/2014). Department of Defense Dictionary of Military and Associated Terms. Retrieved January 30, 2015 from http://www.dtic.mil/doctrine/new_pubs/jp1_02.pdf.

JP 1-0 (2011). Joint Personnel Support. Retrieved January 30, 2015 from http://www.dtic.mil/doctrine/new_pubs/jp1_0.pdf.

JP 2-0 (2013). Joint Intelligence. Retrieved January 30, 2015 from http://www.dtic.mil/doctrine/new_pubs/jp2_0.pdf.

JP 3-0 (2011). Joint Operations. Retrieved January 30, 2015 from http://www.dtic.mil/doctrine/new_pubs/jp3_0.pdf.

JP 3-33 (2012). Joint Task Force Headquarters. Retrieved February 22, 2015 from http://www.dtic.mil/doctrine/new_pubs/jp3_33.pdf.

JP 4-0 (2013). Joint Logistics. Retrieved January 30, 2015 from http://www.dtic.mil/doctrine/new_pubs/jp4_0.pdf.

JP 5-0 (2011). Joint Operation Planning. Retrieved January 30, 2015 from http://www.dtic.mil/doctrine/new_pubs/jp5_0.pdf.

JP 6-0 (2010). Joint Communications System. Retrieved January 30, 2015 from http://www.dtic.mil/doctrine/new_pubs/jp6_0.pdf.

Lepak, J.J. (2009). Creating a Knowledge Management Strategy, Carlisle Barracks: U.S. Army War College.

Lis, A. (2014). Knowledge Creation and Conversion in Military Organizations: How the SECI Model is Applied Within Armed Forces, Journal of Entrepreneurship, Management and Innovation, 10(1), 57-78.

McIntyre, S.G., Gauvin, M., Waruszynski, B. (2003). Knowledge Management in the Military Context. Canadian Military Journal, Spring 4(1), 35-40. Retrieved March 24, 2014 from http://www.revue.forces.ca/vo4/no1/doc/v4n1-p35-40-eng.pdf.

Nonaka, I. (1991). The Knowledge-Creating Company. Harvard Business Review, November-December, 96-104.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. Organization Science, 5(1), 14-37.

Nonaka, I., Takeuchi, H. (1995). The Knowledge Creating Company. New York: Oxford University Press.

Weber, R., Aha, D.W., Becerra-Fernandez, I. (2000). Categorizing Intelligent Lessons Learned Systems. In: D.W. Aha, R. Weber (Eds.), Intelligent Lessons Learned Systems: Papers from the AAAI Workshop, Technical Report WS-00-03, Menlo Park: AAAI Press, 63-67. Retrieved March 28, 2015 from http://www.aaai.org/Papers/Workshops/2000/WS-00-03/WS00-03-016.pdf.

Weber, R., Aha, D.W., Becerra-Fernandez, I. (2001). Intelligent Lessons Learned Systems. Expert Systems with Applications, 20(1), 17-34. Retrieved March 28, 2015 from https://idea.library.drexel.edu/islandora/object/idea%3A2674/datastream/OBJ/view.

Wheatley, M.J. (1994). Can the U.S. Army Become a Learning Organization? The Journal of Quality and Participation, 17(2), 50-56.

Wojtan, A. (2014). Zarządzanie zdolnościami Sił Zbrojnych RP odpowiedzią na zagrożenia przyszłości. In: K. Czupryński, P. Soroka (Eds.), Modernizacja połączonych Rodzajów Sił Zbrojnych RP w nowych uwarunkowaniach geopolitycznych, Warszawa: Wojskowa Akademia Techniczna, 25-47.

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The use of intelligent ICT solutions at a local governmental level

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Abstract

The paper has been devoted to the local government unit from the point of view of how to support it in decision-making issues. The main goal of this paper is to present how Business Intelligence solutions can be used to support Polkowice in municipality management. Authors, in that case, consider BI solution as an integration tool for administration units in municipality responsible for making present ordering and future growth of Polkowice Municipality. Authors intension is to show how all administration units of municipality can cooperate with local authorities using the Business Intelligence solution. Paper consists of 6 parts. After the brief introduction with the characteristics of the local public units in Poland, authors present useful ICT solutions. The next part consists of the conceptual model of the BI solutions for the Polkowice Municipality. Part three presents strengths and weaknesses of this model. Short conclusions end the paper.

Keywords: local public units, sustainable development, Business Intelligence

Introduction - characteristics of the local public units in Poland

The obligation for the functioning of society is to create a particular social order, allowing its smooth functioning. Therefore, it is necessary to create certain rules, principles and criteria that will determine that order. Thus, it is important to define the scope of the tasks that will be adopted for implementation. It is fundamental to determine the financial resources necessary to perform the tasks, which means the best use of public funds in order to satisfy social needs.

