

**CREATIVITY SUPPORT
SYSTEMS, METHODS,
AND APPLICATIONS**

Studia Ekonomiczne

ZESZYTY NAUKOWE

WYDZIAŁOWE

UNIWERSYTETU EKONOMICZNEGO

W KATOWICACH

CREATIVITY SUPPORT SYSTEMS, METHODS, AND APPLICATIONS

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Katowice 2012

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ISBN 978-83-7875-032-1

ISSN 2083-8611

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INTRODUCTION

The first decade of the 21st century inscribed as a period of fast progressing evolution of economies and entrepreneurship being a permanent element of the transformation of the world and humanity. Contemporary business organizations have been faced with a growing need to focus more on creativity and innovation in order to keep up with increasing global competition. Business units creativity and innovation are enhanced through the introduction of computer support systems, tools, and methods.

The aim of this book is to improve our understanding of creativity support system environments. The various articles analyse creative and innovative activities as carried out by individuals, groups, and organizations. The book's focus is on identifying and understanding the factors relating to the working environment that are conducive to human creativity and innovation.

The book is likely to be of interest to students and scholars in a number of research fields as well as to science and innovation policy decision makers concerned with research, teaching, and policy measures for the development of creativity support system environments.

The fourteen articles forming the book illustrate various approaches to the analysis of creativity support systems, methods and applications. The articles were discussed at the international sessions within the 27th Conference on Organizational Support Systems. The construction of creativity support systems involves the development of a creative organization and is located in the area of interdisciplinary research. A rich variety of methods, techniques and applications are used to achieve the creativity and innovation goals, many of them are presented in the book.

In the first article of this book, Janina Banasikowska and Anna Sołtysik-Piorunkiewicz focus on creativity of public administration and present its transformation into e-Administration. They emphasize the opportunities to create a uniform European information space and to strengthen innovations for the integrated European information society.

The second article, written by Piotr Betlej, is aimed to deepen the knowledge of e-learning and to describe research results on different forms of electronic education effectiveness.

The third article, presented by Małgorzata Dolińska, covers discussion on effects of knowledge creation in innovative companies and in business networks. The author emphasize the important role of networking for innovativeness.

The fourth article, written by Dorota Jelonek, is also to present the innovation development problems. The author focuses on the innovation determinants in the case of the involvement of customers in the business process.

The fifth article, provided by Radosław Kowal, covers discussion on structuring of data in wiki repositories. Wiki repositories are now perceived as new and important source of knowledge for information technology users.

The sixth paper, delivered by Jacek Namysło and Stanisław Stanek, discusses selected types of risk that are intrinsic to an innovative technology implementation process. The contemporary business organizations are conscious of the different types of risk, therefore they must be creative in the anticipation of unexpected events and they are interested in the development of business continuity planning.

The authors of the seventh paper, i.e., Adam Nowicki and Leszek Ziora, focus on the presentation of the concept of Semantic Business Intelligence, the application of tags and ontologies in Business Intelligence and on components of Business Intelligence semantic models and modeling.

The eighth article, written by Małgorzata Pańkowska, is to reveal problems of contemporary of business organization designers named business architects, who must be creative in the development of the corporate architecture frameworks and models as well as in their implementation.

Teresa Porębska-Miąc and Joanna Palonka, as the authors of the ninth paper, are interested in the social media development for business organization and they present the new trends in customer relationship strategy (CRM) development, i.e., CRM connected with social media application.

The tenth article, presented by Joanna Świętoniowska, reveals problems known by project managers, but so far not sufficiently well emphasized in literature and in business practice. It is the problem of reusing the project knowledge and creative approach to learning from other projects.

Joanna Wójcik, in the eleventh paper, focuses on acceptance of Web 2.0 technology by students to support their educational processes.

The twelfth article, written by Piotr Zadora, is to answer the question, if agile methods application support the production of software products in terms of increased usability.

Dariusz Zdonek, in the thirteenth article, undertakes the task of the assessment of web accessibility. He is presenting the results of the survey of the web-sites of the city halls associated in the Upper Silesian Metropolitan Union.

The last article belongs to Mariusz Żytniewski, who focuses on presenting the research results on interoperability of ubiquitous systems.

Our gratitude is expressed first to all the academicians who attended the 27th Conference on Organization Support Systems and authored work for the book.

We would like to show our appreciation of the efforts of four reviewers, Prof. Witold Chmielarz, Prof. Antoni Niederliński, Prof. Mieczysław Owoc and Prof. Jacek Unold. Finally, we wish to thank a number of individuals, who supported the conference in a variety of ways and the publishing staff, who helped us deliver the book.

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THE CONCEPTION AND STATE OF THE IMPLEMENTATION OF E-ADMINISTRATION IN POLAND

Introduction

The article concerns the implementation of the European idea of building an information society based on the implementation of systems of public administration in Poland. The development of e-Administration is a very important issue, because of the key role in the transformation into an information society.

The European Union is attempting to create a uniform European information space, strengthen innovations and investments in the research on information and communication technologies and to create an integrating European information society.

The purpose of the article is an overview of e-Administration services in Poland and to determine the current status of implementation of these services in Poland. The article presents the concept of e-Administration, and the anticipated benefits from the implementation of public administration systems. The authors conducted a review of public administration services in Poland, referring to the essence of e-Administration in Poland in comparison with European experience.

1. The issue of e-Administration in Poland and Europe

Public administration is defined as: „(...) the meeting of collective and individual needs of the citizens, resulting from people's coexistence in societies, assumed by the state and implemented by its dependent agencies, as well as by local self-government agencies. It comprises all the organizational structures in

a state and the people employed in these structures, fulfilling public, collective and individual, regulating, providing and organizing tasks of managing and decision-making agents” [Boć10, www1].

Public administration combines administrations dealing with public affairs: state, governmental and self-governmental, and refers to the people, actions, and structures of these types of administration. The principles of operating public administration, both traditional and electronic ones, are regulated by the Code of Administrative Procedure.

E-Administration began in Europe with the publication of the report „Europe and global information society. Recommendations for the Council of Europe” by the European Commission in 1994 [www2]. This report, called *Bangemann’s Report*, showed the directions of the development of an information society in Europe as the basis for creating electronic administration.

In Poland it took place a bit later. In 2000, the State Committee for Scientific Research developed, based on seven expert opinions, the document „Global information society in the conditions of Poland’s accession to the European Union” [www3].

In 2000, Sejm (lower chamber of the parliament of the Republic of Poland) passed a resolution about building the basis for an information society in Poland. After several months the Council of Ministers accepted the objectives and directions of the development of an information society in Poland. Around a year later, acts were passed which contributed to the development of e-Administration, namely the act on the access to public information and the act on electronic signature. An important stage in the development of e-Administration in Poland was the development of the document „ePoland Plan of Activities for the Development of an Information Society, in Poland for the years 2001-2006”, later called „ePoland 2006”, based on the guidelines of the European plan for developing the European society into a global information society, entitled „eEurope 2002 – An Information Society For All”.

In 2003, the Committee for Scientific Research developed „Strategy for Computerisation of the Republic of Poland – ePoland”, based on the assumptions of the Lisbon strategy and the „eEurope” initiative. The strategy involved four basic areas of activity:

- the Internet in all schools,
- Wrota Polski (Poland’s Gate) – plan for implementing e-Administration,
- Polish content on the Internet,
- universal IT education.

In the subsequent year, the Ministry of Science and Informatisation published a new, extended version of the document on the strategy: „Strategy for Computerisation of the Republic of Poland – ePoland for the Years 2004-2006”, which main aim was to provide guidelines for building a competitive knowledge-based economy, and improve the quality of life of citizens through an effective computerisation. In 2004, also other important documents were created: „Plan of Actions for the Development of Electronic Administration (eGovernment) for the Years 2005-2006” and the report „Proposed Directions of the Development of an Information Society in Poland by 2020”.

In 2005, the Ministry of Science and Informatisation prepared „Strategic Trends of the Development of Computerisation in Poland by 2013 and a Long-Term Forecast of the Transformation of an Information Society by 2020”. In the same year, the Act on computerisation of the activity of entities performing public tasks came into force, which, among other things, lays down the principles of functioning of an electronic administration.

Poland’s entry to the European Union forced the adaptation of the Polish economy to the EU standards, which required complete computerisation of Polish public authorities and state institutions. It became necessary to make the exchange of documents between institutions, authorities and applicants more efficient so that each citizen could settle matters with public authorities and institutions online, without the need of leaving his/her home.

Previous experience shows that the development of e-Administration is beneficial both for citizens and entrepreneurs, but above all it is so for the public administration itself. The use of information and communication technologies (ICT) in public administration offices will allow to save time, and decrease costs and excessive burden on civil servants.

2. The conception and expected benefits of the implementation of e-Administration in Poland

The conception of e-Administration in Poland involves creating the Poland’s Gate system making e-services available to citizens – G2C, businesses – G2B and the administration – G2G. The Poland’s Gate was designed as a portal for citizens and companies. For administration entities, it is supposed to be a service bus (Fig.1.).

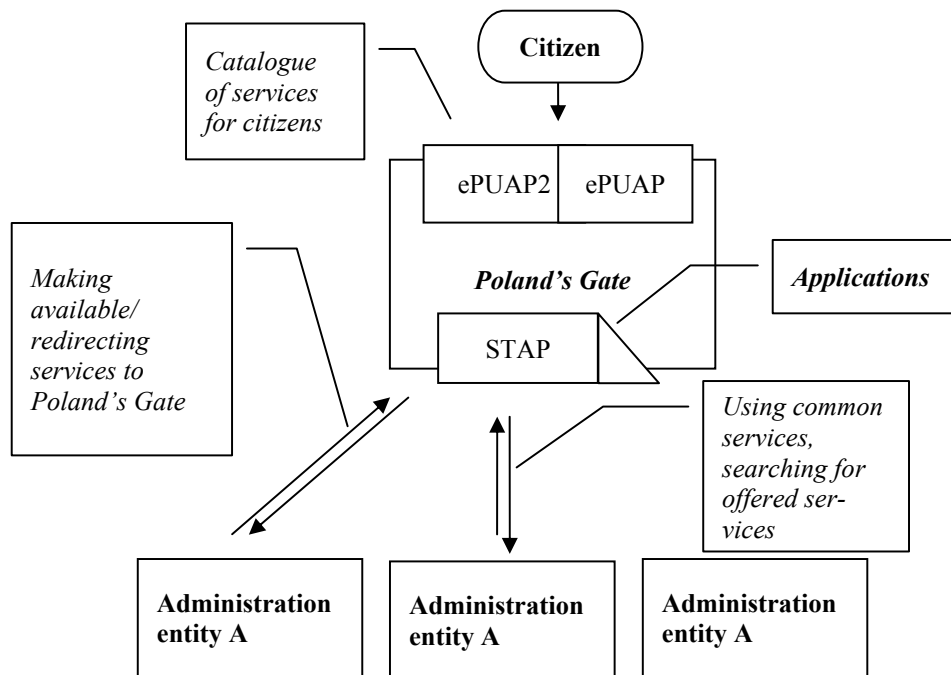


Fig. 1. Conception of the implementation of e-Administration in Poland

Source: Based on [www5].

One of the basic systems of the Poland's Gate is the Electronic Platform of Public Administration Services (ePUAP), run on the website www.epuap.gov.pl, which is an IT system which allows citizens to settle matters in various public administration offices on the Internet, and the representatives of public institutions to make their services available free of charge in an electronic form. The idea underlying the development of ePUAP was to build a single, easily accessible and secure channel for providing public services. The portal www.epuap.gov.pl ensures a smooth communication between:

- citizens and administration (G2C),
- businesses and administration (G2B),
- public administration institutions (G2G).

These services are provided via appropriate tools available on the portal, i.e., catalogue of services for citizens, electronic mailbox (ESP) for public administration institutions and Central Repository of Electronic Document Models (CRD), which gathers valid administration document models and forms in one place.

The ePUAP project was carried out as part of the Sector Operational Programme from January 2006 to October 2008. Currently, the Ministry of the Interior and Administration's Center of IT Projects is implementing the ePUAP2 project, which aim is to extend the functionalities of the ePUAP platform and increase the range of services provided electronically. The project is partially funded from the European Regional Development Fund under the Innovative Economy Operation Programme for the years 2007-2013, priority 7 – information society – building electronic administration. The implementation of the project is to take place in the years 2009-2013 [www4].

Poland's Gate will make services available to citizens and businesses through:

- electronic access channels (web browser, e-mail, mobile telephone WAP, SMS; other devices providing access),
- web services enabling the connection of the external software to Poland's Gate, used e.g., in relation to G2B; the use of web services delivered by companies and organizations is also planned.

As part of the G2G relation, Poland's Gate will enable:

- delivery of services to public and local administration entities,
- storage of information about offered services by public and local administration entities,
- management of G2G data formats for public services,
- communication between the entities directly or through Poland's Gate,
- access to common services in the G2G relation (e.g., verification of a citizen's details, access to national registers).

The role of a web platform for secure communication between public administration entities may be fulfilled by the Information and Communication Network of Public Administration (STAP).

The basic objective of Poland's Gate was to put online all public administration services with proper IT infrastructure and provide access to them online. The most important functions of the system include: improving information flow to citizens; allowing citizens or economic entities to settle matters with administration offices by electronic means; the possibility of submitting forms requesting the issue of documents and certificates through the Internet; providing an easier access to medical and insurance data; an online exchange of information between public administration offices.

E-Administration services should be adjusted to customer needs. Customer-orientation is possible thanks to the combination of personal contacts and access to the Web through the Internet, an information kiosk, TV set, mobile phone with WAP, etc.

The use of IT technologies in public administration offices should give the following benefits:

- time savings (for citizens, businesses, civil servants),
- capital savings (for citizens, businesses, civil servants),
- increased functionality and quality of provided services,
- increased range of available information,
- increased transparency of administrative procedures,
- elimination of errors (the system operates according to specific algorithms),
- increased accessibility of public administration offices (access at any time, 24 hours a day),
- integration of Internet resources (ONE STOP SHOP),
- implementation of the applicant oriented approach.

3. State of the implementation of e-Administration services in Poland

The complete list of planned services contains around 600 types, divided into services implemented centrally and locally, as well as using traditional document flow or electronic one. Of the list of 600 services, the following 20 services for natural persons and legal persons have been chosen for implementation in the first place (Table 1).

Table 1

Services chosen for implementation in Poland's Gate system, stage I

Services chosen for implementation in stage I	
Natural persons	Legal persons
Personal income tax	Employees' social insurance contributions
Employment agency	Corporate income tax
Social insurance for natural persons	VAT tax
Change of the address of permanent residence	Registration of economic activity
Driving licences	Submitting data to Central Statistical Office
Passports	Customs declarations
Identity cards	Environmental protection permission
Registration/deregistration of a vehicle	Public procurement
Construction/demolition permissions	<i>Declarations PIT-II</i>
Reporting an incident to the police	–
Public libraries	–
Documents from the births, marriages and deaths register office	–
Enrolment at higher education institutions	–
Ordering doctor visit	–
Family allowances and allowances for helpless persons	–
Unemployment benefits	–
Voting through the Internet	–
Public opinion poll	–
Public forum	–

Source: Based on [www6].

The services listed in Table 1 include all the services recommended by the European Union for implementation. The additional services are in italics in Table 1: voting through the Internet, public opinion poll, public forum and declarations PIT-11.

As far as the development of electronic platforms for contact with customers is concerned, local administration leads the way among all public services because it is responsible for delivering the most important public services. Thanks to an efficient system of the identification of citizens and economic entities, implementation of electronic signature and integration of application, a person who wants to settle a matter with an administration institution does not have to come to such an institution. During the development of the conception of building an e-Administration system in Poland experts conducted analyses of profitability of implementing such a system and assessed savings as a result of a complete implementation of planned services and their use by the entities concerned. Projected annual savings as a result of implementing e-services are in Tables 2 and 3.

Table 2

Projected annual savings after implementing e-services for natural persons

Service type	Savings [million PLN]		
	Public administration	Natural persons	In total
Personal income tax	28	80	108
Employment agency	2.5	26	28.5
Social insurance for natural persons*	0	0	0
Change of the address of permanent residence	1.0	8.2	9.2
Driving licences	0.5	2.8	3.3
Passports	1.8	9.2	11
Identity cards	3.2	15.5	18.7
Registration/deregistration of a vehicle	0.7	14.1	14.8
Construction/demolition permissions	0.04	1.16	1.20
Reporting an incident to the police	0.4	2.3	2.7
Public libraries	0.7	11.1	11.8
Documents from the births, marriages and deaths register office	0.4	7.6	8.0
Enrolment at higher education institutions	0.9	19.1	20
Ordering doctor visit	72.8	37.9	110.7
Family allowances and allowances for helpless persons	8.7	20.9	29.6
Unemployment benefits	1.6	2.6	4.2
Voting through the Internet	5.9	23.3	29.2
Public opinion poll	0.2	0	0.2
Public forum	0	0	0
In total	129.34	281.76	411.1

* Service implemented before developing the conception of e-Administration in Poland.

Source: Ibid.

Table 3

Projected annual savings after the implementation of e-services for legal persons

Service type	Savings [million PLN]		
	Public administration	Legal persons	In total
Social insurance (the service has been implemented)	0	0	0
Corporate income tax	326	55	381
VAT tax	1017	550	1567
Registration of economic activity	0.3	4.6	4.9
Submitting data to Central Statistical Office	0.4	2.4	2.8
Customs declarations	3.3	4.9	8.2
Environmental protection permission	0.2	1.7	1.9
Public procurement	10006	27	10033
Declarations PIT-11	10.1	66.3	76.4
In total	11363.3	711.9	12075.2

Source: Ibid.

As the figures in the tables above show, the implementation of e-services is profitable for natural persons, legal persons, and public administration itself. It has been estimated that e-services for natural persons may lead to savings of over PLN 411 million, with over PLN 281 million saved by applicants and over PLN 129 million saved by the administration. In case of e-services for legal persons, the savings total PLN 12 075 million, with over PLN 711 million saved by legal persons and over PLN 11 363 million saved by the administration. These are significant savings so the implementation of the system should pay for itself quickly.

Conclusion

The current forecasts of e-Administration development concern the year 2020, with particular regard to the continuation of the plan for the years 2007-2013, which assumes that e-mail, instant messengers, and discussion forums will be the standard in e-Administration. The years 2013-2015 are the period of implementing systems allowing citizens to fully participate in the public life by means of electronic media [Bliż07, Prog05, www7, www8].

The development of e-Administration is a very important issue, also because the key role in the transformation into an information society is attributed to electronic administration.