The local government is a local or regional self-governing community. These units are self-contained and autonomous in functioning in the sphere of public activities of local importance. Units conduct their business in their own name and to their own responsibility. This means that each of them, within its field of competence, itself defines all the aims, possible ways of achieving them and is responsible for the execution of these tasks.

Local government units operate through their constitutive organs. Each of the units has provided a statutory constitutive organ, executive and control one (figure 1).

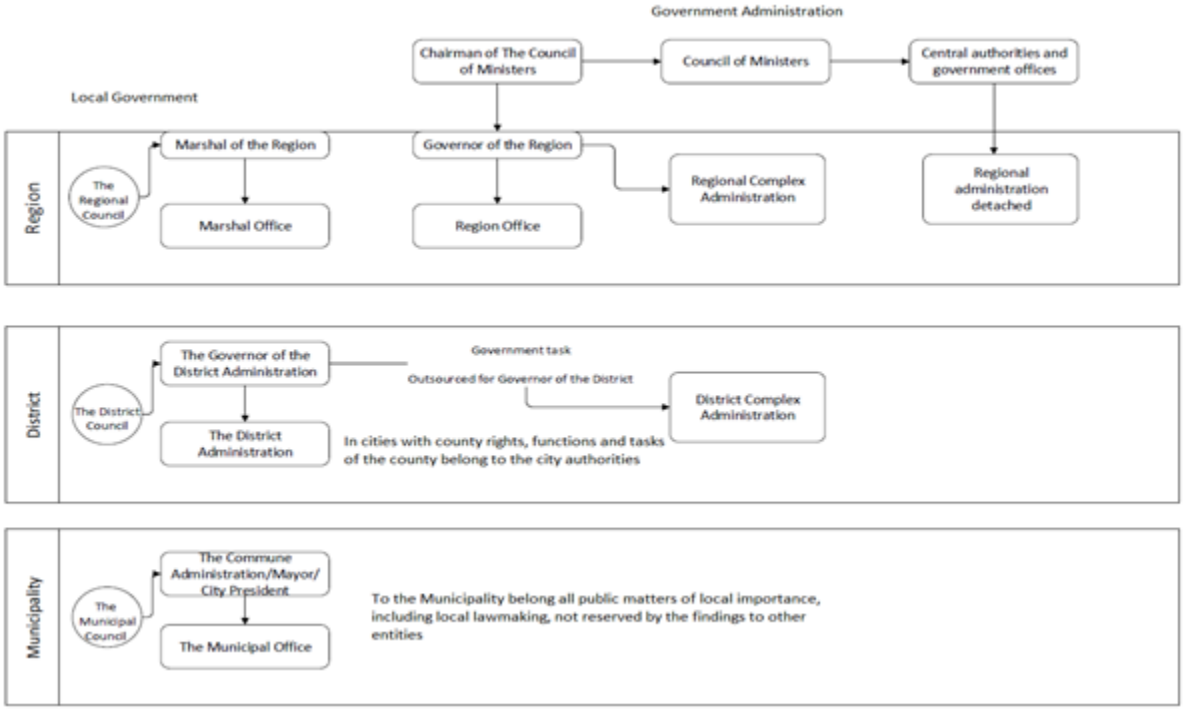

Figure 1. Structure of Government and Local Government Authorities in Poland

Source: Structure of Authorities in Poland, 2013

The constitutive organs of the municipalities are the municipal council, which has competence in forming and control of, depending on the size of the municipality, commune administrator, mayor or city president, who has executive authority. The constitutive organs of the district are the district council and board of the district with governor as chairman. The constitutive organs of the region (province) are council and the board chaired by the Marshall of the region.

The scope of activities for the municipality is not legally defined, which means there is no limited range of tasks of the municipality. The main task is to implement local, specific statutory public affairs and also realize other tasks, those not transferred by the Act to any other entity.

Public tasks carried out in the district cover outside-municipalities activities related to social and technical infrastructure, public order and safety.

The region is a unit which organizes community at the regional (multidistrict) level. At the moment in Poland 16 regions are defined (figure 1). A region is not responsible for controlling or supervising districts and municipalities. It deals with issues on a regional scale, unregistered in the central government authorities.

Figure 2. Regions in Poland

Source: Administrative Map of Poland, 2013

Units conduct their business in their own name and to their own responsibility. This means that each of them, within its field of competence, itself defines all the aims, possible ways of achieving them and is responsible for the execution of these tasks.

The idea of sustainable development in the Polkowice Municipality

A partner in the implementation of the project of supporting the management of local government units with using intelligent ICT is the urban-rural municipality Polkowice Municipality. As we can see in figure 3, Polkowice Municipality is located in northern part of the Lower Silesia Region (between Głogów and Lubin), in an industrial area, called "The Copper Basin", which is also the economic engine of Lower Silesia.

Polkowice Municipality covers a surface area of 158.77 km², of which 43% are arable land and 40% of the forests, with a fundamental landscape of varied elevations, with plenty of forests. For several years a permanent place in the landscape of municipalities is also taken by mine shafts and Europe's largest tailings reservoir "Iron Bridge" - the effect of industrialization associated with the development of the mining industry (Polkowice Municipality, 2013).

Figure 3. Location of the Polkowice town on the map of Europe

Source: Geographical location of Polkowice, 2014

According to the Strategy of Sustainable Development authorities of particular public units dedicated to public sector were forced to focus on complex management. Providing comprehensive analyses over the last approximately ten years, the Municipal Council of Polkowice highlighted its weakest point - strategic management. The Polkowice Municipality has to handle a range of various planning documents of both long-term, as well as short-term. Providing a well-organized data flow system in Polkowice Municipality is especially important, due to dynamically developing economy of the municipality, its growth – mainly based on the exploitation of minerals and range of activities increasing the quality of the citizens' standard of living (Municipalities Sustainable Development Strategy for 2010-2015 Polkowice, 2014).

The main idea of the sustainable development of local government units includes keeping a socio-economic policy in a given territory that will not be at the expense of future generations, and will take into account the requirements and laws of nature.

The concept of sustainable development is an attempt to achieve three fundamental objectives:

- Economic objectives – to meet the basic material needs of citizens,
- Humanitarian and social objectives -security subsistence, health, culture, education, recreation, sport, etc.,
- Ecological objectives - to provide citizens life in a clean natural environment.

The sustainable development priorities of the Government entities:

1. To enhance the quality of life of the inhabitants (appropriate housing conditions, employment, safety, use of free time),
2. To provide residents access to health care, the fight against social exclusion, the problems of ageing, management of natural resources, adequate transportation, etc.

To realize sustainable development of government entities, it is necessary to ensure the competent management of the entity. The management of the local government unit-requires effective knowledge and human capital management, which are treated as assets, which in turn require maintenance, development, evaluation and supervision. The knowledge contained in the databases of the territorial self-government units provides a valuable resource that to be useful must be acquired, so it has to be known and understood (The concept of sustainable development of local self-government, 2014).

Managing a local government unit, such as Polkowice Municipality, requires efficient management of knowledge and human capital, which are treated as assets that are purchased, maintained, developed, evaluated and supervised. Knowledge contained in databases of local

government units is a valuable resource, which to be useful, must be mined. Currently used databases were created in the past for completely different purposes than the acquisition of knowledge. Acquisition of knowledge refers to the acquisition of tacit knowledge (from personal sources of knowledge). In the units of local government employees interact with each other in different ways: in person, by phone, by fax or via e-mail. It is important to know where to find the necessary knowledge, with whom to talk, in which documents, in which collection, acts or publications. In addition, time is a very factor important to spend for finding the necessary, useful knowledge in the decision making process. The process of obtaining high quality and meaningful information about particular business cases, which can help managers make more complex analyses, draw more certain conclusions or make assumptions, or - from the perspective of information systems - a system which, via OLAP technology and data analysis can provide users with answers to important business questions and identify significant trends or patterns is nothing else than the Business Intelligence technology (BI). BI systems are widely known and commonly used in the entities of the world economy, as well as public entities involved in the management of cities (Amsterdam, Rio de Janeiro, London, Barcelona, etc.). Implementation of dedicated information solutions in Polkowice Municipality is one of the most important priorities when fulfilling the Strategy for Sustainable Development of the country until 2020. Following the idea of the "common good", all institutions located in Polkowice Municipality are focusing on restoring order and cohesion within their own activities which constitute one of the major problems faced by the decision-making bodies of each institution. Attempting to achieve a future complexity in the management of the Municipality, institutions are determined by the current investment decisions and run upgrades. Functioning in an era of knowledge (resp. information), forces all Polkowice's institutions to manage this precious resource in a special way, because it is often determined by its use of "to be or not to be" of a particular unit. Due to the fact that we live in the information era and our economy is a knowledge-based one, the key has become the use of intelligent systems supporting comprehensive management of the organization.

Characteristics of useful ICT solutions

Business Intelligence (BI) as an innovative technology that uses the latest innovations in the field of ICT (Szmelter, 2013), seems to be the one which can provide the necessary information and knowledge management. Business Intelligence can be traded as the "art and science of preparing companies for the future by way of systematic knowledge management process. It is creating knowledge from openly available information by use of a systematic process involving planning, collection, analysis, communication and management, which result in decision-maker action" (Hans and Mnkandla, 2013). And the easiest way to explain what BI is, can be that BI is

information technology, which is used to transform large volumes of data into information and then to transform the information into knowledge (Surbakti, 2015). Primarily it is addressed to policy makers at various levels of management, mainly tactical and strategic and analysts, such as marketing, human resource management, etc. its nucleus is a data warehouse (figure 4).