Nowadays the effect of both the EU's and the Polish government's activities should be ensuring a convenient, secure, interoperating, and verified access to public services across Europe and strengthening the civic participation and democratisation of decision making. It is difficult to predict if the implementation of the plans will be successful at the time of a global crisis.

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KONCEPCJA I STAN REALIZACJI E-ADMINISTRACJI W POLSCE

Streszczenie

Artykuł dotyczy realizacji europejskiej idei budowy społeczeństwa informacyjnego, w którą wpisuje się wdrożenie systemów administracji publicznej w Polsce. Budowa e-Administracji w Polsce jest zagadnieniem niezwykle ważnym ze względu na fakt, iż

stanowi kluczową rolę w transformacji na drodze do społeczeństwa informacyjnego. Unia Europejska dąży do stworzenia jednolitej europejskiej przestrzeni informacyjnej, wzmocnienia innowacji i inwestycji w badaniach nad technologiami informacyjno-komunikacyjnymi oraz stworzenia integracyjnego europejskiego społeczeństwa informacyjnego. Celem artykułu jest przegląd usług e-Administracji oraz określenie bieżącego stanu realizacji tych usług w Polsce. Artykuł przedstawia koncepcję e-Administracji oraz przewidywane korzyści z wdrożenia systemów administracji publicznej. Autorki dokonały przeglądu usług administracji publicznej, odnosząc się do istoty e-Administracji w Polsce na tle europejskich doświadczeń.

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FROM TRADITIONAL TO ELECTRONIC EDUCATION – RESEARCH ON LEARNING EFFECTIVENESS

Introduction

Observed in recent years rapid development of communication, computers, and IT technologies contributed to the rise of blended learning and e-learning. Growing popularity of these new forms of education makes it possible to move learning into new level. That is why comprehensive studies on their effectiveness and usefulness are so important. Lack of solid data in this area makes it much harder to convince decision makers to invest in e-learning and is a barrier in setting goals and development paths of that modern form of education. The aim of this article is to deepen the knowledge of e-learning and to describe research results on different forms of education effectiveness.

1. Opinions about different forms of education

The area of research on effectiveness of different forms of education, although very interesting, still remains relatively poorly understood. There are few studies in this area. Companies implementing e-learning generally do not want to share their experiences, treating them as a competitive advantage. On the other side, some research has been done on universities, but their results are inconclusive. Exhaustive and complete analysis about which form of education is the best, it difficult to perform because it requires to organize classes simultaneously in different forms of education on the same subject. It is believed that research on learning effectiveness is very necessary and may determine the future of education in the coming years. Different opinions in this area are presented below.

E-learning can be a very effective and popular form of education. Such findings come from the research of graduates of ten virtual colleges carried out

in 1994 in the USA by Distance Education & Training Council [MoKe96]. Majority of students (94%) determined that e-learning meet their needs, was satisfied with this form of education and would recommend it to others (95%). The majority of people (80%) intend to continue to use this form of acquiring new knowledge and skills. The confirmation of e-learning effectiveness is the fact, that the vast majority of employers (94%) confirm the high level of professional competences of learners that used this form.

In 2000, M. McVay Lynch from Portland State University organized a research on Business communication subject [RyZa05]. All students were divided into two groups: traditional and e-learning. One group was required to physically participate the classes, while the other group learned online. The classes were conducted under specific conditions by the same teacher. The method of checking knowledge for both groups did not differ from each other, and the assessment was made according to identical criteria. The final exam results showed that in both cases there are no significant differences in learning effectiveness. The experiment also showed that, in terms of students satisfaction, e-learning gained a slight advantage of traditional classes.

Z. Osiński in his paper [Osin04] presented an experiment that was conducted in 2002-2004 at the UMCS in Lublin. It included students of History and Inter-departmental Historical and Philosophical studies. His research has shown that adopted method of teaching had significant impact on motivation to learn the subject. 65% of respondents identified that impact as very important, while 35% considered it small or insufficient. Among the factors contributing to increased motivation, most respondents mentioned the automatic recording of all results and online activities by e-learning platform. 85% of people stated that they prefer to prepare for classes and exams via e-learning platform, and only 15% prefer traditional methods of learning. For 69% of respondents it is a good way to increase the attractiveness for not studying people, and for 60% a good method to increase learning efficiency. Final results comparison of students using e-learning with traditional classes, learning according to the same program, showed that slightly better results were obtained in the first group.

Interesting are also the data described in 2003 by K. Swan [Swan03]. The author says that the various forms of education do not differ significantly in terms of results. Effectiveness depends mainly on teacher activities. E-learning through high interactivity and personalization offers much more in that area than traditional education.

Not all professionals consider a pure e-learning as the best form of education. W. Bielecki [Biel07] believes that every student as a social being tries to physically be with other people. For this reason new, distance forms of learning

and communication never completely replace direct human interaction. However, they may effectively expand them. The author believes the future belongs to the complementary solutions, in which online work is supported by traditional forms of education. This combination is the most effective and allows to train more people. The important fact is that blended learning solutions are flexible and allow to combine the best features of both traditional and online classes.

These examples show that e-learning in many cases can be an alternative for traditional training. It allows to gain new knowledge and skills in different way. But research results are not unambiguous. Predominant opinion is that the most effective form is blended learning. E-learning is not suitable for everyone, because some people prefer to work face-to-face with the teacher and they do not like to learn using computer.

2. Research description

From 2009 to 2011 the author of this article carried out the study, whose main objective was to assess and compare the effectiveness of traditional education, blended learning and e-learning. The research was made at the University of Information Technology and Management in Rzeszow. It involved 292 students from the Faculty of Economics. The additional goals were:

- to examine whether there are significant differences in the effectiveness of various forms of education depending on the subject taught;
- to analyze how learning outcomes depend on factors such as: gender of students, grades average from their studies, grades from similar subjects taught in previous years of their studies;
- to find out how online learning time and level of activity on the discussion forum affect final results;
- to examine student's attitudes to new forms of education and online testing;
- to determine whether students have the good learning conditions to use e-learning: access to computer and Internet.

The main hypotheses verified in the work are as follows:

- H1. Blended learning is the best form of education in terms of learning outcomes and effectiveness.
- H2. Traditional learning and e-learning have similar effectiveness.
- H3. The effectiveness depends on the type and nature of the learning subject.
- H4. The effectiveness depends on the gender and grades average from studies.
- H5. Online learning time and the level of activity on the discussion forum are the key factors that affects the learning process.
- H6. Students have good learning conditions and ability to use electronic forms of education.

The research on effectiveness of different forms of education was divided into three separate and carried out successively phases: preparatory, main, and analytical. Fig. 1 illustrates the relationship between all phases of research.

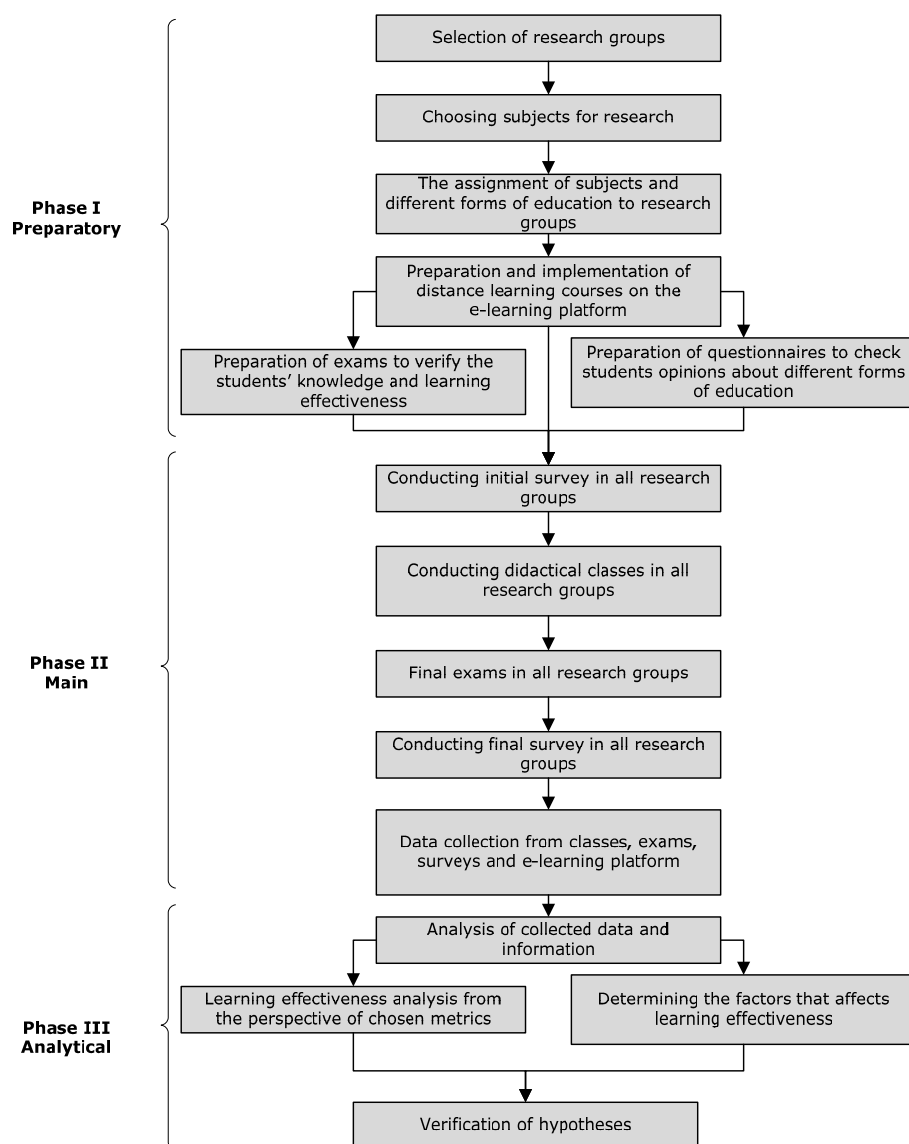


Fig. 1. The research plan

In the first phase (preparatory), before selecting subjects for research, three main research groups were chosen. This action was important due to the fact that – according to the assumptions of the research – the experiment could only be done in the Faculty of Economics. That is why the considered subjects have not been done yet in all selected groups of students. To each group one different form of education was assigned. In total there were 97 people in those groups. The selection was made based on the following conditions:

- possibility to have classes with all groups at the same period of time; the same procedure and organization of the studies in all groups. Due to the greater flexibility and ability to change the schedule of classes only daily students were considered. In result there was similar age of students in all groups – mainly young people under 25 years of age;
- the number of students in each group should be at least 30 people;
- selected groups should have a similar structure based on gender – the same proportion of men and women;
- students grades average in all selected groups should be similar, which provides a comparable level of knowledge and skills.

In order to ensure greater representativeness and reliability of the research an additional research group was created. This group involved all three selected main groups and other students that accepted taking part in the research. There were 292 full-time and part-time students in this additional group. It was used to check student's opinions about e-learning and their preferences for different forms of education.

One of main aims of conducted research was to check the relation between the kind of subject taught and the effectiveness of the education. For that purpose all subjects from the study program of the Faculty of Economics were divided into three groups. In the first group there were only quantitative subjects, such as: Mathematics for economists, Statistics, Accounting, Forecasting and simulations, Mathematical economics, Operational research. Second, descriptive group consisted of the following subjects: Sociology, Philosophy, Economic geography, International economic relations, Foundations of management, Marketing, Economic policy, Social policy. All other subjects, that could not be put into first two groups, created third one, which was not taken into the research. It consisted of the following subjects: English language, Physical education, Foundations of computer science. The research focused on first two groups and only one subject was selected from each of them. The quantitative group was represented by Mathematical economics and the descriptive group by Economic policy. The condition that each of these subjects had to meet was the possibility to have

classes at the same time with all three selected groups of students. Number of topics and amount of teaching hours for both subjects had to be the same. During the experiment all classes in these subjects were performed only with the author of this research. This guaranteed the same conditions and teaching specification in all groups. It had a significant effect of collected data and achieved results reliability.

After determining groups and choosing subjects for blended learning form all topics from both subjects were divided into traditional and e-learning part. Next, the author of the research developed 14 different e-learning courses: 7 to Mathematical economics and 7 to Economic policy. Before courses preparation process began, detailed content and learning standards analysis were made. Based on that courses scenarios were done, which contained both didactical materials, but also tests and exercises to check students' progress. Thanks to those operations, achieved quality and attractiveness of courses was very high.

The last preparatory phase activities were to develop questionnaires for planned surveys and final exam tests. The first questionnaire – preliminary – was designed to check student's attitudes to new forms of education and online testing. Second questionnaire – final – was used to collect student's opinions and observations after the research.

Table 1

Summary of differences in the learning effectiveness research

Group	Traditional learning	Blended learning	E-learning
Content delivery	Everything was presented during traditional classes	Traditional classes and e-learning	Everything was presented via e-learning courses
Data sources	Tutor notes from traditional classes	Tutor notes from traditional classes and e-learning platform	e-learning platform
Evaluating students opinions	Questionnaires conducted before and after didactical classes		
Knowledge check	Final written paper exam		

Second, main phase of the experiment started from research survey of all 292 students. Next, didactical classes were carried out. Students from blended learning and e-learning groups were receiving access to e-learning courses based on the detailed schedule. This helped to achieve regular and systematic learning activities. It is also important that in blended learning form e-learning courses were preparing students for traditional classes: face-to-face discussions and problem solving. In all three research groups data about students' progress, activi-

ties and learning time were collected. At the end of the semester, in the same time, all groups wrote paper final exam from both subjects. Three months later the second survey has been carried out. The data from e-learning platform (number of visits, learning time, level of activity in the discussion forum) and university internal system provided required data for hypothesis testing. Table 1 presents discussed differences of different forms of education effectiveness research.

Phase III – analytical – was started by gathering data and information. Next, an effectiveness analysis of different forms of education was made. Finally all hypotheses were tested. A spreadsheet Microsoft Excel and SPSS software were used for the statistical data analysis.

3. Synthesis of research results

To measure and compare the effectiveness of different forms of education is a very complex task. Performed analyses can contribute to the ongoing discussion over usefulness of implementing e-learning in Polish universities. Described various aspects of e-education gives arguments for and against it. Results achieved during the research authorize the author to express the following conclusions:

1. Traditional classes and blended learning can have similar effectiveness of the education, regardless of the taught subject type (quantitative or descriptive). E-learning can be as effective as other forms only in the case of descriptive subjects. A different situation occurs in the case of quantitative subjects, where scores of students for this form of education were significantly worse (see Table 2).

Table 2

Exam results in all research groups

Subject	Group	Final result average	Average grade	Coefficient of variation
Mathematical Economics	Traditional learning	52.1	3.58	31.7%
	Blended learning	51.4	3.55	34.7%
	E-learning	43.4	3.12	40.6%
	All groups	49.2	3.43	35.6%
Economic Policy	Traditional learning	54.0	3.85	26.1%
	Blended learning	55.6	3.86	27.7%
	E-learning	51.1	3.62	27.2%
	All groups	53.6	3.78	27.1%

Achieved results indicate that the effectiveness of teaching different subjects depends on the chosen form of education. This is particularly evident for e-learning. In this form the results were considerably different between quantitative subject (Mathematical economics) and descriptive subject (Economic policy). This form is much more suitable for teaching descriptive subjects and allows to achieve comparable results with other methods of teaching. For traditional and blended learning there were no significant differences between the results of quantitative and descriptive subjects.

2. In the opinion of most students, effectiveness depends on the type and character of learning subject. This was confirmed by the results of the research. Especially it is visible for e-learning form, for which the data confirmed the significant difference between the quantitative and descriptive subject.
3. The effectiveness of learning depends on gender and the grades average from studies of similar subjects.

Table 3

Exam results in all research groups by gender

Group	Subject	Final result average	Average grade	The value of t-Student test	Group		Subject
		Man	Woman	Man	Woman		
Traditional learning	Mathematical economics	55.0	50.1	3.75	3.47	0.814	
	Economic policy	54.2	53.9	3.90	3.82	0.053	
Blended learning	Mathematical economics	50.9	51.7	3.50	3.60	−0.126	
	Economic policy	53.7	57.1	3.65	4.03	−0.606	
E-learning	Mathematical Economics	38.7	50.3	2.80	3.60	−1.738(x)	
	Economic policy	46.8	57.6	3.33	4.05	−2.081 (x)	

In e-learning group men achieved worse results than women (see Table 3). This was the case for both subjects. Analysis of achieved results depending on the average grade from studies allows to make the statement that there is high correlation between these values. Collected data showed that the higher average grade student had from quantitative subjects, the higher result he received from Mathematical economics. A similar relationship was also observed for the average grade from descriptive subjects and Economic policy. This relation occurred in all research groups.

4. The time spent on learning via Internet and the level of online activities on discussing forum has very little influence on the final grades from both subjects. The research data proven that these are not crucial factors affecting learning outcomes.
5. According to students, traditional learning is the most preferred method of acquiring new knowledge and skills (see Fig. 2). The alternative for that may be blended learning. In the opinion of most respondents pure e-learning should be used where applicable of first two forms of education is not possible.
6. The most preferred form of communication with the teacher and other students is traditional, personal contact. Other forms are less preferable, but also accepted: e-mail and discussion forum (see Fig. 3).
7. According to students, the most important advantages of e-learning are: individuation of the education process, savings of time, access to knowledge data-bases and other additional materials. The most significant disadvantages of this form are lack of direct contact with teacher, problems with motivation and self-discipline and fewer opportunities to interact with other students.

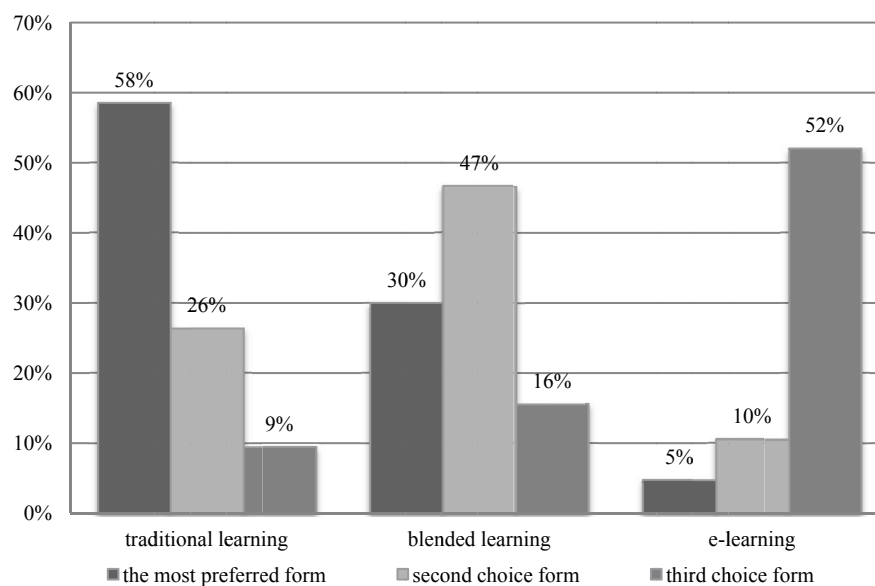


Fig. 2. Student's preferences for different forms of education

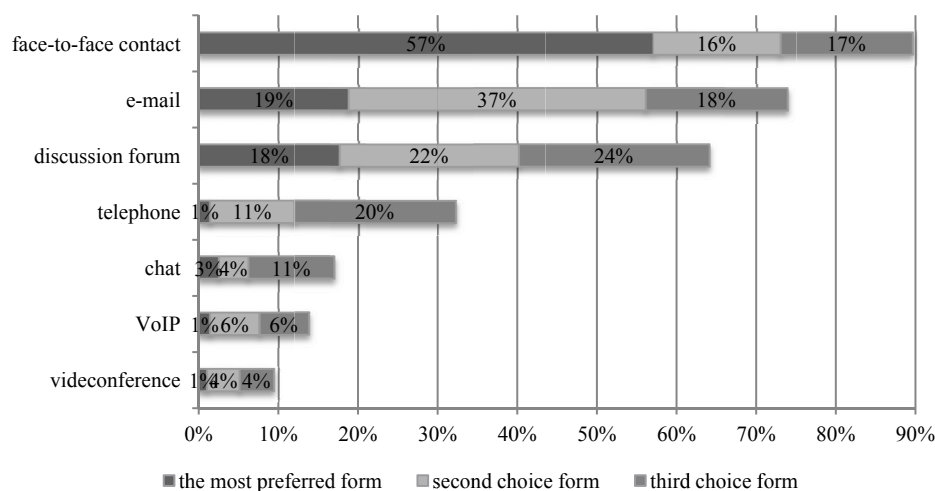


Fig. 3. Student's communication preferences

8. The key elements of e-learning courses that facilitate gaining new knowledge, make it more enjoyable and effective, according to respondents are: important concepts highlighted in the text, clear and simple illustrations and charts, appropriate structure, easy to use intuitive navigation, presence of different exercises, practical elements in course content.
9. In student's opinion, online exams are not more stressful and difficult than traditional, paper tests. Most persons would like to have them as an alternative. For most individuals they are not as good as written exams, which is the most preferred form of knowledge verification.
10. Students have all necessary skills to use electronic forms of education. This may be a result of fact that most people work with a computer and use Internet every day. This was confirmed also by a large number of Internet service used, some of which also exist in e-learning.
11. Young people have no problems with access to computer and Internet that allows distance learning. The ongoing development of the telecommunication and falling prices results that Internet connection speed is an increasingly smaller problem.
12. Most students who observe the impact of using e-learning at their university think that it is a positive influence.

Conclusion

Described results of the research and conclusions do not cover all issues related to effectiveness of different forms of education. They may be a prerequisite for further research in this area. There are still questions about the effectiveness of other subjects and fields of studies. Their specification is quite different from subjects taken into the research.

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TRADYCYJNA I ELEKTRONICZNA EDUKACJA – BADANIA NAD EFEKTYWNOŚCIĄ KSZTAŁCENIA

Streszczenie

Obserwowany w ostatnich latach gwałtowny rozwój komunikacji, technologii informacyjnych i komputerów w znacznej mierze przyczynił się do powstania nowych, elektronicznych form kształcenia. Coraz większego znaczenia nabierają zatem kwestie dotyczące ich skuteczności i przydatności w szkolnictwie wyższym. Brak kompleksowych opracowań w tej dziedzinie utrudnia przekonywanie decydentów do konieczności inwestowania w e-learning, stanowi barierę w wytyczaniu celów i ścieżek rozwoju tej formy kształcenia. Głównym celem artykułu jest poszerzenie wiedzy o e-learningu oraz przedstawienie wyników badania efektywności różnych form kształcenia.

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EFFECTS OF CREATING KNOWLEDGE BASED RELATIONSHIPS BY COMPANIES WITHIN INNOVATION NETWORKS

Introduction

Innovative companies have increasingly shifted from innovation initiatives that are centered on internal resources to those are centered on external networks (said another way, a shift from firm-centric innovation to network-centric innovation) [NaSa11]. The value of the innovative company depends on ever-growing its inside and outside resources of knowledge, exchange and creation of knowledge with partners (suppliers, consumers) and/or competitors within innovation networks, and also its effective application in innovation processes.

In this paper innovation network is understood as an organization in which two or more independent firms aim at jointly researching, developing or dispersing innovations. In such a relatively stable and cooperative collaboration, the partner firms find support during one or more activities of the innovation process, which may increase their innovation performance [DiGW08]. Networks emphasize interaction, connectivity, and mutual complementarity and reinforcement. The rationale, knowledge exchange and relationships between participants of innovation processes are that comprises innovation networks [CaCa09].

Mutual collaboration and/or competition (coopetition) of the network participants in innovation processes create knowledge based relationships between them. These relationships of innovative companies with partners (suppliers, consumers) and/or competitors in networks are built during mutual development and exchange of their knowledge during innovation process activities execution. This paper attempts to describe goals and synergy effects of creating knowledge based relationships by innovative companies with partners within the framework of the innovation network.

1. The role of knowledge in innovation networks

The issues concerning the balance between suitable knowledge, its impact on performance, and when and with whom to seek such knowledge are important for sustainability of companies innovative development. Companies become more and more network organizations and dependent upon external sources of knowledge to reach their strategic objectives. The use of external knowledge has been proven to be one of the key factors in ensuring innovation, learning, business competitiveness and long-term growth [AnSP10].

The innovation process consists of the following activities: development of a new solution concept, innovation elaboration, its application, promotion, and selling on the innovation market, its diffusion, and also improvement at all times. Innovation processes comprise knowledge management and learning activities within the network, where knowledge based relationships are created and improved between suppliers and consumers of knowledge. The completion of any stage of an innovation process is considered to be an innovative solution, which can be offered for sale on the innovation market. During the course of the process knowledge based relationships are created among its contractors connected with the flow, application, and development of shared knowledge resources. The base of building these relationships is shaping mutual trust between participants of innovation processes [Doli10].

Innovative capabilities of companies are based on the management of knowledge, because it is the source of organizational sustainability and competitive advantage. Successful companies realize that investing in knowledge is essential to their ability to create high value products and services [ChHs11]. They also assimilate and integrate knowledge by facilitating its communication, sharing, and transfer among individuals and by encouraging interactions, relationships in groups and networks [KePT08]. Flexibility allows the innovation network to react quickly to unexpected situations and changes on the market, and also create and exploit effectively knowledge of their partners during innovation process execution.

In fields where scientific or technological progress is developing rapidly, and the sources of knowledge are widely distributed, no single firm has all the necessary skills to stay on top of all areas of progress and bring significant innovations to market. In such settings, networks can become the locus of innovation, as the creation of knowledge is crucial to improving competitive position.

In today's innovation markets, competition no longer takes place between individual competitors. Rather, it takes place between the entire knowledge

value-delivery networks created by these competitors. Hence, each company unit ought to function as a link in the company's value chain, which is created during knowledge management along the innovation process, which is executed within the innovation network. Companies must work closely with partners from other organizations to form an effective value chain that serves the customers.

Innovation networks may be differentiated with respect to their duration and stability, as well as whether they are forged to accomplish a specific task or evolve out of pre-existing bonds of association. Networks vary from short-term projects to long-term relationships, and the different temporal dimensions have important implications for others are more heterarchical, with distributed authority and strong self-organizing features. Powell focus on temporal stability and forms of governance to differentiate four key types: informal networks (based on shared experience – for instance a club of innovators); project networks (short-term combinations to accomplish specific tasks – application of new technology); regional network (where spatial propinquity helps sustain a common community – collaboration of companies with universities, R&D entities, innovation transfer and financial institutions in the region, regional innovation system, cluster); and business networks (purposive, strategic alliances between two or many parties – scientific and technological park, cluster) [Powe04].

Every country should construct open innovation systems (of country – national innovation system and its regions – regional innovation systems), and that not only focuses on the participated public and private sectors, but also expands to relative economic structure, and various social cooperation networks that help effectively improve collective learning and knowledge development, exchange and using in innovations. The capability of production and innovation of a country can be improved by the increasing number of well skilled and educational employees [Chen08] and also their knowledge based relationships with partners inside and outside the companies during execution of innovation processes within the framework of the innovation network.

The region is increasingly the level at which innovation is produced through regional networks of innovators, local clusters and the cross-fertilizing effects of research and development (R&D) institutions [AsGr06]. Innovations ought to contribute to the regional/local economy. The role of regional innovation networks is to create innovation processes that accelerate knowledge application and commercialization of innovations, and their diffusion. This system is characterized by knowledge exchange during collaboration among: regional/local authorities, industry and service companies, universities, R&D entities, innovation transfer and financial institutions. This collaboration shape knowledge based re-

relationships among entities of regional innovation system. The firms and other organizations of the regionally networked innovation systems are embedded in a specific region and characterized by localized, interactive learning. In many countries, efforts to increase the national and regional economic returns from public investments in university research have attempted to stimulate the creation of regional clusters of innovative firms around universities and technology-science parks.

Clusters are geographic concentrations of interconnected: companies, specialized suppliers, service providers, firms in related industries, and associated institutions in a particular field, that compete, but also cooperate among themselves [IbFR06]. These undertaking seek to stimulate regional economic development and agglomeration via facilitating the creation of spin-off firms to commercialize university technologies and knowledge. Clusters and technology-science parks positively affect universities' and R&D entities' contributions to creating knowledge based relationships with companies and their innovative development.

Technology-science park is an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a science park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubators and spin-off processes, and provides other value-added services together with high quality space and facilities [Iasp12].

2. Knowledge based relationships among collaborators of innovation networks

Increasingly, innovations have come to be based on the interactions, relationships, knowledge, and information flow between economic entities, which collaborate among themselves as partners of the innovation network during the execution of innovation process activities.

Structural changes in the knowledge economy mean that managers will increasingly seek to make cooperative relationships the norm in their organizations. Where relationships are high in trust, people are more willing to engage in social exchange in general and cooperative interactions in particular. In the con-

text of knowledge processes, trust leads to the openness, dialogue and the shared experimentation that are so important for innovation. A firm's total ability to create value certainly depends in part on specialist groups such as R&D and marketing, but there is a growing acknowledgment that successful innovation also involves effective processes of knowledge management affecting a far larger number of people distributed around the organization [NaGR05].

This paper's focus lies on knowledge based relationships of the innovative company with partners and/or competitors of the innovation network, where they collaborate and/or compete between themselves during innovation process activities execution. These relationships are created during knowledge management in innovation processes by (Fig. 1):

- partner entities of the national and the regional systems of innovation;
- companies and their customers and/or suppliers of knowledge, information, innovative solutions (also patents, licences);
- employees and project or process teams which cooperate between themselves in the company and with the partner entities of the innovation networks (also national, regional innovation systems): firms the same and/or different lines of business, R&D institutions, laboratories, high schools, universities, polytechnics, technology-science parks, clusters, regional and/or local authorities, innovation transfer institutions, clubs, associations of innovators, suppliers of funds for innovations (also VC firms), of consulting, innovation sale and promotion services.

External knowledge of the innovative company derives from its partners and/or competitors within the innovation network, and is generated in the area of micro- and macroenvironment. Firms and their employees cooperate among themselves during the execution of innovation process activities in the framework of the innovation network and then they use and develop their mutual knowledge resources. External knowledge of the innovative company derives from its partners and competitors within the innovation network. Assimilation and effective using of external knowledge depends on the company's capacities of cooperation with participants of networks and creating knowledge based relationships with them.

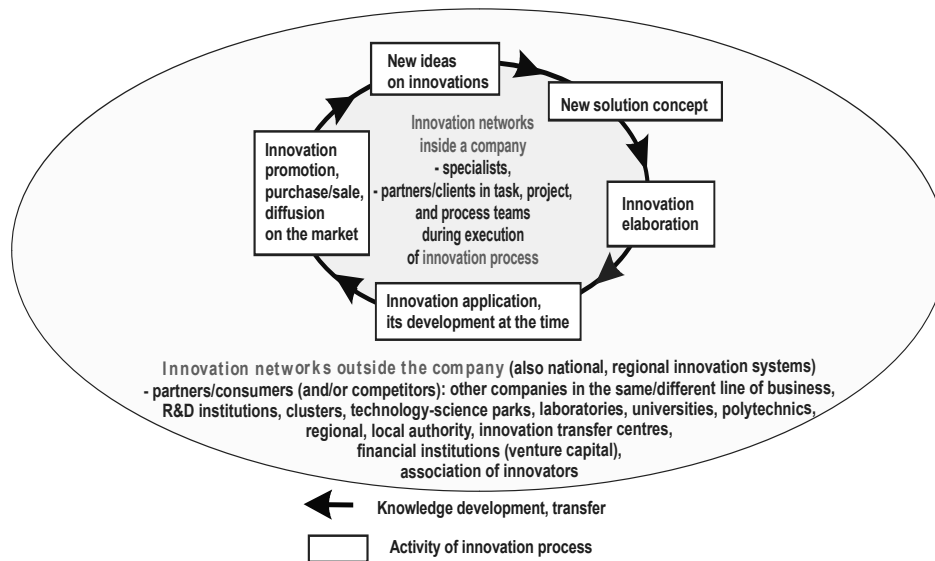


Fig. 1. Knowledge development and transfer among participants of innovation processes within innovation networks

Source: Author's own concept.

At present we can observe an increased reliance on external sources of knowledge and R&D results that is universities, R&D institutes, laboratories, as well as other firms, and customers in the development of new solutions and products in innovation processes and application of them in the economy. Getting to know and meeting customer needs and expectations guarantees the sales of company's new products and its continued existence and innovative development on the market.

Goals and effects of building knowledge based relationships by companies with partners within the area of innovation networks.

Companies ought to upgrade their innovative capabilities by investing in their competencies, skills and knowledge bases and also knowledge based relationships with collaborators in the framework of innovation networks. Knowledge based relationships lead to various benefits with respect to knowledge diffusion, resource sharing, access to specialized intellectual assets, skills and interorganizational learning.

The most important goals that the innovative companies aim to realize by building knowledge based relationships with partners of innovation networks include: flexible access to and gain of technologies, new solutions and also current knowledge resources, intensified contact with clients, partners, access to and entrance to new markets, long-term bonding of knowledge suppliers and clients,

safeguarding the network members (partner-firms) from outside competition on the innovation market, access to other innovative competencies, results of R&D, increasing efficiency of innovation process accomplishment, access to many sources of innovation financing and flexible using of them during innovation development and application, also risk sharing and safeguarding property rights.

Firms with broader networks are exposed to more experiences, different competences, and added opportunities. By having access to a more varied set of activities, experiences, and collaborators, companies broaden the resource and knowledge base that they can draw on [PoGr06] and these possibilities enable them to develop faster.

Networks are critical for: accessing knowledge to create innovations, the diffusion of technology, and they are important for learning about innovative work practices that other organizations have developed or adopted. Advantages that accrue from diverse sources of information, knowledge and other resources in innovation processes are considerable for their partners. Interorganizational networks are a means by which organizations and their partners can pool or exchange knowledge resources, and jointly learn and develop new ideas, skills and innovations. Collaborators allows innovative companies to learn from a wide stock of knowledge. Partners of the innovation network create knowledge based relationships among themselves which play a crucial role in development of knowledge, entrepreneurship and relational (social) capital during accomplishment of innovation processes in the network area. They also acquire knowledge from outside the network and make it accessible for collaborators in innovation processes. Networks promote social interactions, generating trust that is conducive to knowledge transfer, its practical application and early adoption of innovations.

Innovation arises from complex interactions and relationships between individuals, firms-partners of the network organization and their operating environment during the implementation of innovation processes. Knowledge based relationships and learning capacities of people and companies are instrumental for innovation processes, as are their powers of creativity, initiative and drive, determining, to a large extent, the innovation capacity of network organization and its partners, and also effective knowledge development and using in innovations.

Building knowledge based relationships between the innovative company and its partners within the framework of the innovative network enable the company to create synergic effects during knowledge management in innovation process activities. These effects are results of:

- mutual knowledge exchange and creation with partners (consumers, suppliers) and/or competitors in activities of innovation processes;

- transformation tacit into explicit knowledge, development, and application of it in the field of innovation;
- learning from partners, competitors and using their complementary knowledge and skills in innovations;
- improving innovative competencies, abilities of the company and its staff;
- increasing innovative capacities and culture of the company;
- using external (also foreign) and internal sources of knowledge on technology, innovations and innovation markets;
- access to complementary knowledge, other innovative competencies, results of R&D;
- conducting R&D with partners from outside the firm, reducing R&D time and costs, increasing efficiency of innovation process accomplishment;
- knowledge development, diffusion, and use within the innovation network to the company's benefits;
- access to many sources of innovation financing and flexible using of them during innovation development and application;
- creating knowledge with partners, consumers and using it in new products, on new markets;
- entering new domestic, foreign markets;
- growth of competitiveness of the company and its offer on the innovation market;
- upgrading efficiency of collaboration with partners in the framework of innovation network;
- building and using shared information and knowledge bases in the area of innovation networks;
- growth of the trust between the company and its partners within the innovation network.

With accomplishment of innovation processes within the framework of the innovation network, knowledge, and intellectual resources of its participants are multiplied [Doli10].

Conclusion

Relationships of companies with partners/consumers and competitors in network are based on development and exchange knowledge, which is used in innovation processes. Cooperative relationships of the company with other participants of the innovation network create synergic effects in the area of their knowledge development, diffusion and commercialization on the innovation market, and also the company innovative capacities development and competi-

tiveness improvement. Good knowledge based relationships of the innovative company with partners are at the heart of the innovative company success in the innovation network and its offer on the innovation market.

Intangible assets such as knowledge based relationships with customers, partners and supply channels are defined as relational market-based capital of the innovative company, which can provide sustainable competitive advantage and create added value for the company. These relationships enable the innovative company to learn effectively how to manage its knowledge during innovation process activities execution, and influence on growth of the company intellectual assets and its innovative capabilities.