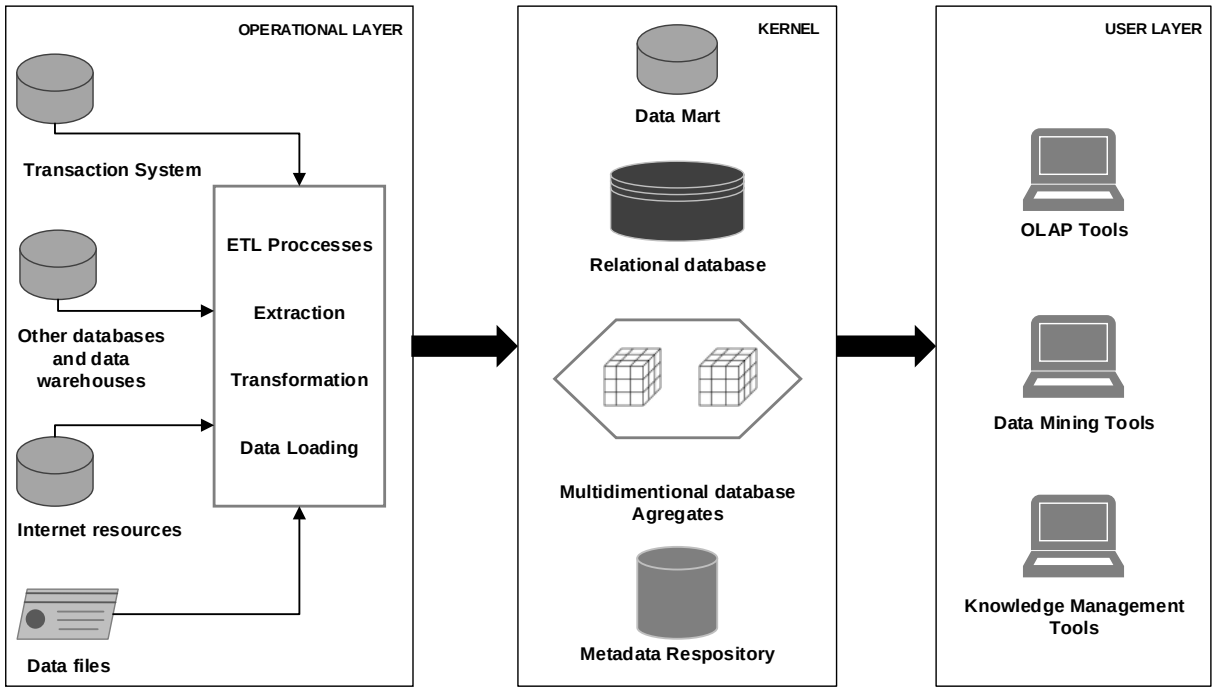

Figure 4. Data Warehouse functional schema

Source: own elaboration

The objectives of the creation of Business Intelligence systems can be specified as follows:

- Data consolidation of the casework of citizens and finance, projects undertaken by the local government, etc.,
- On-line access to pre-defined reports,
- Ability to plan, simulation and forecasting,
- Instant access to strategic data and business analysis.

Typical applications of this group of BI are those such as strategic planning, analysis of CRM, controlling and management accounting, the profitability of products, services, etc., analysis of internal processes.

The requirements of BI systems can be formulated as follows: integrating data from multiple sources into a single, basic and consistent data store; providing truly interactive data manipulation capabilities; offering multiple ways of presenting data (graphics, tables, standard and an obtained ad-hoc statement); allowing the user to refill the application elements which are an "extract" of his own intelligence; simple and intuitive to use; ensuring the functionality of the protective security and limiting access to data.

BI provides complete information - depending on demand - which is then used in the decision process and this in turn is directly related to the tasks of local government units. They can be divided into four groups, such as (Olszak and Ziemba, 2003):

- The tasks of the technical infrastructure of the municipality (roads, bridges, streets, sewer, water, cleaning, garbage dumps, etc.),
- The tasks of social infrastructure (health, culture, education, physical education, social assistance),
- The tasks in the field of public order and safety (traffic, public order, fire protection, safety, sanitation),
- The tasks in the field of spatial order and ecological (spatial planning, management areas, environmental protection).

Business Intelligence systems are aimed at promoting the economic processes taking place in a public entity. However, the same data storage, although necessary in everyday work, is a value in itself. One of the factors capable of achieving significant competitive advantage is information that can be obtained with the data stored in the systems function throughout the institution, and to use this information to make tactical and strategic decisions. Of course it can be said that the information in the reports is generated from the above described systems (Berkovic and Lecic and Cekovic, 2014).