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EFEKTY KREOWANIA RELACJI OPARTYCH NA WIEDZY PRZEZ PRZEDSIĘBIORSTWA W SIECIACH INNOWACJI

Streszczenie

W opracowaniu przedstawiono pojęcie, charakterystykę oraz przykłady sieci innowacji, w tym regionalnych systemów innowacji, klastrów, parków naukowo-technologicznych, a także budowanych przez przedsiębiorstwa relacji opartych na wiedzy z partnerami w trakcie realizacji procesów innowacji w sieci. Sformułowano cele oraz efekty synergiczne budowania przez firmy relacji opartych na wiedzy z partnerami w sieciach innowacji.

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THE CHOSEN DETERMINANTS OF CUSTOMERS CO-CREATED INNOVATIONS

Introduction

The conception of involving customers into the process of creating the innovation gains more and more supporters [PrRa04], [Full10], [Howe08]. We observe deep changes in the interaction between the consumer and the firm in co-creating not only the innovation, but widely understood value co-creating. Prahalad distinguished four fundamental elements of the process of co-creating: dialogue, access, risk assessment, and transparency defined as DART concept. Unfortunately, experiences of many firms show that taking into considerations DART concept does not warrant the success in the realization of the process of co-creating the innovation with the customer.

The aim of this article is to present the additional determinants, which positively influence on creation experience environment and the growth of the efficiency of processes of co-creating innovation with the customers. First is the proposal of the selection of consumers engaged into the process of co-creating, because aiming such an offer at the whole group of consumers causes the groundless increase of costs. Besides, positive influence on co-creating the innovation has the recognition and the amplification of motives, which drive consumers participating in this process.

Innovation plays an important role in both the survival and prosperity of firms of all sizes and in every industry. Innovation means the process of making changes to something established by introducing something new. The goals of innovations are: positive change, to serve and create value for users, to make something better. Innovation leading to increased productivity. The importance of innovation will continue to grow in the future, as the market becomes increasingly uncertain and competitive.

Successful innovation requires attention to users' needs, that users' knowledge is central to the development of established firm's new products [LMSS02], and that the central content of innovations in some cases comes from users [FrSh03]. Von Hippel has accented the importance of communication and joint learning between customers and the producers of innovation [Hipp94].

There are two overall reasons why customers may contribute to the innovation process. First, in many cases they are the principal beneficiaries of the innovation. Second, customers often possess "sticky" knowledge i.e. knowledge that is difficult and hence costly to transfer [Hipp94].

A number of existing innovation paradigms and design approaches, such as open innovation [Ches03], user experience [PrRa03], user-centred design [Hipp05], and user-centred open innovation ecosystems [Pall09], are all promoting distributed collaboration among organisations and user communities.

1. The changing role of the consumer in co-creation innovation

Since the 1990s, the role of consumers in the industrial system is changing and the impact of the connected, informed, and active consumer keeps increasing through information access, a global view, networking, and experimentation.

Bettencourt introduced a model that could be an essential building block of the customer coproduction concept. He argued that customers could play three important roles as co-producers [Bett97]:

- customers as consultants,
- customers as promoters and
- customers as human resources.

In this time of social networks and user-generated content portals terms such as crowdsourcing [Howe08], co-creation [PrRa04], user innovation [Hipp05] have become quite popular. They also describe the promising, active role users may play in innovation. Consumers are considered a valuable source of innovation such as the generation, design, refinement, and testing of ideas and new product concepts. Consumers take on the role of co-creators.

Prahalad and Ramaswamy describe co-creation as co-creation is about joint creation of value by the company and the customer. It is not the firm trying to please the customer [PrRa04]. They wrote also, that co-creation is "(...) creating an experience environment in which consumers can have active dialogue and co-construct personalized experiences; product may be the same (...) but customers

can construct different experiences” [PrRa04]. Customer become a new sources of competence, consisting of the knowledge and skills they possess. They are ready to learn, experiment and engage in dialogue with the firm.

Sometimes customers do innovation in order to develop new products and services that better meet consumers’ wants and needs and to decrease the high failure rates of new product introductions, especially prevalent in the consumer goods sectors.

2. The co-creation process and experience environments

In co-creation process we can divided the four building blocks. There are: dialogue, access, risk assessment, and transparency [PrRa04]. Dialogue encourages knowledge sharing and qualitatively new levels of understanding between companies and consumers. It also allows consumers to interject their views of value into the value creation process. By focusing on access to experiences at multiple points of interaction, as opposed to simply ownership of products, organizations can broaden their business opportunities. Risk assessment assumes that if consumers become co-creators of value with companies, then they will demand more information about potential risks of goods and services – but they may also bear more responsibility for dealing with those risks [PrRa04a]. Transparency of information is necessary to create trust between organization and customers.

The realization of the process of innovation co-creation by customers demands creation of certain platform, the reference frame which enables the firm bringing to various experiences of co-creation with customers. The platform is called as experience environments [PrRa04]. We can develop a broad specification for designing an experience environment. At a minimum, the experience environment must [PrRa04a]:

- offer opportunities for consumers to co-construct their own experiences on demand, in a specific context of space and time;
- accommodate a heterogeneous group of consumers, from the very sophisticated and active to the very unsophisticated and passive;
- recognize that every consumer (including the active, smart consumer) does not always want to co-create, sometimes he or she just wants to consume;
- facilitate new opportunities afforded by the evolution of emerging technologies;
- accommodate the involvement of consumer communities;
- engage the consumer emotionally and intellectually;
- explicitly recognize both the social and the technical aspects of co-creation experiences.

In the realization of above-recommendations it is proper to take into account two determinants, which will positively influence on the process of co-creating innovations with the customer:

1. The identification, the selection of customers who in the greatest degree seem to be involved, effective co-authors of the innovation.
2. The recognition of motives of customers who are inclined to co-creating the innovation.

The first element is essential especially in the situation, when the organization wants to make available its own customers products for the purpose of its testing and notifying of innovative improvements and corrections, or when certain specialist information about given products are made available. Directing such offers to the whole cluster of customers generates high and superfluous costs when one can direct it to sorted and interested group of customers. The second element will permit effectively strengthen the motivation of customers to co-creating the innovation.

3. The choice of customers co-creators of innovation

In order to stimulate co-creation, a continuous and dynamic exchange between the organization and its customers is required to convert those customers into active participants in every step of the innovation co-creation process.

Potential customers of co-creators should be chosen taking into account two essential for the further collaboration features:

- number of communication channels used by them,
- commitment to the research of information.

For the purpose of the segmentation of customers one can draw a map of the channels used by customers to establish relationships with organization and to co-create innovation and give a rational for different levels of commitment to the co-creation process among consumers. The map of the consumer's segments was presented in Fig. 1.

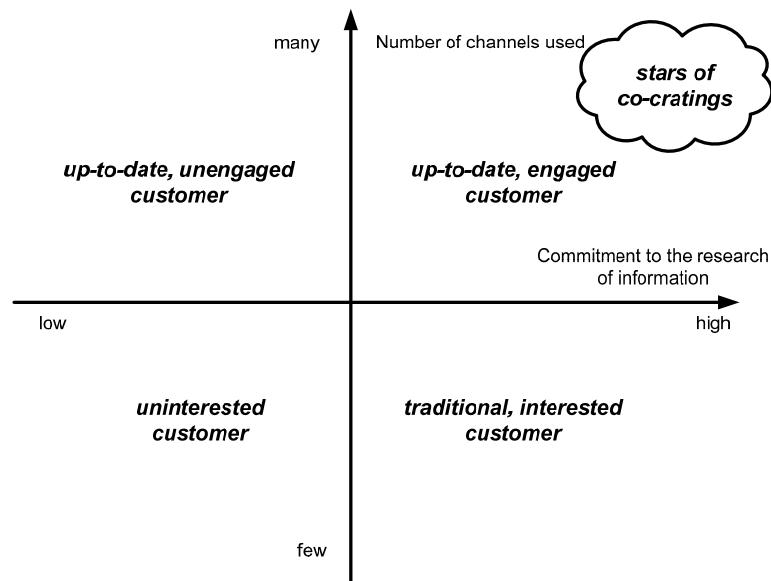


Fig. 1. The map of the customer's segments

Source: The author's own study.

Segmentation of the consumers with regard to their interest in active participation to co-creation processes we can analyse as follows:

- the customers that occupy the left part of the map on Fig. 1 segment “up-to-date, unengaged customer” and segment “uninterested customer” are the less sensitive to innovation co-creation process and are also the less attractive for many organizations;
- the right part of the map shows the more innovative and attractive segments “up-to-date, engaged customer” and segment “traditional interested customer”.

Customers who will be in the segment “up-this-date, engaged customer” will differ at the level of interests and with the activity within the range of communications. The group, potentially best co-authors of the innovation are persons who on the map will be marked as the segment “stars of co-creatings”. Good effects can also bring the collaboration with permanent, but with rather traditional customers who show the interest, want to cooperate with the company, but on the basis of traditional communication solutions. These customers, rather are not inclined to the creation of the community of virtual discussion groups, to share information and knowledge, but their individual innovative ideas can be very precious.

4. Motives of customers who are innovation co-creators

Knowing motives, which drive customers undertaking the collaboration in concreting the innovation we can select the most effective factors for strengthening the interest of customer cooperation with the company. In the Table 1 were introduced chosen motives, which can be applied by customers concreting innovations.

Table 1

Motive categories for engaging in co-creation process

Motive category	Description
Intrinsic playful task	Individuals contribute to new product development, because they may consider it as playful and enjoyable activity, valued for its own sake, and therefore perceived as intrinsically rewarding rather than an effort
Curiosity	Consumers may engage in co-creation projects during NPD* just because they are curious. They have a desire of knowledge because of intrinsic reasons
Altruism – community support	Altruism may motivate consumers to engage in co-creation activities and to support producers in innovating new products
Make friends	Getting in touch with like-minded people – employees and consumers – may be a reason for consumers to participate in virtual NPD. Beyond the interest in the topic, the possibility to get in contact with like-minded people is a reason why consumers engage in virtual communities
Self efficacy	Consumers virtually working on new product development tasks, similar to “Hackers”, may derive a sense of accomplishment due to their contributions. They may perceive the co-creation activity as a challenge to be mastered
Information seeking	Consumers may engage in virtual co-creation projects, because they are seeking innovation or product-related information pertinent to their hobby, upcoming product purchase, or just through novelty seeking behavior. Prior studies show that people participate in online communities because they are looking for information relevant to them
Skill development	Engaging in virtual new product development enables consumers to improve their skill and gain additional knowledge. They may be interested to learn more about new technologies and products, and find solutions to hitherto unanswered questions
Recognition – visibility	Consumers may participate in virtual new product development to become visible and get recognition from other participants as well as from the producer. Online community members are motivated to share their know-how and participate in activities for ego gratification or the desire for peer recognition
Personal need – dissatisfaction	Personal need may motivate consumers to virtually engage in virtual NPD. Sports enthusiasts start to modify or develop their own products, because they are dissatisfied with existing products and because they derive benefit from using their innovation
Compensation – monetary reward	Immediate as well as delayed payoffs such as may be the reason why consumers engage in co-creation during NPD

* NPD – New Product Development.

Source: The author’s own study based on [Full10, p. 105], [Kozi02], [FrSh03].

Motivating, as the function of the management of collaboration with customers is crucial. Activities should be undertaken within the range of:

- the maintenance of good relations with the customer,
- stimulating his commitment in the creation of the innovation,
- strengthening bonds in the group of virtual experts,
- encouraging to the creation and then collaboration in the resultant community of customers of innovators.

The process of concreating the innovation should be steered at the long-lasting cooperation with the customer. It is the investment during which the customer acquires the specialist knowledge, and on the other hand has still different perspective, proper to customers not to producers and is therefore a precious source of innovation.

Conclusion

The consideration presented in this article support the evidence that co-creation might play a crucial role in the relationship between companies and customers and specially in innovation process. Enterprises which want their products to extremely meet expectations of customers, should direct their own operations just toward the collaboration and co-creation of the innovation with the customer. There was presented the conception and advices of how to create experience environment. There were indicated determinants, which positively affect the efficiency of the process of collaboration in the creation of innovation. It is appropriate to do the segmentation of customers and to aim offers of cooperation first of all to the segment called “Modern, involved customers”. In relations with customers one can then use all communication solutions offered by IT, in this first of all the Internet and the Internet 2.0. Customers from this segment will be inclined to create virtual community of experts (experts virtual communities) who share information and knowledge creates innovations together.

The segment of customers “Traditional, interested customers” is the group who can be the resource of co-authors customers of innovations, but the platform of the communication must be properly matched to skills and habits of these customers.

Essential is also the recognition of motives, which drive customers co-creating innovations to strengthen the motivation of customers of co-authors. Customers engagement into the process of concreating innovations is a good investment, about what already made sure many firms. Most well-known examples of companies which effectively create cooperation with the customer are:

Nike – the sportswear giant, Sumerset – one of the world's largest houseboat manufacturers, Lego – famous toys manufacturer, Linux – open source systems and many others.

Co-creation innovation is not an extra action, but is fast becoming the standard that customers expect. And if carried out correctly, it can give advantage over competitors.

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WYBRANE DETERMINANTY WSPÓŁTWORZENIA INNOWACJI PRZEZ KLIENTA

Streszczenie

Obserwujemy głębokie zmiany w interakcji między konsumentem a firmą w szeroko rozumianym współtworzeniu wartości, w tym także we współtworzeniu innowacji. Celem artykułu jest prezentacja wybranych determinantów, które pozytywnie wpływają na wzrost efektywności procesów współtworzenia innowacji z klientami. Pierwsza z nich to propozycja selekcji i doboru konsumentów angażowanych w proces współtworzenia. Druga dotyczy rozpoznania, a następnie wzmacniania motywów, jakimi kierują się konsumenci, uczestnicząc w procesie współtworzenia innowacji.

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STRUCTURING DATA IN WIKI FOR AN IMPLEMENTATION COMPANY

Introduction

In 1980 Alvin Toffler [Toff80] predicted a very important change in the way how society and economic works. He stated that the information would be the most important asset. Today we can, without any doubt, confirm his prophecy. Nowadays in many cases the knowledge in the possession of the employees decides if the enterprise is successful or not. It is quite opposite to the times before the so-called third wave. During the times of Toffler's second wave the quantity of the capital determined the ability of the enterprise to compete on the market. In the age of the internet and global markets the quantity and quality of knowledge and above all the ability to use that knowledge in an effective manner determines the competitiveness of an organization. Given the key role of the knowledge in the contemporary economy it is said that it is a knowledge-based economy. According to the definition provided by OECD [OECD96], such economies are "(...) directly based on the production, distribution and use of knowledge and information". Different definitions of the knowledge-based economy point to the key role of the knowledge in creating the value added and as a competitive advantage factor.

The relationship between the usage of knowledge and the usage of information and communication technology (ICT) is often mentioned. It is based on the fact that ICT is very effective in gathering, creating, transforming, and transferring explicit knowledge [Robe00].

In the knowledge-based economy there are many companies which do business with knowledge and competences of their employees as a key assets. One of the most widespread kind of such enterprises are the companies that offer consulting services. The growing need for management information systems (MIS) and especially Enterprise Resource Planning (ERP) systems resulted in establishing many consulting companies that specialize in implementing MIS

according to the specific requirements of their customers. Those companies build their competitive advantage on the base of the knowledge about the best practices applied to the certain line of business and the knowledge about adjusting ERP system to the requirements. The significant amount of creativity is often needed to find the right solution of the emergent problems.

Implementing companies seek the tools which can help them in managing organizational knowledge. Probably the most important feature of such a solution would be the ability to gather and preserve organizational knowledge. The organization has to be prepared for the situation of losing their employees. It is also important because knowledge in the knowledge base can be sought which means that the preserved knowledge can be reusable and can be used for teaching purposes. Usually the employees of the implementation company form teams in which they work together during the implementation projects. They have to be able to communicate and collaborate effectively [Baje10].

Wiki systems proved to be a good solution for the knowledge management. In many cases organizations can apply wiki to support knowledge management processes [Deck05], [Grac09], [Jack10], [Shee08], [Melo09]. But there are several drawbacks that are related to using wiki in enterprises. One of the biggest is the amount of time and energy that is needed for users to write knowledge to the wiki and to find the correct topic. This paper addresses that problem and suggests the solution in the form of data forms attached to the topics and topic templates. Topic templates can be defined separately for viewing and editing.

1. Using wikis to support knowledge management

Social software changes the way people collaborate. When used, social software such as wiki technology, supports KM by facilitating the knowledge extraction. Using wiki for KM changes the nature of participation in creating and sharing knowledge in the enterprise. The main assumption is that everybody can create and transform content in the wiki system. Everyone who wants to participate becomes at the same time both a knowledge vendor and knowledge consumer. Nonaka and Takeuchi [NoTa95] presented the SECI model. Model is built on the assumptions that there are two kinds of knowledge: tacit, which can be described as hard to codify, personal knowledge, and explicit, which is knowledge that can be easily written down and transfer. SECI model defines four modes of knowledge conversion and creation: socialization – from tacit to tacit through social interaction, externalization – from tacit to explicit through use of metaphors and story-telling, combination – from explicit to explicit through

knowledge exchange and transforming one form of explicit knowledge to another and internalization – from explicit to tacit through sharing mental models, learning-by-doing. Thanks to the presumption it is easier to receive knowledge socialization, which was described by Nonaka and Takeuchi as a part of SECI model. It is also easier to transform knowledge from tacit form to explicit.

Essentially wikis are a group of websites with a content management system that helps users with editing. Probably the key characteristic of the wiki is that wiki sites can be edited by virtually anyone. It means that every employee in the company when wiki is used can and is actually encouraged to change the content of wiki sites [LeCu01]. The other of the main characteristics of the wiki is that every change done to the content of any website is logged and can be reverted when needed. Also the functionality of backlinks is important because they can be used as connectors between websites allowing users to bind separated pieces of knowledge into bigger blocks.

The users who write down knowledge to the wiki system describe their own experiences. Thanks to that we can assume that wiki contains knowledge really useful for executing business processes.

Wagner identified the knowledge management system needs and how those needs can be fulfilled by wikis [Wagn04]. His findings are presented in the Table 1.