Management Organization Systems are not suitable for this type of analysis (designed for efficient processing of small portions of data - recording contract, an invoice, a price list, etc. - not to cross-cutting analysis of large chunks of data) (Mathrani, 2014). Typically Management Organization Systems maintain only current information on most objects (e.g. about citizens) without storing the history of changes to its data. This can lead to many misunderstandings (e.g. in a situation where a citizen will change name, address or marital status). What's worse, often it is difficult to deal with a single system, only with multiple systems used by different parts of the institution, which may lead to a slightly different understanding of certain concepts by different groups of people and the particular public service can be something different in the

one department and a little something else in the second department. Often there is a need to compare current rates with values from previous years.

The BI process begins with a business query defined by the decision maker and ends with providing him proper, convenient and understandable form for the response (e.g. tables, charts, etc.). The data used in the decision making process is not only the current operating data, it is also historical data, the second, and they often come from different sources. These data come from a variety of heterogeneous database systems, most commonly distributed. The purpose of the data warehouses is their integration into one coherent data warehouse that provides the data to the desired business analysis (Barakat and Al-Zu'bi H and Al-Zegaier, 2013)

The data in the data warehouse can be used in three types of processing. They are multi-dimensional data analysis, data mining and reporting. The results are verified evaluated and presented as a report in the form convenient for the user. Schematically, the operations performed on the data collected in DW can be presented as in figure 5.

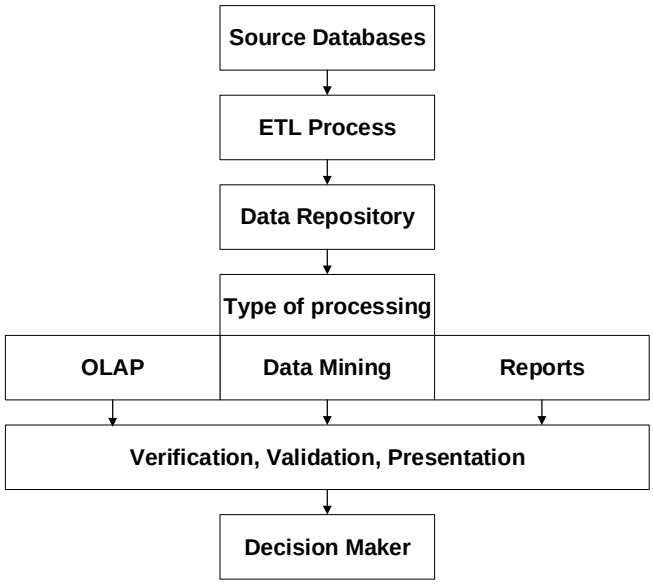

Figure 5. Types of data processing in a Data Warehouse

Source: own elaboration

Sources for the Business Intelligence technologies can be seen in two categories: internal – like databases, data files from the organization's assets, and external – from the internet. BI

technology processes data from different data sources by OLAP analysis, data mining or reports. There are implemented such information systems as ERP, CRM, budgeting, financial analysis, sales analysis, marketing analysis, balanced scorecards, etc. in most local government units to support their everyday work. These systems, or rather their databases, are the data sources for the BI processes. That is why we can say that the BI technologies occupy the central place between management information systems in an organization.

Characteristics of useful ICT solutions

Knowing the characteristics of the Polkowice Municipality and the indications of the implementation of Business Intelligence solutions in the community, we would like to present a concept of BI to fulfil the needs of the municipality model.

The main decision-making body is the Mayor of the municipality of Polkowice Municipality. Under Polish law, the Mayor is the executive body of the municipality. He directs the current affairs of the municipality and represent it outside. He delivers a resolution of the City Council and the tasks specified by law. The Mayor is obliged to:

- prepare draft resolutions,
- specify how the resolutions will be implemented,
- management of municipal property,
- performance of the municipal budget,
- hiring and firing of managers of municipal organizational units.

The Mayor is answerable only to the City Council. Units subordinate to the Municipality Office in Polkowice include:

- Municipal Police,
- Centre for Social Welfare,
- Primary schools,
- Secondary schools,
- Nurseries,
- Municipal Public Library,
- The company Urban Economy,
- Village Cultural Centre in Sobin.

Auxiliary units in the municipality include:

- Council housing estates, and,
- Villages.

After an initial interview conducted in the Municipality of Polkowice, the authors were able to obtain information on the current structure of ICT within the commune office and among the selected subordinate units. Most of the units have rather poorly developed structure of ICT (Microsoft databases and spreadsheets), except the copper industry, financial and accounting offices and some municipal units as the Enterprise of Municipal Economy. It should be noted that the most of the divisions within the selected units works in an autonomous manner using heterogeneous tools and they are not necessarily integrated within the institution. The information flow between employees of offices is still realized by mail, telephone or face to face. In turn, signup information outside the company is done with the help of letters, messages, local newspapers and website. Management of subordinate units by the Municipal Office is still made in the traditional manner using conventional information systems - mainly, by issuing a written decision sent by mail. Provision of information to the public happens using the website and messages in various local media.

Since the Municipal Office of Polkowice is focused on development, it strives for rapid and full implementation of the Sustainable Development Strategy 2020. To achieve this goal, the decision to implement an appropriate IT strategy for the municipality has been undertaken. The model of innovative solutions has been prepared.

We assume that the launch of the full computerization of the municipality will start with the implementation of a complex information system for the municipal office. Such a system can be of ERP class and it will integrate municipalities and subordinate institutions already computerized. The implementation of a comprehensive information tool aimed at the integration of data and allowing for the generation of relevant information for defined users, can be called one of the ways to implement tools for knowledge management in the institution. Taking the moment after the implementation of the selected solutions as a starting point for familiarising the management of the municipality with the use of integrated information system, we can finally move to the explanation of the role of business intelligence in the whole process.

Business Intelligence technology has been designed to enable generation of the answers to business questions. These answers are the results of analytical processing of data coming from different heterogeneous data sources, and they have to be delivered to the managers/decision makers in a short time. That is nothing but a further step in the management of knowledge - both internal and external (Campbell, 2014). Looking from the point of view of the District Council, it is very important to make decisions in an environment of complex and reliable information. This is particularly important at the moment for example. Drafting budgets, a

conceptual development for the municipality in crisis situations, have to be supported by appropriate data. Knowledge needed to make this type of decision is a complex set of information generated by almost all subordinate units and other external sources, which could be in some way facilitated by the implementation of Business Intelligence solutions, with a customized manager dashboard.