Table 1

Knowledge Management Needs and Corresponding Wiki Design Principles, Characteristics, and Features

User needs	Principles	Wiki characteristics and features
Ad-hoc knowledge	Incremental, Organic, Universal	Incremental knowledge creation as question answering; Power of N; Wiki editing features (speed of publication)
Finding knowledge	Unified, Precise, Incremental	Knowledge indexing and hyperlinking; Backlinking; Centralized, web-based resource
Filtering knowledge from noise	Unified, Precise, Convergent	Hyperlinking, Power of N, Removal of duplication
Quality of source	Open, Organic, Observable	Power of N; Record history of changes with author information; Ability to comment on changes
Dynamically changing knowledge	Organic, Observable	Power of N; Record of history of changes with author information; Ability to comment on changes
Distributed knowledge	Organic	Power of N; Wiki editing features (history and version management)
Errors and recovery	Open, Tolerant, Observable	Power of N; Wiki editing features (history and version management)
Publication overhead	Mundane, Universal, Overt	Wiki editing features; Wiki publication features

Source: [Wagn04].

The knowledge in the wiki system is written in the form of so-called topics. This resembles the atomized character of knowledge. Every single topic covers one small unit of knowledge. Because of the hypertext that serves as a foundation for the wiki system the connections existing between different units in a wiki are implemented via hyperlinks. Either in the hypertext or in the wiki links enhance creating the relations between different topics.

Every topic in the wiki can be also perceived as an idea. The idea that describes a specific activity of the enterprise, which is actually a solution to the specific problem situation. From this point of view wiki topics are similar to the memes – a term coined by Dawkins [Dawk89]. The topics share several characteristics with the memes:

1. They evolve – similar to the genes topics in the wiki change over the time, due to the conversational character of the wiki ideas (topics) which is manifested via the freedom of changing topics by content receivers.
2. They can be transferred from one unit to another – the knowledge in the wiki can ‘contaminate’ the users.
3. Topics can form a big picture – wiki can serve as a knowledge base for the whole domains of the organizational knowledge.
4. Evangelization is possible – one can share his or hers beliefs, market knowledge in the organization.
5. Relation of trust – to effectively transfer knowledge within organization. In other words if someone who reads wiki topic doesn’t trust his creator then he wouldn’t use the knowledge that this topic contains.

2. Metadata in wiki

Every site in a wiki can be improved by structuring information that it contains. Researchers have been exploring this possibility for some time now. Especially adding semantics to wikis seems very popular in the literature. The most often used goals for adding semantics to a wiki are: enhance searching, allowing other software to access content, content recommendation.

Decker et al. [Deck05] present a semantic wiki, which supports software engineering. They provide a useful insight into what the advantages of using semantics to structure knowledge in a wiki and how to apply ontology in a wiki.

Buffa et al. [Buff08] describe the application of an ontology in a wiki. The goal was to structure data in a wiki in order to ease searching through the wiki and to enable users to ask questions to wiki’s search engine in a manner similar to the natural language. They propose a classification for semantic wikis. If

a wiki recognizes specific topics as concepts with links as properties of those knowledge objects, then the wiki belongs to the category described as a “wiki-tology”. This kind of wikis offer two different editors: one for the main content and another for editing metadata. On the other hand if a wiki uses ontology in reference to itself then it can be a member of the category “the use of ontologies for wiki”. Resources and objects like a page, attachments in the wiki are described in an ontology of the wiki structure. The applied semantic web technologies are RDF and OWL Lite.

Schaffert et al. [Scha05] explore the possibilities of extending the concept of semantic web through data formalization in social software. They assume that every single topic should be enriched with metadata which provide description needed to identify the meaning of the topic’s content. This metadata can use OWL ontology.

3. Foswiki – a structured wiki

Foswiki is a so-called fork of an elder project TWiki. It is an open-source project offered to the public under GPL license, which means that every organization can use it for free. Foswiki is built using Perl programming language, which is one of the oldest and widespread language for Web application programming. The project has a modular structure, so its functionalities can be easily plugged-in or out. In addition, the project offers a possibility to create plugins and macro commands.

Data are stored in so-called topics which from technical point of view are nothing more than plain text files. Every single topic is a one wiki site identified with unique URL. Metadata are stored in the topic itself in the data form. Single topic consist of different data types. The type depends on the data form That means that every topic becomes a typed knowledge item: Foswiki topic + form data. The data form name becomes item’s identifier and the data form itself along with templates describes the implementation details [Harv10].

4. Metadata for implementation company

Foswiki allows to create many data forms, each for a different purpose. It is possible to create metadata in a designed wiki system. In this paper we use metadata to support knowledge management in the implementation company. We identified, based on self-experience, several characteristics, which can be

used to describe knowledge related to different knowledge items useful for the implementation company. First of all, we identified the key organizational roles existing in the examined company:

1. Implementation consultant.
2. IT consultant.
3. Service consultant.
4. Project manager.

There are different goals for which people prescribed to the above mentioned roles use a wiki. Everybody is going to use it in the search for knowledge but some of them will write down knowledge to the system as well. Project manager can use a wiki system to oversee the outcomes of the projects he or she manages.

The whole knowledge base was divided into several namespaces, containing knowledge related to different subjects. In the terminology used in the Foswiki project those namespace are called webs. The underlying assumption says that knowledge related to projects, customers, business processes and IT solutions should be described with different metadata. This kind of partition reflects the actual needs of the particular organizational roles. On the other hand it helps with the creation of separated semantic namespaces for different realms of organizational knowledge. Consequently it helps with searching for information since everyone who wants to find information about, for instance, projects, will go to the namespace 'Projects'. Foswiki itself doesn't restrict users to look for topics within one web.

For the implementation company there were following webs defined: Projects, Solutions, Customers, Best Practices and Tasks.

Projects is the web designed to gather knowledge related to the projects being realized by the implementation company.

Solution is a web designed to gather knowledge related to the IT solutions prepared by the company in order to realize specific customer's requirement.

Customer contains basic information about customers and contact data.

Best Practices is devoted to gather knowledge about typical implementation and service problems and, of course, how to solve these problems.

Tasks is the web for managing workflow – assigning and monitoring execution of tasks during implementation projects.

Below we present a screen shot of a data form for the IT solution. It contains data that can help find the right solution related to a specific business process.

SolucjaForm edycja	
Projekt	WdrozenieAPM?
Autor	AdminUser?
Typ	RaportSAP
Proces	CRM
Data	19 Jan 2012
Klient	APM
Baza	APM
SAP	8.81
SQL	2005
Status	Gotowe

Fig. 1. Data form for IT solutions

Source: Own research.

5. Enhancing usability of wiki with data forms and templates

We postulate using data forms and templates to make topic's edition easier. At least in the beginning of using a wiki software for organizational knowledge management users can feel anxious because of the necessity to learn how to create new wiki topics and what to write to them. In addition, one of the biggest concerns of the new users was the amount of time they have to spend on creating new topics. We decided to address those problems and created several templates of wiki topics. Also, data forms can enhance user experience because they contain drop down list with positions build dynamically from the content of other topics and many fields are equipped with autocomplete features. For example, for the Solutions web there is a template containing the following sections:

- the name of solution,
- business goal,
- solution description,
- previous versions,
- similar solutions.

The user is guided through the edition of topics and all that he or she has to do is to fill up the template. Thus, the users are relieved from conceiving the structure of the wiki topics and from wondering what sort of knowledge they are supposed to contain in the wiki. It is also worth to mention that templates can be defined separately for viewing and editing the topics.

The metadata are also very helpful in creating different kinds of applications. For example, in the prototype built for the implementation company we created an application which helps users in searching through the wiki. This application has been built on the base of a sample application created by Peter Theony, the founder and leader of TWiki project. It comprises different pieces: templates, data form, formatted searches and web forms – Fig. 2.

Baza Projektów

[Dodaj nowy](#) [Pokaż wszystkie](#) [Export to Excel](#)

	Klient	Typ	Wersja	Status
Filtruj	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Ilość rozwiązań: 0

Dodaj nowy projekt

Klient:

Typ: Wybierz typ

Projekt: [Użyj WikiWord](#)

DataUtw?: [Podaj datę utworzenia](#)

DataZak?: [Podaj datę zakończenia](#)

Baza: [Podaj nazwę bazy](#)

SAP: ☒ 8.81 ☐ 8.8 ☐ 2007A ☐ 2004C ☐ 7.6

SQL: ☒ 2008R2 ☐ 2008 ☐ 2005 ☐ 2000

Status: ☒ Gotowe ☐ Realizowane ☐ Porzucone

[Stwórz nowy projekt](#)

Fig. 2. Application ‘Project base’

Source: Own research.

6. Contribution and limitations

This paper aims to provide some insight on how an implementation company can use wiki a software to effectively manage organizational knowledge. One of the main disadvantages of using conversational knowledge management systems such as wikis is the necessity of convincing the users to participate in creating knowledge units. This can be overcome by using techniques, which concentrate on structuring data in the knowledge base and on increasing the ease of use a wiki software. Structuring can be done using data forms which contain

the key characteristics of the specific topic. To increase ergonomics we propose the usage of templates for wiki topics. Both techniques are easy to implement and therefore are cost effective.

There are also limitations to this study. The system presented above is strongly dependent on a wiki engine. The one we have chosen is designed especially to support the use of metadata and topic templates. Using templates can help with editing topics, but can also limit creativity and lead to the loss of useful knowledge when poorly designed. Metadata with ontology are probably more useful. An ontology gives the ability to create more powerful solutions but creating a proper ontology is potentially much harder to accomplish.

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STRUKTURALIZACJA DANYCH W WIKI DLA PRZEDSIĘBIORSTWA WDROŻENIOWEGO

Streszczenie

Wiele współczesnych przedsiębiorstw polega w dużym stopniu na wiedzy zatrudnionych w nich pracowników. Wiedza będąca w ich posiadaniu liczy się najbardziej wtedy, kiedy głównym produktem firmy są wysoce specjalistyczne usługi, takie jak usługi wdrożeniowe i doradztwo biznesowe. Tego typu usługi polegają na modelowaniu oraz odwzorowywaniu procesów biznesowych klienta we wdrażanym systemie klasy ERP.

Ten artykuł różni się od innych opisujących metody strukturalizacji danych w systemach wiki, ponieważ koncentruje się na upraszczaniu sposobu wprowadzania metadanych służących do strukturalizacji wiedzy w wiki, oraz na ergonomii użytkowania wiki w środowisku biznesowym. Wielu tzw. pracowników wiedzy nie chce w codziennej praktyce używać narzędzi służących do zarządzania wiedzą, gdyż uznają tego typu praktyki za marnotrawstwo czasu. Ten artykuł ma na celu określenie metod, dzięki którym osiągnięty zostanie efekt w postaci gromadzenia ustrukturalizowanej wiedzy organizacyjnej w systemie wiki, z jednoczesnym uwzględnieniem zgłaszanych przez użytkowników potrzeb odnośnie do ergonomii sposobu zapisywania wiedzy.

Treść artykułu w dużej mierze odwołuje się do koncepcji strukturalizacji danych w wiki, zastosowanej przez twórców oprogramowania Foswiki.

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DIVERSIFYING THE RISKS OF AN INNOVATIVE TECHNOLOGY IMPLEMENTATION PROCESS THROUGH THE USE OF VIDEO COMMUNICATION TOOLS

1. Technology risk in business settings

1.1. The perception of technology risk

A lot of experienced managers realize that the management of any organization critically involves control over a number of risks arising at each stage of the company's formation and evolution.

The perceptions of the role and relative importance of technology risk management within an innovation design and implementation process are illustrated by the findings of a survey conducted among a group of businesses operating in the information technology sector, classified as SMEs (staff headcount below 250, annual turnover less than €50m)* and having a minimum 3-years' presence in the Polish market. The survey aimed primarily to learn about the perceptions of technology risk by real Polish businesses. It led to the following three conclusions:

- technology risk is specifically inherent to innovative ventures,
- the cost to introduce and sustain a technology risk management system is a major barrier to ventures undertaken by SMEs,

* Pursuant to Commission Recommendation 2003/361/EC of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises, *Official Journal* L 124, p. 36-41, of 20 May 2003.

- the possibility to transfer risk via insurance is perceived as the basic protection [Namy11].

It is increasingly often argued in literature that technology risk should be recognized as part of operational risk, and that the latter risk should be defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events.

In a survey performed by the General Inspectorate of Banking Supervision* in fulfillment of a recommendation of the Basel Committee on Banking Supervision** and in accordance with its terminology, most respondents ranked technology risk (i.e. risk relating to the efficient functioning of information and communication systems, software bugs, data loss, adequate equipment, provision of critical services, etc.) as the most important category of operational risk. The human resources risk (concerning the availability and qualifications of staff, staff turnover, adaptability, work culture, etc.) was rated second most important. Threats relating to fraud, errors and natural disasters were also regarded as major types of hazards.

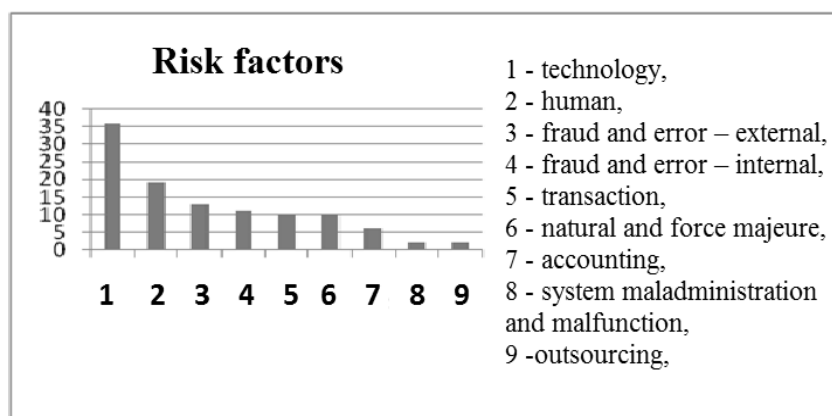


Fig. 1. The findings of a survey conducted by the General Inspectorate of Banking Supervision

1.2. The human being – the most valuable asset, or a key risk factor?

Within technology innovation initiatives, regardless of the way technology risk is perceived and of how its specific constituent factors are classified, a vast majority of hazards relate directly or indirectly to the human element. It is no

* The National Chamber of Statutory Auditors [online], “A communication by the General Inspector of Banking Supervision to presidents of banks concerning operational risk management”.

** Basel Committee on Banking Supervision, “Sound practices for the management and supervision of operational risk”, February 2003.

one, but the project team members that have all the critical, including strategic, information on the project. And it is their know-how where the team's power – and therefore the organization's power, too – stems from. This fact has been recognized by a number of studies, and it is often identified by scholars as a key success factor for any technology project.

People, their knowledge and abilities constitute an organization's most valuable asset and one of its most important capitals; it is particularly so in the case of high technology companies. At the same time, humans represent the greatest potential danger – a major, if not critical, risk factor.

Chapter two highlights and describes a selection of dangers relating to technology risk conceptualized as the areas where the human factor may have (and often does have) a substantial impact on whether and how much damage occurs (cf. e.g. [Kral06]).

1.3. Risk within the design process

As early as at the startup and design phase of any innovation initiative, technology risk emerges as a critical area where potential dangers should be anticipated. This results chiefly from what such initiatives tend to be like at initial stages of the process: not yet completely structured and formalized as a high performance enterprise (department) that applies prudential measures and strives to assess and mitigate risks. In today's extremely competitive economy, where rivalry is not always fair, projects aimed at developing an innovative product or technology run exceptionally high levels of risk. Globalization further increases their risk exposure, and the way information common circulates – over computerized networks – only adds to this account [Koło11].

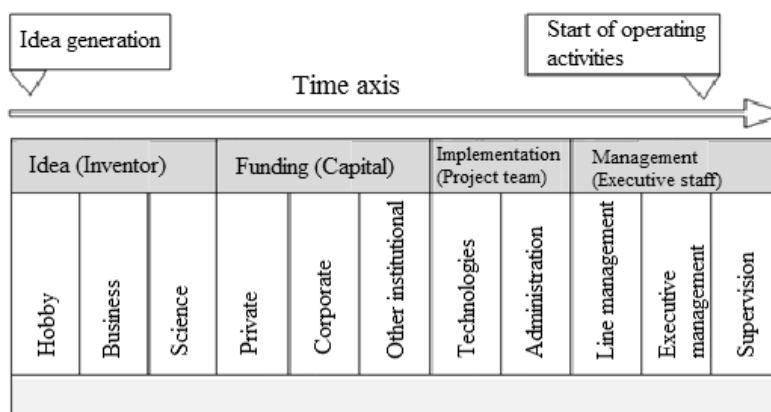


Fig. 2. Stages in the life of a project

The figure above presents a project schedule, from the generation of an idea, through the stages of resource accumulation, to the project launch and the commencement of operating activities. Obviously enough, as projects will be diverse in character, specific stages may also vary from project to project. In some, unique elements may be present, attributable e.g. to the need for legal protection under a patent (patent application), while in others the sequence may be different – for example, financing may be already available prior to the outset of the project.

Notwithstanding the inevitable diversity, the common element that can be found at each stage is the risk relating to the human factor.

2. Selected risks related to the human factor

Next, a categorization of dangers will be attempted in the context of discussion (cf. e.g. [Namy11]).

2.1. Surveillance

Information may be intercepted intentionally, which is considered part of business intelligence, or accidentally, when information is acquired in the course of other activities (e.g. government war-on-terrorism initiatives – cf. the Echelon system) and then unlawfully conveyed to an unauthorized individual.

This risk should be seen as not dependent on project team members themselves. Nevertheless, employees should be aware of such hazards, which can help prevent an accidental release of confidential information.

2.2. Illegal access

As the issue of hacking has received plenty of media coverage, there must be very few people around who have not heard of it. Cases of unauthorized access to computers and networks, or malware, are real and have to be taken seriously. However, these risks should always be placed in an appropriate context, since most information system security violations are only possible due to somebody's error, negligence, or unawareness [Mitn03].

This risk should be seen as not depending directly on specific employees (i.e. it does not result from intentional acts). Nonetheless, the staff should be aware of the hazard and try to avoid behaviors that could facilitate information theft.

2.3. Natural hazards

Earthquakes, floods, avalanches, volcanic activity – there are lots of natural hazards. Those that have materialized have been felt by thousands of business companies throughout the world, directly or indirectly – for example, through supply chain disruptions or through discontinuity of logistics services. The biggest of natural disasters have caused business losses estimated at millions or billions of US dollars*.

This risk should be seen as not depending immediately on humans. Despite its low incidence, natural hazards must not be ignored or underrated.

2.4. Politics and its outcomes

Most political decisions will sooner or later affect the economy and, hence, business enterprises**. The complex character of economic processes, which are to a great extent contingent on largely unpredictable decisional factors, further aggravates the problem. Politics and political outcomes will bear on everyday operations of individual businesses as well as global economic slumps [Stig11; SzSz07].