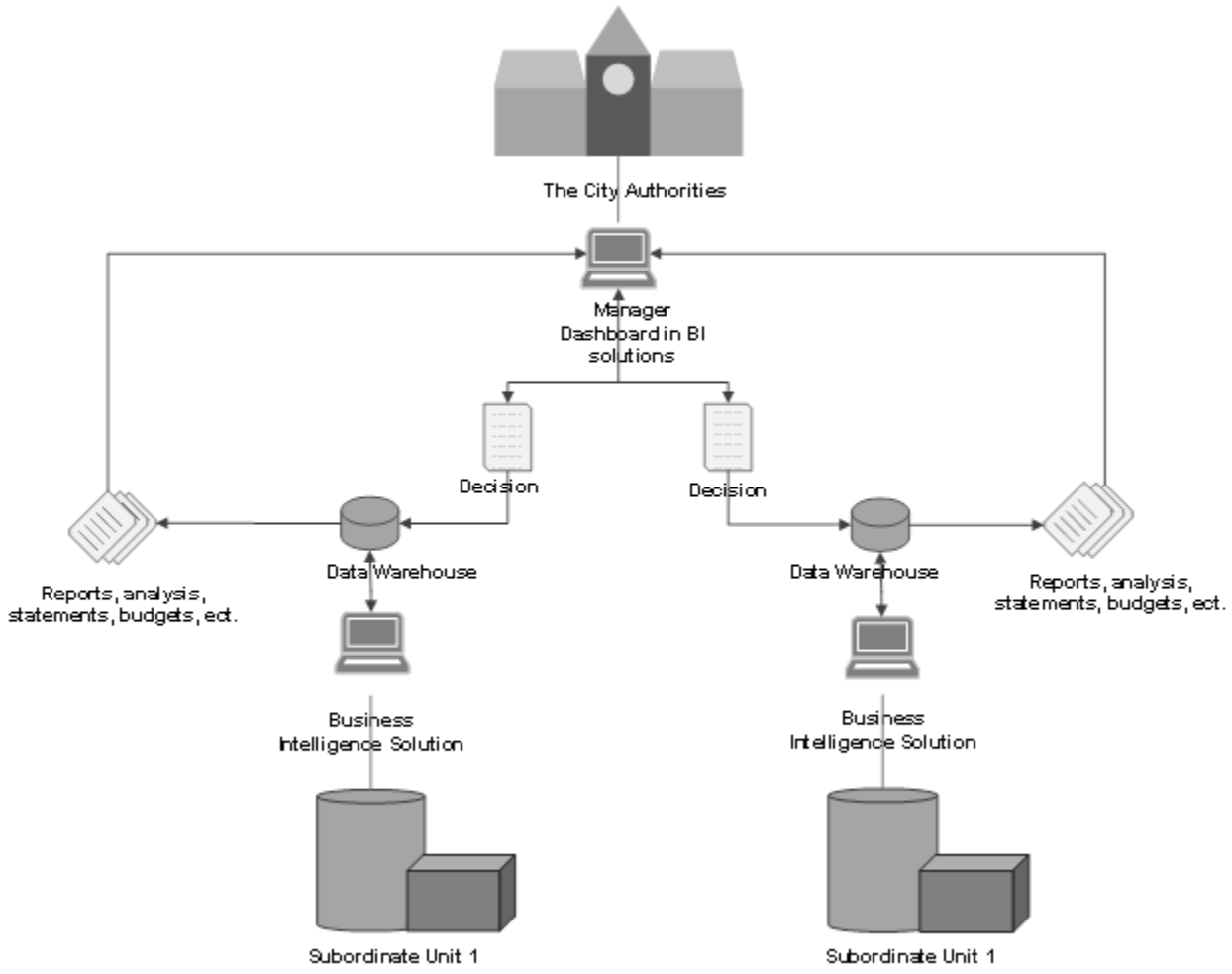

Figure 6. A sketch model of Business Intelligence solutions for Polkowice Municipality

Source: own elaboration

How is it going to work? At a time when functioning within the community, all budget units together with the office of the municipality will have to implement a computerized structure.

It will be possible to build a data warehouse for each of them. This assumption will ensure quick access to consolidated data for the indicated not only institutions but also for the parent institution. Building a warehouse will additionally provide high quality data necessary to conduct business analysis. At the same time, the data warehouse in this case will be the basis for building multi-dimensional OLAP cubes. Such a possibility may allow the conversion of the relevant data available in the warehouse and the generation of specific business information (in this case from the point of view of the strategic municipal office). A saner, more stable solution is to build a warehouse for each institution separately, due to the amount of information generated by the appropriate units data, but also from the point of view of its direct and indirect user (department managers, analysts, planners or even the same administrators). Assuming the position of the municipal office, it will also be more convenient to use several data warehouses as sources requested to generate relevant reports. Because of the fact that the proper information will be generated and kept in an orderly manner, complete and easy to understand, it will be retained as a properly functioning knowledge management scheme between institutions.

Where's the Business Intelligence? A properly implemented data warehouse enables the implementation of the Business Intelligence platform, which de facto in this case will be a dedicated tool for IT managers, analysts, planners in the indicated institutions as well as a basic information tool for individual employees of selected branches of local government. What would this look like? The concept is as follows: executives with analysts develop reports relevant to the commune office and calculate Key Performance Indicators (KPI) defining the condition of the institution for the purposes of further development of the concept of development. Developed reports and documentation are shared with the office of the municipality using the appropriate built-in in BI tool presentation techniques. The district office by managerial dashboard has the ability to observe and control generated documents in an attractively presented manner. In addition, the office of the municipality, as the strategic level, is able to generate ad hoc reports. The ability to generate the municipal office answers to questions can enable efficient planning of development strategies and accelerate the decision-making process. The municipal authority makes decisions, using the dashboard. These decisions will appear as messages in the accounts of analysts, planners and managers of subordinate units. Such an approach will not only aim to make a decision, but also properly integrate it into the system for determining the appropriate tasks for specified employees of the institution. Then, again, the analysts of this subordinate institution to perform the appropriate tasks are able to pass a defined documentation of the office of the municipality and it really takes a series of strategic information between the level of municipalities and operational level employees in the subordinate units.

Strengths and weaknesses of the presented model

As each conception, this proposed by us also has its strengths and weaknesses. As obvious advantages the following can be included:

- Organizational governance and organization of generated data and information,
- Properly functioning information flow,
- Better data management,
- On-line access to pre-defined reports,
- The possibility of planning, simulation and forecasting,
- Instant access to strategic data and business analysis,
- Offering multiple ways of presenting data (graphics, tables, standard and obtained an ad-hoc statement),
- Ensuring the functionality of the protective security and limiting access to data,
- Integrating data from multiple sources into a single, basic and consistent data store.

To make these features realistic, it is recommended to prepare carefully all the phases of implementation of Business Intelligence solutions in the Polkowice Municipality. It is also obvious that the preparation time will be rather long, costs and resources consuming, but if the Polkowice commune wants to be a leader of innovation in Poland, it has to invest in preparations. Implementing the Business Intelligence solution in the whole Polkowice Municipality can be considered as a kind of strategic investment. After physical implementation and sometime of the prospering of BI solution, the Municipality Office of Polkowice should be more aware of the condition of the environment in which it functions. Understanding the economic situation of subordinate units and knowing more about citizens, it will be also very likely to be achieved by the authorities (which is one of the main goals to reach). Having defined access to proper data it will be also almost certain to provide wide forecasting and analytical activities among the municipality. Such prospering will have influence on quality, accuracy and time of making future decisions. While analysts will be doing their job well and will prepare reports based on accordingly prepared answers of business questions, it might be very probable that decisions made by authorities will be adequate and the decision making process might be improved by the tasks division.