This risk should be classified among those that do not immediately depend on staff involved in the project. Unfortunately, there are not so many preventive measures one can apply to mitigate the risk. It needs to be emphasized, however, that an organization's responsiveness to changes is vital.

2.5. Impact from the business environment

The declining condition of associated markets, disturbing reports on economies around the world, warnings of an economic slowdown, unfair practices pursued by financial institutions, unconstrained speculative activities, confusion ensuing the standardization of investment instruments, are just several of the potential causes of instabilities in the business environment [SzSz07].

This risk should be classified among these types that do not immediately depend on project team members. And again, to control the risk, an organization needs to be able to instantly interpret incoming information and respond to changes in the environment.

* After *Puls Biznesu* [online]: "Sektor lotniczy stracił 1,7 mld USD".

** See e.g. *Puls Biznesu* portal [online at <http://www.pb.pl>]: "Inwestorzy na rynku złotego czekają na doniesienia ws. Grecji" (20 February 2012); "Wysokie oczekiwania inwestorów przed poniedziałkowym europokerem" (17 February 2012); "Japonia ma rekordowy deficyt handlowy" (20 February 2012); *onet.biznes* portal [online at <http://gielda.onet.pl>]: "Iran wstrzymał sprzedaż ropy naftowej firmom brytyjskim i francuskim" (19 February 2012), etc.

2.6. Staff disloyalty

This is a very broad issue, whose in-depth understanding and appraisal involves interdisciplinary knowledge and experience in economics and management science alongside pure social sciences. Yet, whatever the motivation is that drives a disloyal employee and whatever specific actions he or she has perpetrated, organizations frequently suffer severe losses*.

This risk should be classified among those that depend on, and can be influenced by, employees themselves. Besides constant monitoring, the most important method of risk diversification is to undertake activities such as those described at length in the following chapter.

3. Diversification of risk

3.1. Control or awareness

The signature phrase “trust but verify” suggests that supervision is a crucial principle to be applied even with very loyal and dedicated staff. At the same time, risk should be diversified through any activities that will help absolutely everyone in the team become aware of the hazards as well as of the ways in which adverse incidents can be prevented.

Incidents of random nature are extremely difficult to prevent and even more difficult to anticipate. Therefore, managers should concentrate efforts on the availability of tools designed to mitigate risks and minimize adverse effects in case an incident occurs, e.g. through adequate insurance cover. However, on an everyday basis, most managers deal primarily with other classes of risk. Many of those are directly or indirectly linked to the so called human risk factor, i.e. risk originating in human actions. Since modern economy is knowledge-based, it is to a large degree tied to the human mind [Morb07]. Furthermore, considering how much information is exchanged these days and how it is done, this information – being, after all, the key medium to convey knowledge – becomes increasingly vulnerable to a multitude of dangers [WiTo07]. This kind of risk is particularly significant where innovative products are being developed and where a product’s commercial success hinges on its uniqueness or on its ability to pioneer the market. It is reflected by hundreds of examples in such industries as consumer electronics, information technology and the Internet.

* The Personal Data Protection Law of 29 August 1997 – Journal of Laws 1997, no. 133, item 883 as later amended; the Act of 18 July 2002 on the Provision of Services by Electronic Media – Journal of Laws 2002, no. 133, item 1204 as later amended.

It should be also observed that entrepreneurs will not always realize that an information leakage has occurred, since electronic storage makes information easy to copy surreptitiously. Data theft often means that a copy has been made while the original information is retained by its legitimate owner. Hence the chances that effective control is maintained are poor.

Given these intricacies, the most effective method of risk mitigation seems to be prevention, conceived as a sequence of systematic, continued efforts to increase the awareness of all personnel. A lot of people are aware of the fundamental hazards and perceive basic security standards as commonplace. However, the truth is often very different. One of the best examples is the way that access passwords are handled in many workplaces. Everybody knows that they must not be too simple, that should be often altered, and that they should never be written down where they would be easily accessible to others – and yet we indulge in bad habits and surrender to our natural propensity for ease of life [MiSi03].

3.2. A sense of shared responsibility

Collective responsibility, when embraced properly by an organization and combined with a sense of unique relevance of each individual role, can help produce the effect of mutual loyalty. As a result, everyone will have an understanding of their common interest and therefore will pay more attention to their own as well as others' actions.

However big or small the project, and however big or small its budget, several simple principles could be adhered to because they are inexpensive and easy to implement:

Reliable and true information on all hazards that are germane to the organization should be available at all times to those in charge. As a result, the company executives will have a true picture of relevant risks at each stage in the life of a project.

Managers should then convey this knowledge to all of their staff through e.g. coaching and in-house training. This will significantly improve the awareness of relevant hazards among project team members.

Everyone in the workplace has to realize that they should protect the project very much the same way they would fend off personal risk. This is because humans tend to give best protection to what they feel responsible for.

It is not enough to convey information once – it could be ineffective, since it will soon be naturally suppressed. Instead, information on relevant hazards has to be delivered repeatedly and at regular intervals [Namy11].

Regretfully, many innovation design processes never obtain adequate funding. In the circumstances, it seems a luxury to bother about such trifles as fostering a sense of shared responsibility. Organizing additional meetings, creating new information channels, continuing education of personnel on existing dangers, or the deployment of relevant training systems to everyone involved – such needs are often neglected on account of budget cuts.

Fortunately, new powerful technologies come in handy, increasingly often referred to as “video communication”, but also known under the term “videoconferencing”^{*}.

3.3. Video communication – a support tool for the life of a project

The market currently offers a variety of tools that specific project units can run in different combinations and exploit to reduce costs by up to several dozen percent (e.g. e-VideoLearning®, e-VideoKonsultant®, e-VideoTransmisja®, e-VideoChat™).

Team members can access this functionality through dedicated IT tools, the so called video communicators, that are available in desktop as well as Web-based versions. The latter can be launched via a standard internet browser, which means that no specialized skills or advanced infrastructure are required.



Fig. 3. The use of videoconferencing (the VidCom video communicator): (a) a meeting; (b) a training session (e-VideoLearning); (c) a discussion (summarizing a project stage)

^{*} Rich information resources can be found e.g. at <http://www.vidcom.pl>.

The deployment of this type of tools leads to multiple benefits that this paper cannot even begin to enumerate. The basic advantages of this technology include the following (see Fig. 3):

- It provides for smooth, fast and efficient communication and exchange of information and documents between and across organizational units – divisions and departments – including room-to-room interaction and interchange among staff.
- It is exceptionally useful in holding meetings, organizing conferences and training sessions, since it not only offers fully interactive audio/video/chat facilities but also includes integrated training tools bundled with support for online collaboration.
- It permits the creation of special consultation zones within a Web site.
- It allows up to 80% savings on organizational costs compared to traditional training events and conferences and, at the same time, an enormous reduction of time spent on travel and organizational activities.
- It offers a novel and interesting form of training, lecture or seminar delivery for comprehensive coverage of an issue or area and at the same time contributes to increasing staff's computer skills and IT awareness.
- It makes it possible to deliver Web-based training courses that can be attended by any number of participants who are not required to operate any highly specialist equipment.

It should be pointed out immediately that professional systems are way ahead of commonly used communicators featuring video connection options. In the Polish market, such systems have been available for several years now, with one of the suppliers being a global industry leader, delivering cutting-edge solutions that have won a number of prestigious awards for innovative products.

The listing of differences between professional and mass products is far too long to be produced here, therefore it will be confined to just a few selected categories:

a) security:

- all the components of a communication session are protected with strong encryption;
- a two-step connection process (joining a video conference) involving a login and a password, and the subsequent creation of a conference session by defining a name and an optional password;
- an option to define a group of contacts (while the account cannot be accessed via the standard system exploration tool);

- an option to apply advanced settings when creating a connection and, for example, pre-determine the status of meeting participants (e.g. whether a user is supposed/allowed to transmit audio/video content, hold private conversations – chatting in text format, or whether participants are supposed/allowed to see and hear one another, etc.);
 - an option to set up a server computer to handle connections within a secure corporate network.
- b) functionality – several hundred options, controls, advanced setting, etc., e.g.:
- a multi-level account hierarchy,
 - automatic login,
 - automatic conference startup on program launch,
 - an option to enhance the interface with logos and custom colors,
 - an option to enforce the host's customized logo and colors on all conference participants,
 - imposing a restriction on the number of participants (on startup),
 - setting a call time limit (a startup option),
 - an economical mode (reducing the demand for Internet bandwidth),
 - the Mono mode (where the host can see and hear all participants while they cannot see and hear one another),
 - defining sound alerts (new message, tools, first user joining a session, conference invitation, etc.),
 - control of voice/picture and speak/show rights,
 - full audio/video access and toolbox access (Host, Presenter),
 - restricted audio/video and toolbox access (Speaker, Observer, Listener),
 - notification of automated software updates,
 - a feature to instantly and freely rearrange windows (including an option to create and save custom screen compositions/settings),
 - a manageable/customizable toolbox,
 - an ability to change the audio and video source during the conference,
 - conference files (clipboard, distribution),
 - a whiteboard feature (including an option to draw using a drawing toolbox, and an option to load and display PowerPoint and PDF presentation or graphics files);
 - an advanced test wizard (including single and multiple choice questions; open questions; scaled questions; question assessment; reporting; result delivery; statistics, etc.);
 - instant file transfer,
 - conference recording (where the save location is chosen by the user),

- desktop sharing,
- questionnaire creation and execution,
- a built-in Web browser,
- an e-mail outgoing call wizard,
- online (public, moderated, private) chatting with a login option and an archive facility,
- multiple language versions.

c) technology:

- both a desktop and a Web-based version of the communicator is available;
- a number of dedicated releases;
- a communicator built into a Web site (requiring no software installations on the part of delegates);
- an option to connect to any outside technology (WWW, ERP software, etc.),
- a possibility to adapt server versions to a customer's specific requirements;
- an option to employ cloud computing*.

The evolution of information technology has reached a point where it is possible to develop professional-class, economical and easy to operate tools which enable you, on the one hand, to hold video conferences for hundreds of participants simultaneously and, on the other, to perform routine activities no matter where you are. These benefits are no longer perceived as a blessing – it has become imperative for any responsible manager to make the most of the latest technology solutions. It is not often feasible, however, to produce clear and obvious synergy effects in terms of substantial time and cost saving or risk diversification within an innovation design process.

3.4. A case study

This chapter presents a sample application of video communication and online collaboration tools as well as the benefits it has brought in terms of risk diversification and financial savings. Some run-of-the-mill activities are described which took place just over the next few days following the introduction of the innovative technology. The company is classified as a SME and operates in the high tech sector. In respect of size, then, it can be seen as the statistical epitome of an average Polish business; its selection is also consistent with the focus on the development of innovative technologies adopted in this paper.

* Cf. information resources available at <http://www.vidcom.pl>.

Over just three days, the following activities were scheduled:

- Negotiations with a potential foreign partner based in London, concerning a large contract that could be decisive for the company's future prospects.
- Preliminary talks with a large potential customer headquartered several hundred miles away from the company's offices.
- A monthly training event on information security addressed to heads of the company's key departments – a task nearly as important to the company's future prosperity as its financial performance.

Each of these activities involved the same person, acting as a negotiator in the first two and in the capacity of information security officer in the third. Of course, this person could not be simultaneously present at three different locations. Normally, therefore, only one of the tasks would have to be chosen while the other two would be postponed. In this case, however, owing to the incorporation of videoconferencing technology in the company's daily operations, there was no need to make choices or to harmonize a number of diaries. The negotiators met the customer personally. The talks spanned two days altogether (two meetings several hours each), but left enough time in-between to conduct negotiations with the foreign partner via videoconferencing and to attend the scheduled training event via e-VideoLearning® – a tool that is perfectly fit for such applications.

The company experienced the following benefits:

- cost minimization (fuel, plane tickets, accommodation, etc.),
- time savings (several days, several people),
- responsibilities relating to the company's internal policies, described in sub-chapters 3.1 and 3.2, were not neglected,
- the objectives were attained – new business partners were acquired that could make a difference for the company's future prospects.

In addition, it should be stressed that professional-class, very secure tools were utilized, which marks a high level of risk awareness and concern for risk diversification. Character and area of the company activity (innovation design in IT technology) and also valid legal regulation on a range of security did not allow neglecting training duties of an organization member. At the same time the company could not resign from strategic business conversations in which an advisable person had to participate. Absence of this person could negatively influence on an final success of innovative design process for customers. Thus, in this situation the company dealt with the increased risk. Fortunately the company had a tool and by means of this tool could avoid the threat arising. It happened like that thanks to earlier predictions and decisions. In area which was essence

for the company, well in the innovative design process for customers, thanks to earlier decisions the risk was diversified. Preventive operations brought intended results and the company avoided threat.

Conclusion

The following conclusions can be drawn from our analysis based on prior research and on an investigation of behaviors observed in business practice.

In the case of innovative projects, where information and knowledge represent at once critical resources and the greatest value at risk, most types of risk seem to be intrinsically linked to the so called human factor.

Computer support can be targeted at human creativity by strengthening visualization and communication, which, however, at the same time increases exposure to dangers.

The progressive capability of new technologies to support creativity should be coupled with an awareness of what “human risk” is and how widespread it can be. Fascination with modern technologies must not make one blind to a great variety of hazards, such as e.g. industrial espionage, that emerge or evolve parallel to the ongoing advances in technology. Popular personal solutions offered in the consumer market may not be able to satisfy business needs, in which case attention has to be directed at specialized, professional-class products.

It is advisable to disseminate knowledge on risk management support tools among all staff involved in technology development projects. It is also highly recommendable to make managers at all levels fully aware that basic information protection is neither difficult nor costly (e.g. a good practices guide). All that it takes in real settings is the common awareness of relevant hazards, the introduction of a system to enforce compliance with simple procedures, and elementary supervision. Compared with the costs that any breach of rules is likely to incur in case a loss of information results, the cost to implement such measures is negligible. And could be further reduced if video communication and online collaboration tools are employed.

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DYWERSYFIKACJA RYZYKA PROCESU PROJEKTOWANIA INNOWACJI ZA POMOCĄ NARZĘDZI WIDEOKOMUNIKACJI

Streszczenie

Niniejszy artykuł prezentuje wybrane rodzaje ryzyka występującego w procesach projektowania innowacji technologicznych, a także definiuje element wspólny dla poszczególnych faz rozwoju projektu. W artykule wskazano rolę ryzyka związanego z tzw. czynnikiem ludzkim, jako szczególnie istotnego w przypadku tworzenia oraz prowadzenia projektów innowacyjnych technologii. Analiza ta została dokonana na podstawie danych ściśle związanych z rzeczywistością gospodarczą, w szczególności dotyczących innowacyjnych podmiotów informatycznych.

W ostatniej części artykułu zaproponowano kilka prostych, niekosztownych i łatwych we wdrożeniu podstawowych zasad dywersyfikacji ryzyka technologicznego, począwszy od etapu projektowania innowacji, z wykorzystaniem profesjonalnych narzędzi komunikacji i wspólnej pracy na odległość.

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THE CONCEPT OF SEMANTIC BUSINESS INTELLIGENCE. REVIEW OF SELECTED PRACTICAL SOLUTIONS

Introduction

Contemporary organizations gather large amounts of information in its databases and data warehouses and very often excess of information in the IT systems causes that business analyses are hindered. In order to make appropriate managerial decisions based on such data they have to be transformed and analysed by such systems as Business Intelligence. Data transformed into managerial information may contribute to the gain of competitive advantage on the local and global market by enterprises of different branches. Semantic Business Intelligence can provide indispensable solution for this purpose. Is worth mentioning its feature as encoding meaning of data individually from data and content and also from application code. The application of SBI may contribute to improvement of decisions' efficacy and improvement of the whole decision making process in a particular enterprise. The application of semantic Business Intelligence in enterprises of different branches is broad and can also create new business opportunities.

The aim of the article is to present the concept of Semantic Business Intelligence including two different practical solutions. It raises mainly two issues, the first one is connected with the application of tags and ontologies in BI and the second presents briefly the BI semantic model and its components.

1. The notion of Semantic Business Intelligence

In a traditional view Business Intelligence is perceived as “(...) an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize deci-

sions and performance” [Gart12]. B. Aker claims that semantic intelligence “(...) incorporates morphological, logical, grammatical, and natural language analysis that translates into higher precision and recall when searching for information and helps organizations strategize, analyze, and make predictions” [Aker09]. Combining semantic intelligence with business intelligence allows for application of structured and unstructured data as a base for decision making and improvement of information processes in the enterprise as well.

C.V. Damme claims that: “Business Intelligence tools in most cases focus on analysis of structured information” and proposes the usage of tags and tagging data to generate business intelligence. She states that “(...) analysis of large amounts of unstructured information for business intelligence purposes can be reduced to analysing tags and tag data” [Damm08]. Such effect can be achieved according to the mentioned author by applying existing data mining and statistical techniques.

The proposal of Semantic Business Intelligence was also presented by Sell, Silva, Beppler, Napoli, Ghisi, Pacheco and Todesco where they applied “(...) ontologies on the description of business rules and concepts in order to support semantic-analytical functionalities that extend traditional OLAP operations” [Sell08]. Theirs practical example of Extracta solution is presented in the last chapter of this paper. Ontology is a basic description of things in the world. In computer and information science “(...) an ontology refers to an engineering artefact, constituted by a specific vocabulary used to describe a certain reality, plus a set of explicit assumptions regarding the intended meaning of the vocabulary words. Ontology is used to model and reason about information systems at the conceptual level as opposed to a specific information system at implementation time” [Fons07]. Spahn, Kleb, Grimm, Scheidl state that “(...) an ontology is a formal explicit specification of a shared conceptualisation of a domain of interest. Further they state that the formal knowledge representation in an ontology provides a well defined way of interpretation. The knowledge is explicitly stated and thus processable for machines” [Spah08].

The other usage of ontologies can be its application in semantic business process mining. The use of ontologies here brings two opportunities for process mining techniques. “The first opportunity is to make use of the ontological annotations in logs or models to develop more robust process mining techniques that analyze the logs or models at the concept level. In this case, it is assumed that event logs and models link to ontologies. The second opportunity is to use process mining techniques to discover or enhance ontologies based on the data in event logs” [MPAD10]. Ontologies may be applied for monitoring business processes as well.

There exist many benefits resulting from implementation of Semantic Business Intelligence. T. Lachev in prologika forum presents a few pros and cons of Business Intelligence semantic model. He enlists i.e. such advantages of this solution as: “(...) it will attempt to simplify OLAP and make BI even more accessible”. BISM has a huge potential and will bring enhancements, such as:

- schema simplification – no need to define explicit cubes, dimensions, measures, and thus eliminate the perceived complexity of implementing an OLAP solution,
- blazing performance – avoidance of partitions and aggregations,
- flexibility – no distinction between measures and dimensions, so every attribute can be used for aggregating and slicing,
- detail-level reporting,
- DAX expression-based language that removes some of the complexity of MDX,
- possibility of real-time data access [Lach11].