As certain weaknesses the following can be classified:

- Difficulties in defining the output of information,
- Aversion and resistance of potential users to the implemented solution,
- High costs of implementation and training,

- Long-time of implementation,
- Limited use.

To avoid the presented obstacles in the implementation of the presented conception, it is necessary to fulfil some requirements. According to good practise in implementation of the BI solutions, the authorities of Polkowice first of all should care about hiring well trained field consultants, experienced in project realization field. Such a move can be crucial for the whole process of implementation, especially in the phase of gathering the demands. The next point which can lead Polkowice to success can be the cooperation with project managers experienced in the implementation of BI solutions. Investing in specialists is one of the most important needs of long-term strategies in IT. This aspect has been already undertaken – launching the business and scientific expertise with a technical background and knowledge of the tool. Multidisciplinary expertise can focused on different problems and in the end it can be easier and faster to find the critical point in the concept which in turn could be also faster to solve.

Summary

The future of communities is determined by the national government as well as local governments. To satisfy the future needs of citizens, it is important for authorities to start to realize some crucial tasks right now. According to the Polish Strategy of Sustainable Development 2020 and the demands of the present economy called a knowledge based economy and where society is defined as information society, it has become crucial for local government to implement information technologies in their structures.

For local government, it is important that the decisions were held back with the least risk. Therefore, it is important to support decision-making processes in local government with appropriately prepared Business Intelligence tools. Business Intelligence solutions allow authorities to conduct advanced business analysis, more accurate planning and full monitoring of the implementation established for local government purposes. A business Intelligence system based on the data warehouse can provide the analysts, strategists, planners and authorities with the answer to their needs along with the ability to conduct advanced business analyses. Problem-solving business queries posed by local government using Business Intelligence tools can facilitate better decisions, and will help to reduce the risk of using the suggested alternative solutions.

References

Administrative Map of Poland: http://www.nationsonline.org/oneworld/map/poland-administrative-map.htm [2013-11-10]

Barakat S., Al-Zu'bi H. A., Al-Zegaier H., The role of business intelligence in knowledge sharing: a Case Study at Al-Hikma Pharmaceutical Manufacturing Company, European Journal of Business and Management, Vol.5, No.2, 2013, ISSN 2222-1905

Berkovic I., Lecic D., Cekovic M., Business Intelligence as a support to marketing analysis and decision-making, 2nd International Conference on Applied and Information Technologies Proceedings, Muscat, Oman, April 2014

Campbell H.M., Linking knowledge management to business intelligence and organizational performance, from https://www.researchgate.net/publication/259991126_Linking_knowledge_management_to_business_intelligence_and_organizational_performance, 5th June 2014 [2014-06-30]

Geographical location of Polkowice: http://www.polkowice.pl/s,1,polozenie-geograficzne.html [2014-04-17]

Hans R.T., Mnkandla E., Modeling software engineering projects as a business: a business intelligence perspective, AFRICON, IEEE 2013, ISBN: 978-1-4673-5940-5

Mathrani S., Managing Supply Chains Using Business Intelligence, 25th Australasian Conference on Information Systems, 8th -10th Dec 2014, Auckland, New Zealand, DOI: 10.13140/2.1.1031.7122

Municipalities Sustainable Development Strategy for 2010-2015 Polkowice: http://www.bip.ug.polkowice.pl/183,Strategia-Rozwoju-Zrownowazonego-Gminy-Polkowice-na-lata-2010-2015.html [2014-05-10]

Olszak C.E., Ziemba E., Business Intelligence as a Key to Management of an Enterprise, InSITE - "Where Parallels Intersect", Informing Science, June 2003

Polkowice Municipality: http://www.zgzm.pl/nasze-gminy/gmina-polkowice/ [2013-11-26]

Structure of Authorities in Poland: http://www.lubelskie.pl/index.php?pid=400 [2013-11-21]

Surbakti H., Integrating knowledge management and Business Intelligence processes for empowering government business organizations, International Journal of Computer Applications (0975-8887), volume 114, no 05, March 2015

Szmelter A., Business Intelligence as an element of information supply system in organization (Polish), Roczniki Naukowe WSB w Toruniu 2013, no 12 (12)

The concept of sustainable development of local self-government: http://www.samorzad.lex.pl/czytaj/-/artykul/koncepcja-zrownowazonego-rozwoju-samorzadu-terytorialnego [2014-02-08]