It is crucial to express the fact that thanks to the application of traditional Business Intelligence systems and semantic ones the managers are able to make decisions in a shorter time [Compare: TALS07].

2. The model and architecture of Semantic Business Intelligence

Microsoft corporation in tech blog article entitled “Analysis services – roadmap for SQL server »Denali« and beyond” presented the Business Intelligence semantic model which can be perceived as a three-layer model and was illustrated in Fig. 1.

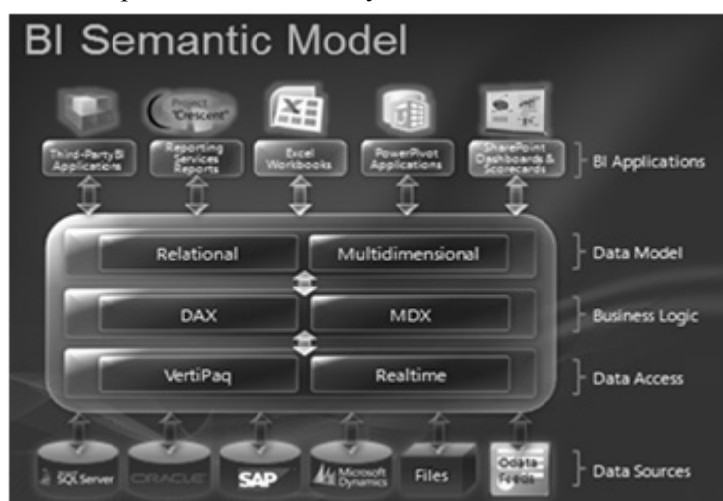


Fig. 1. Business Intelligence semantic model

Source: [Anan12].

The authors of this concept presented such mentioned layers as the Data Model, the Business Logic and Data Access. They state that “(...) the Data Model layer is exposed to client applications. The BISM model is fundamentally relational and uses both relational as well as multidimensional interfaces. OLAPware client applications such as Excel can consume the multidimensional interface and send MDX queries to the model. On the other hand, a free-form reporting application such as Crescent can use the relational interface and send DAX queries” [Anan12].

They further state that the Business Logic layer encapsulates the intelligence in the model. The business logic is created by the model author using DAX (Data Analysis Expressions) or MDX (Multidimensional Expressions). DAX is an expression language based on Excel formulas that was introduced in PowerPivot and built on relational concepts [Anan12]. The BI Semantic Model is one model for all end user experiences – reporting, analytics, scorecards, dashboards, and custom applications. All client tools in the Microsoft BI stack – Excel, PowerPivot, SharePoint Insights and Reporting Services (including Crescent) – operate on this model [Anan12]. Next they describe the Data Access layer which integrates data from various sources – relational databases, business applications, flat files etc. The data may be cached from all the sources and accessed in a real time. There were applied here so called VertiPaq solution using i.e. data compression algorithms [Anan12]. The essential characteristic of BISM is its ability to exploit external data sources and other’s vendors business intelligence tools which use different data formats and models.

D. Sell et al. present the framework to support SBI consisting of modules. As it is shown in the Fig. 2, the SBI ontologies “(...) include business semantics and describe the relationship among such semantics, BI terminology, operational semantics, and data sources [Sell08]. The authors of this architecture framework claim that “(...) SBI ontologies are used by the QueryManager to parse analytical tools and data requests, and to execute such requests on heterogeneous data sources, enabling the combination of unstructured and structured data on the very same analysis. The OntologyManager is the module that provides access to SBI ontologies. Such module relies on a Reasoner to support on-the-fly and batch based inferences over business semantics” [Sell08].

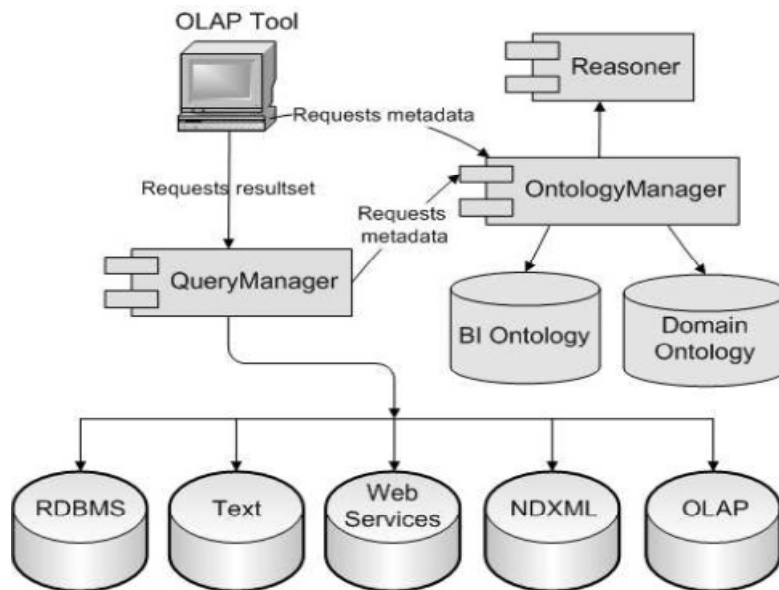


Fig. 2. Illustration of SBI components

Source: [Sell08].

SBI ontologies are used by functional modules to support analytical tools on the localization and exploration of data sources. In this proposed concept according to the authors: “(...) information is presented to the users using their own vocabulary and in logical views that make it easier to locate information and understand their meaning; the definition of business concepts is used to present structured and non-structured data sources available in the organization or remotely; structured and non-structured data can be combined in the same analysis; knowledge and business rules definitions can be altered any time, providing more flexibility to align analytical tools to the latest business rules; new possibilities of slice and drill were made possible by combining business semantics and two different reasoning strategies” [Sell08].

3. Practical solutions of Semantic Business Intelligence

Considering practical solutions of Semantic Business Intelligence it is worth mentioning the research project called MUSING which is „(...) developing a new generation of BI tools and modules based on semantic-based knowledge and natural language processing (NLP) technology to mitigate the efforts involved in gathering, merging, and analysing information. A collaborative an-

Another example of Semantic Business Intelligence solution is previously mentioned tool called Extracta. It is a web tool with analytical features showing how the SBI modules and ontologies are used by an analytical tool. Extracta's main objective is to guide the decision maker on finding and combining data in order to produce indicators and extract knowledge from repositories maintained in an organization or in the Web. Its domain ontology was defined to present information contained in a data mart which keeps academic information of Brazilian educational institutions [Sell08]. There was also used textual driver allowing access to an index composed by curricular information stored in XML documents. Extracta was developed in a fashion in which users are gradually introduced to their data sources. The tool applies the semantic abstraction of data sources to introduce users in a step-by-step approach implemented by a wizard where the user can select an analysis previously defined or creates a new one. Then the Ontology Manager is requested to present all analysis units defined in the ontology and the user can explore the analysis themes according to their information needs. Extracta solution can be used to perform e.g. an analysis that presents the number of candidates, vacancies, and admissions in the Brazilian universities by state and filtered by the knowledge area in which the students were enrolled or in which vacancies and admissions were registered [Sell08]. It may be added that some functions and analyses characteristic for Extracta are shared e.g. by popular spreadsheets like Excel and for some but not for all analyses it could also be applied. As far as comparison of BISM with Extracta and MUSING is concerned it is worth mentioning the fact that BISM is a commercial product MUSING and Extracta are research projects.

Conclusion

Semantic Business Intelligence may help many enterprises from different industries to improve key areas of its business activity. It can improve functionality of business processes or facilitate execution of different ventures in the enterprise. It also helps to process different types of information. Semantic BI thanks to the application of structured and unstructured data helps managers to undertake more complex decisions at all levels of management. Managerial decisions may be undertaken much quicker and in a more efficient manner. Shortening the time needed for performing appropriate analyses may contribute to the reduction of overall business activity costs. Thanks to the application of presented solutions the analyses become more detailed and many new possibilities appear.

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KONCEPCJA SEMANTYCZNEGO BUSINESS INTELLIGENCE. PRZEGLĄD WYBRANYCH ROZWIĄZAŃ PRAKTYCZNYCH

Streszczenie

Celem artykułu jest przedstawienie koncepcji semantycznego Business Intelligence wraz z prezentacją wybranych rozwiązań praktycznych. Przedmiotem rozważań zostały objęte zastosowania znaczników i ontologii w BI oraz semantyczny model Business Intelligence wraz z jego komponentami. Przedstawiono komercyjne rozwiązanie BISM oraz takie projekty, jak MUSING i Extracta.

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FROM SOCIAL MEDIA TO SOCIAL CRM (SCRM)

Introduction

*It takes many good deeds to build a good reputation,
and only one bad one to lose it*

Benjamin Franklin

Customer satisfaction is an integral part of company growth and success. Social CRM systems offer companies a way to keep current customers satisfied, as well as a way of finding new customers. With the worldwide explosion of social media usage, companies are feeling extreme pressure to be where their customers are. Social networks create a new and completely different environment to connect people. Their experiences (both positive and negative) and expectations on the creation of new products or services are a new source of valuable information for the company's decision-making process regarding client relation management issues.

The environment is strengthened while the members of Y Generation* not only become part of the workforce, but also represent the new generation of clients, and their preferences regarding ways of communication and selection of information sources lead to wider embracement of those social means [Delo11].

Social CRM (SCRM), often called CRM 2.0, is a new business approach that extends the current capabilities of the traditional CRM. SCRM uses social media services, techniques and technology to enable companies to engage with their customers. The aim of this article is to present the strengths of Social CRM in comparison traditional CRM.

* Born after 1982.

1. Social Media

Social media and social networking have changed the way people connect and communicate. These technologies are being adopted by people of all ages, all over the world. Nowadays social media (Facebook, Twitter, Myspace, LinkedIn, YouTube, N-K) attract large number of users. They are visited every day by million users, therefore they are the most suitable place for building brand relationships and brand promotion. Polish Internet Library data shows that at least one of social media service is visited at least once a month by 18 million Poles i.e. 99% of all internet users [Gałk12].

Social media includes web-based and mobile technologies used to turn communication into interactive dialogue between organizations, communities and individuals. Social media has given liberty to customers to interact with each other using blogs, social networks, and customer reviews sites, regardless of whether companies are taking part in the conversation or not. Social networking allows customer to be an interactive part of business process. Through social media customers can share suggestions, ideas, ask questions, inquire about other products and communicate about countless other topics.

Size and range of activity are the main advantage of each social networking service. Users are very active, willingly share their information, show their preferences, create interests groups. Social services makes a source of huge, costless knowledge automatically built. Analysis of this knowledge can help companies develop and optimize their activities. Results of researches prove that the most influential factors for consumers when deciding which company to do business with are: personal experiences (98%), company's reputation or brand (92%), recommendations from friends and family (88%) [Gałk12].

The capability of social media can be effectively used by companies, which can get kindness and users involvement. Conversely, social media can cause society dissatisfaction, outflow of customers and finally damage a company's reputation.

2. Social Media + CRM = Social CRM

The integration of social media with CRM strategies allows companies to optimize the power of social interactions to get closer to customers. Social CRM doesn't substitute for traditional CRM, but it extends traditional CRM. Companies still need to use technology, run processes, develop operational strategies, apply business rules, assign rules and responsibilities for these rules and developing appropriate routing and workflow for their particular efforts. It hasn't and

will not change. Social CRM takes that traditional CRM set of functions and capabilities applicable to sales, marketing and customer support and extends it by integrating the social tools communication with the customers [Gree09].

The concept of SCRM can be defined as a process (or function), as a strategy, as a philosophy, as a (cap)ability, as a technology, as a practice or as a combination of all or some of above aspects [5Thi11].

Paul Greenberg, CRM guru, defines Social CRM is a “(...) philosophy and a business strategy, supported by a technology platform, business rules, workflow, processes and social characteristics, designed to engage the customer in a collaborative conversation in order to provide mutually beneficial value in a trusted and transparent business environment” [Gree10a]. SCRM is technological extension of traditional CRM, which enables businesses to interact with customers in real time using variety of social media platforms in a cost effective way. Using social media with such channels as blogs, internal Wiki, video sites, micro blogging, personal social networks, companies can effectively conduct their activities connected with sales, marketing, and customer services. They base on network data analysis and users behaviors (Table 1).

Table 1

How an organization can use social channels to support SCRM processes

Social channels	CRM and entity process		
	marketing	sales	service
Blog	<ul style="list-style-type: none"> • blog focused on building reputation written by a senior executive • focus on leadership 	<ul style="list-style-type: none"> • deals with members of a community, for acquisition of products and services 	<ul style="list-style-type: none"> • capture of comments in the executive blog regarding claims or requests by customers, and to act accordingly
Internal Wiki	<ul style="list-style-type: none"> • platform to share market knowledge that has been collected from conversations with customers 	<ul style="list-style-type: none"> • shared presentations on sales and common knowledge about new sales leads 	<ul style="list-style-type: none"> • creation of a knowledge base of customer service procedures
Video Sites/ YouTube	<ul style="list-style-type: none"> • viral advertising propagated only on-line encouraging word-of-mouth references 	<ul style="list-style-type: none"> • point of contact to create sales opportunity in another channel 	<ul style="list-style-type: none"> • publication of educational videos on how to use certain product, extending the user manual on-line
Micro Blogging/ Twitter	<ul style="list-style-type: none"> • messages to announce special offers and discounts • spreading of viral marketing campaigns, integration with channels like YouTube 	<ul style="list-style-type: none"> • launching of exclusive product offers for Twitter followers, as a way of looking for new sales opportunities • focus on the current follower base 	<ul style="list-style-type: none"> • response to support inquires and product complaints, monitored by an exclusive team • focus on all digital customers
Personal Social Networks/ (Facebook)	<ul style="list-style-type: none"> • spreading of advertising campaigns within the communities of clients 	<ul style="list-style-type: none"> • launch of new product and benefit campaigns for community members only • focus on the current follower base 	<ul style="list-style-type: none"> • resolution of enquires among community members • opinion gathering regarding products and services

Source: [Delo11].

SCRM tools provide the means to capture the data, the profiles and to create experience maps which in turn help to develop the real insights into customers that provide what is a really personalized and delineable experience for individual customers. Traditional CRM could gather all transactional data, but the emotional and behavioral knowledge of the customer that the profiles and the experience maps supply weren't part of CRM solution [Gree09].

In order to achieve business value social CRM should indicate how to plan and conduct social media activities. The idea of Social CRM presents the LARA framework [Ogne10]:

- (L) – listen to consumer conversations,
- (A) – analyze those conversations,
- (R) – relate his information to existing within your enterprise,
- (A) – act on those customer conversations.

3. Traditional CRM approach versus Social CRM approach

CRM is comprised of sales, marketing and service & support functions. Social CRM doesn't replace what CRM is or does, but it does evolve how it is done (Fig. 1).

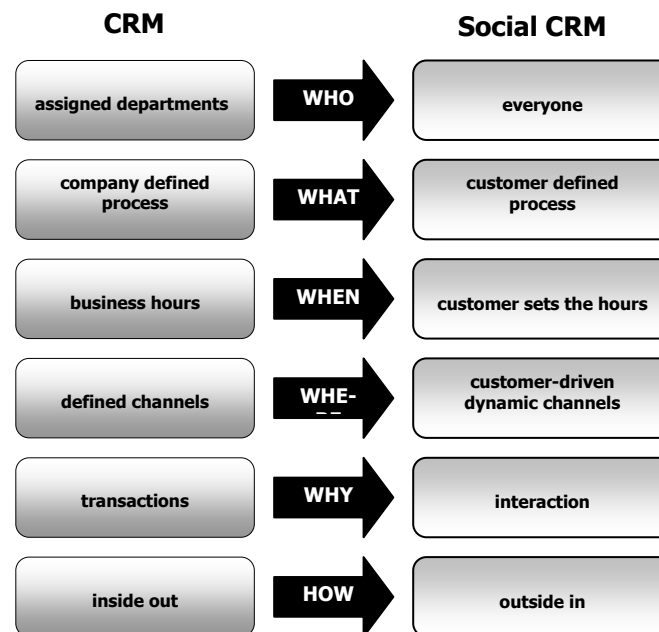


Fig. 1. Evolution of CRM to Social CRM

Source: based on: [Morg10].

The focus of social CRM differs from traditional CRM in few fundamental ways. Traditional CRM is a linear approach to managing a customer through a process that essentially keeps them buying more stuff from company. A collaborative relationship here does not exist (as evidenced by the uni-directional arrows in Fig. 2). Instead, companies manage customers based on data and information that they collect over time in an attempt to get to “know” their customer. CRM is an inside-out approach meaning that a team within a company gets together to decide what to make, how to make, how to market it, and then pushes everything out to the customer.

CRM has traditionally consisted of one-way communication between a brand and the customer. Client messages are mainly limited to complaints, product requests and answers on defined marketing campaigns. SCRM assumes continuous exchange of experiences, not only between company and client, but also between individual clients. Such a conception assumes that client acts as a central point. Instead one-way communication companies should conduct dialog with client and collaborate with him in order to solve business problems. Thus, CRM users can individually create their experiences and build relationships with other clients.

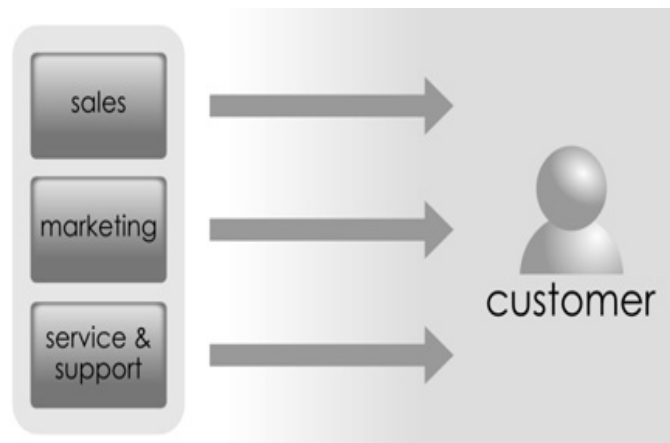


Fig. 2. Traditional CRM

Source: [Morg10].

Figure 3 presents many of the same elements as in CRM, but there are a few differences. Public Relations (PR) is a part of SCRM. The reason for this is that sales and support issues are now PR issues if they made public (such as a blog post or with a tweet). PR have a very active role in SCRM. PR departments manage the social presence of brand and handle the customer engagement.



Fig. 3. Social CRM

Source: Ibid.

An advocacy and experience are crucial components of SCRM, which revolve around the customer. In traditional CRM the customer is not really a part of CRM – there's no collaboration, no relationship. In SCRM the customer is the focal point of how the company operates. Instead of marketing or pushing messages to customers, brands now talk and collaborate with customers to solve business problems, empower customers to shape their own experiences and build customer relationship, which will hopefully turn into customer advocates [Morg10].

Traditionally CRM plans are developed in an "inside-out" direction whereas Social CRM is considered best "outside-in" direction. Thus, information democracy is more and more prevalent.

The major difference between Social CRM and traditional CRM is the social aspect. CRM relationships are more structured and revolve around traditional channels such as e-mail or call center. SCRM relationships are more casual and highlight at social human interaction in customer support.

CRM strategy, enabled by processes and technology, is designed to manage customer relationship as a means for extracting the greatest value from customers over the lifetime of the relationship. This strategy typically concentrate on

the operational responses required to manage the customer. With social media, though, companies are no longer in control of the relationship. Instead customers (and their highly influential virtual networks) are now driving the conversations, which can trump a company's marketing, sales and services efforts with unprecedented immediacy and reach [BaPa11].

Traditional CRM strategy focuses on management solutions for channels such as corporate Web sites, call centers, and brick and mortar locations. With SCRM, these strategies now take into account the dynamics of the community-based environment that define social media – an environment in which control of relationship has shifted to consumer, who has the power to influence others in his social network [BaPa11].

The traditional CRM paradigm is based on the knowledge the firms have of their customers from specific facts used to generate a unidirectional communication of structured messages for passive audience. The key components there are institutions, processes, technologies and the analysis of information [Delo11].

Social CRM paradigm adds to the traditional approach the building of the relationship and the knowledge of the customer by analyzing the bidirectional interactions (downwards and upwards) and horizontal, collaborative, community-oriented ones, where the essential components are experiences and emotions of users and communities.

Traditional CRM strategies are designed to manage relationship via traditional channels, usually from company's perspective. A main goal of traditional CRM is derive optimum value from customer during the lifetime of the relationship. Social CRM strategy is emerging as a approach to managing the dialogue, not the customer. Paul Greenberg notices: "(...) the underlying principle for Social CRM's success is very different from the predecessor (...) traditional CRM is based on an internal operational approach to manage customer relationships effectively. But Social CRM is based on the ability of company to meet personal agendas of customers while, at the same time, meeting the objectives of own business plan. It is aimed at customer engagement rather than customer management" [Gree10].

Table 2 summarized the most essential changes between traditional CRM approach and Social CRM approach.

Table 2

Fundamental changes between the traditional CRM approach and SCRM approach

	Traditional CRM	SCRM
Context	<ul style="list-style-type: none"> • focuses on individuals relationships • messages are the value generators 	<ul style="list-style-type: none"> • focuses on collaborative relations • conversations are the value generators
Channels	<ul style="list-style-type: none"> • single customer view, based on the history of operations, stored in the internal information systems 	<ul style="list-style-type: none"> • the single view is harder to achieve, since it includes the need to complement the information residing in the internal systems with profile information and behavior in social networks
Processes	<ul style="list-style-type: none"> • customer service processes developed from the organization's standpoint • processes-focused: to adopt and optimize process to support interactions and transactions with the customers 	<ul style="list-style-type: none"> • customer service processes developed from the customer's standpoint • conversations-focused: to include the "conversation" factor in order to establish an organization community, capture the new ideas and improve segmentation • it requires the generation of dynamic processes that provide the organization with capability of reaction towards what has been identified in social networks
Organization	<ul style="list-style-type: none"> • innovation comes from specialized source within the entity (innovation team) • frontline employees communicate the targeted messages for transactional operations 	<ul style="list-style-type: none"> • innovation is gathered from all the employees that are closely connected with end customer and among them via Web 2.0 tools • new skills and roles are required oriented at behavioral and sentiment analysis • these roles require the analysis of information and feedback to the sectors involved or immersed in the conversations in social networks • customers are in the centre of the innovation cycle
Technology	<ul style="list-style-type: none"> • CRM solutions focused on automating and supporting internal business processes 	<ul style="list-style-type: none"> • capture of network information in order to know the customer in his social milieu • need to include social network tools, both created and managed by third parties, which interact with CRM solutions and meet with existing security standards in regulations in each country • use the fast and specific monitoring tools that can support internal business processes
Communication Image and Brand Reputation	<ul style="list-style-type: none"> • massive face-to-face client communications depending on business needs • segmented direct communications from the analysis of structured information • image and reputation analysis from traditional market research 	<ul style="list-style-type: none"> • communication designed and supervised on the basis of the analysis of structured information involving the "social" traits of the client • image and reputation analysis from metrics accounting the number of followers, type of comment or impressions and influence on the networks • need to establish communication in times of crisis or unexpected circumstances requiring timely and wise reactions

Source: [Delo11].

Conclusion

Social media create new dimension in client relationship. They holds unprecedented potential for companies to get closer to customers and, by doing so, facilitate increased revenues, cost reduction and efficiencies [BaPa11]. Business are rapidly embracing social media not only to build virtual communities, but also to create innovative social commerce programs and improve customer care.

Social CRM is not a replacement for traditional CRM. SCRM adds a new dimension and focus that works best on top of a solid foundation. This includes an easily accessible centralized customer database, keeping track of events and coordinating activities, and managing important sales and marketing processes [Lear08]. To successfully exploit the potential of social media, companies need to design experiences that deliver tangible value in return for customers' time, attention, endorsement, and data.

Social CRM differs from traditional one, because of its specificity. Realizing one-time campaigns by SCRM is a basic mistake. Social media should be treated as part of integrated and consistent company communications.

Implementation of SCRM strategy is not possible without new technology. This technology is not created only for social portals, but also for multi-dimensional data analysis systems and systems based on large data sets in operational activity.

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OD MEDIÓW SPOŁECZNOŚCIOWYCH DO SOCIAL CRM (SCRM)

Streszczenie

Obecnie media społecznościowe pełnią istotną rolę w kontaktach międzyludzkich. Stają się także ważnym kanałem dotarcia do potencjalnych klientów. Social CRM (SCRM) to narzędzie integrujące systemy CRM mediami społecznościowymi. W praktyce oznacza to możliwość prowadzenia przez firmy działań związanych z marketingiem, sprzedażą i obsługą klienta w sieciach społecznościowych, opierając się na analizie informacji publikowanych w sieciach oraz zachowań ich członków. W artykule przedstawiono specyfikę Social CRM i wskazano istotne różnice pomiędzy tradycyjnym CRM i SCRM.

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ENTERPRISE ARCHITECT'S CREATIVITY

Introduction

The term “enterprise” can be interpreted as an overall concept to identify a company, business organization or governmental institution. According to Robins, an enterprise is considered as a “(...) consciously coordinated social entity, with a relatively identifiable boundary, that functions on a relatively continuous basis to achieve a common goal” [Hoog09]. In enterprise engineering, system theory and system approach have dominated for the last fifty years, however, now the enterprise engineering is underpinned by two fundamental concepts:

- enterprise ontology, whereby the complexity of an enterprise is captured and understood by focusing on the implementation-independent essence of an enterprise [Fens04] [BoLe07];
- enterprise architecture, which reduces the complexity of enterprise by addressing strategic objectives and areas of concern.

The enterprise architecture (EA) is defined as a coherent and consistent set of principles and rules that guide system design [Lank05]. For an enterprise, architectural framework as a conceptual structure related to a certain system type consists of areas of concern and a necessary and sufficient set of design domains. Enterprise architecture is also defined as a strategic information asset base, which defines the business mission, the information and technology necessary to perform the mission, the transitional processes for implementing new technologies in response to the changing mission needs [Upda03]. Therefore, there is a simple question, who is competent and responsible for the EA planning and development and what activities must be realized to achieve the EA goals. The paper aims to present the active role of enterprise architects. Analyses of the EA frameworks and development methods allow to reveal creativity and involvement of the enterprise architects. Their involvement is described basing on the actor network theory (ANT).

1. Enterprise Architecture Modelling Frameworks

The IEEE 1471-2000, more recently known as ISO/IEC 42010:2007 shows that an architecture is the fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution. The goal of EA is to create a unified information technology (IT) environment (standardized hardware and software systems) across the firm or all of the firm's business units with links to the business side of the organization, to promote alignment, standardization, reuse of existing IT assets, and the sharing of common methods for project management and software development across the organization. There are many risks of the lack of EA i.e.:

- locally optimal, rather than globally optimal solutions,
- expensive and non-shared solutions,
- closed vendor/proprietary environments,
- solutions aiding for the short term, but constraining in the long term,
- non-adherence to standards, complex solutions, plethora of one-off designs,
- suboptimal service from a cost, feature and portability perspective,
- failure to follow industry standards or regulatory compliance [Mino08].

The EA provides a holistic expression of the enterprise's strategies and their impact on business functions and processes, taking the firm's sourcing goals into explicit consideration. The EA helps the firm to establish technical guidelines of how the service delivery function needs to operate to deliver cost-effective, flexible, and reliable business services. The EA gives user faster delivery of new functionalities and modifications and easier access to higher quality, more consistent and more reliable information. Well architected systems can more quickly link with external business partners. The EA is to ensure the comprehensive understanding of the current state, the desired state, or the interrelationships of processes, people and technology affected by IT projects. The organization has got a bigger consistency of business processes and information across business units. The EA identifies opportunities for integration and reuse of IT resources and prevents the development of inconsistent processes and information. Especially important to users is the capability of integrating the information among applications and across data warehouses and data marts. By understanding an organization's data architecture, there is a possibility to develop a standard data dictionary and metadata standard to minimize data inconsistency. Eventually, the EA ensures the traceability between business processes, data, user roles, applications and IT infrastructure. Therefore, the EA aims to provide a holistic view of

an enterprise. Generally, the EA involves additional domains such as business architecture, process architecture, data architecture, software application architecture and infrastructure architecture. The EA is the bridge between the strategy and design, and it is a creative application of scientific principles to develop enterprise and to forecast its behaviour under specific operating conditions. Nowadays, the EA is considered as the discipline of designing enterprises guided with principles, frameworks, methodologies, requirements, tools, reference models and standards. There are many frameworks that support the EA modelling and development, e.g.: Zachman Framework (ZF), The Open Group Architecture Framework (TOGAF), Generic Enterprise Reference Architecture and Methodology (GERAM), Purdue Enterprise Reference Architecture (PERA), Computer Integrated Manufacturing Open System Architecture (CIMOSA), Lightweight Enterprise Architecture (LEA), Nolan Norton Framework (NNF), Extended Enterprise Architecture Framework (E2AF), Enterprise Architecture Planning (EAP), Federal Enterprise Architecture Framework (FEAF), Treasury Enterprise Architecture Framework (TEAF) [BNSc03], [Lank05], [Mino08], [Theu05]. Mostly, the mentioned above frameworks are product-oriented, and only some of them (i.e., ZF, FEAF, CIMOSA, and MODAF) emphasize the role of architects in the EA development processes.

The ZF provides a basic structure for organizing business architecture through dimensions such as data, function, network, people, time and motivation [Zach10]. Zachman describes the ontology for the creation of EA through negotiations among several actors. The ZF presents various views and aspects of the enterprise architecture in a highly structured and clear-cut form. It differentiates between the levels: Scope (contextual, planner view), Enterprise Model (conceptual, owner view), System Model (Logical, Designer view), Technology Model (physical, builder model), Detailed Representation (out-of-context, subcontractor), and Functioning Enterprise (user view). Each of these views is presented as a row in the matrix (see Table 1). The lower the row, the greater the degree of detail of the level represented. The model works with six aspects of the enterprise architecture: Data (what), Function (how), Network (where), People (who), Time (when), motivation (why). Each view (i.e., column) interrogates the architecture from a particular perspective. Taken together, all the views create a complete picture of the enterprise.

Table 1

The Zachman Enterprise Architecture Framework

	DATA What?	FUNCTION How?	NETWORK Where?	PEOPLE Who?	TIME When?	MOTIVATION Why?
SCOPE planner	Business Things	Business Processes	Locations	Business Units	Events/ Cycles	Business Strategies
ENTERPRISE owner	Semantic Model	Business Process Model	Business Logistics	Work Flow Model	Master Schedule	Business Plan
SYSTEM designer	Logical Data Model	Application Architecture	Distributed System	Human Interface	Processing Structure	Business Rules
TECHNOLOGY builder	Physical Data Model	System Design	Technology Architecture	Presentation Architecture	Control Structure	Rule Design
OUT-OF- CONTEXT Subcontractor	Data Definition	Program	Network Architecture	Security Architecture	Timing Definition	Rule Specification
ENTERPRISE User	Data	Function	Network	Organization	Schedule	Strategy

Source of the Zachman Framework: [Mino08].

Since 1999 the FEAF has promoted shared development for US federal processes, interoperability and sharing of information among US federal agencies and other governmental entities. The FEAF components of an enterprise architecture cover architecture drivers, strategic direction, current architecture, target architectures, transitional processes, architectural components, architectural models, and standards. The architect has a responsibility for ensuring the completeness of the architecture, in terms of adequately addressing all the concerns of all the various views, satisfactory reconciling the conflicts among the different stakeholders. The framework emphasizes the role of planner, owner, designer, builder and subcontractor in the EA development process (see Table 2).

Table 2

The Federal Enterprise Architecture Framework

	Data Architecture	Application Architecture	Technology Architecture
Planner Perspective	List of Business Objects	List of Business Processes	List of Business Locations
Owner Perspective	Semantic Model	Business Process Model	Business Logistics System
Designer Perspective	Logical Data Model	Application Architecture	System Geographic Deployment Architecture
Builder Perspective	Physical Data Model	Systems Design	Technology Architecture
Subcontractor Perspective	Data Dictionary	Programs	Network Architecture

Source of FEAF: [Fede99].

The FEAF is derived from the Zachman Framework, however the user of realized architecture is not included in the development team. Planning of enterprise architecture according to the ZF meets some unclear situations (e.g. answer When? is difficult), therefore the FEAF seems to be the simplified and more intense version of the ZF.

The other frameworks of enterprise architecture, although focused on the architectural components development also include questions concerning the EA developers. The Ministry of Defence Architectural Framework (MODAF) is the UK Government specification for architectural frameworks for the defence industry [PeBe03]. The MODAF covers 7 view points. The All View viewpoint is created to define the generic, high-level information that applies to all the other viewpoints. In this approach, the architect's role is hidden in the particular viewpoints. The Acquisition viewpoint is used to identify programmes and projects that are relevant to the framework and that will be executed to deliver the capabilities that have been identified in the strategy views. The Strategic viewpoint defines views that support the analysis and the optimisation of military capability. The intention is to capture long-term missions, goals and visions, and to define what capabilities are required to realise them.

The Operational viewpoint contains views that describe the operational elements required to meet the capabilities defined in the strategic views. This is achieved by considering a number of high-level scenarios, and then defining what sort of elements exist in the scenarios. The operational views are solution-independent and do not describe an actual solution. These views are used primarily of part of tendering where they will be made available to supplier organizations and form the basis of evaluating the system views that are provided as the supplier's proposed solution.

The System viewpoint contains views that relate directly to the solution that is being offered to meet the required capabilities that have been identified in the strategic views and expanded upon in the operational views. There is a strong relationship between the system viewpoint and the operational viewpoint. The system views describe the actual systems, their interconnections and their use. This will also include performance characteristics and may even specify protocols that must be used for particular communications.

The Service-oriented viewpoint contains a view that allows the solution to be described in terms of its services. This allows a solution to be specified as a complete service-oriented architecture where desirable. The Technical viewpoint contains two views that allow all the relevant standards to be defined. This is split into two categories: current standards and predicted future standards.

Standards are an essential part of any architecture and it should be borne in mind that any number of standards may be applied to any element in the architecture [PeBe03].

The CIMOSA framework is based on four abstract views (function, information, resource and organization views) and three modelling levels (requirements definition, design specification and implementation description) [SpAb07]. The four modelling views are provided to manage the integrated enterprise model (design, manipulation, access). The role of each view is to filter components out of the model according to given perspective. For the management of views, CIMOSA assumes a hierarchy of business units that are grouped into divisions and plants.

2. The Actor Network Theory as fundamental of the Enterprise Architect creative role development

An obvious way to keep an adequate eye on the interests of stakeholders is more direct involvement of them in enterprise development activities and the assessment of top management. According to Op't Land et al., enterprise architecture focuses on shaping and governing the design of the future enterprise using principles to stipulate future direction and models to underpin and visualize future states. The authors specified three important perspective on the role of enterprise architecture [OPWC09]. A regulation-oriented perspective is to emphasize the notion governing the design of an enterprise. Taking this perspective, an enterprise architect should focus on principles, rules, guidelines and standards, leading in the direction of the success of enterprise design chosen by the enterprise itself. The design-oriented perspective emphasizes the comprehensive and cohesive specification of an enterprise in all its aspects of a high level design. The pattern-oriented perspective focuses on the use of design patterns, which form a bridge between the regulative and the design perspectives.

The enterprise competencies should be planned and addressed at two levels: the enterprise and the personal level. An enterprise competence is an integrated complex of enterprise skills, knowledge and technology. To a considerable extent, enterprise's competencies rest on the competencies of employees, i.e., the competencies at the personal level. Competencies are defined in measurable behavioural characteristics that determine the ability to function successfully – knowledge, skills, craftsmanship, attitude, social skills, personal traits. They are also the abilities to cooperate, to take initiatives, or showing customer-orientation and decision making skills [Hoog09]. The general classification of competencies is as follows:

- cognitive, thinking, intellectual, knowledge;
- relational, feeling, affective, interactive and trustful;
- action-oriented, power and action [Hoog09].

The important for the enterprise architect knowledge areas cover system thinking, business and organization, information, information technology, enterprise development and change. The enterprise architects should be able to translate the strategic initiatives and areas of concerns in a concrete enterprise design. The enterprise architect is responsible for documenting, analysing and designing the business processes, business function, products, business units and business objects and the interactions between them. By the analysis of the entire model, the enterprise architects are able to uncover the points where there is a need for action and the potential for optimization. There is a necessity to ensure the cohesion among roles: application managers, project managers, process architects, business analysts, organization consultants, infrastructure acquirers, project portfolio components' controllers, IT strategists, IT managers, security representatives, risk managers, and quality managers (see Fig. 1).

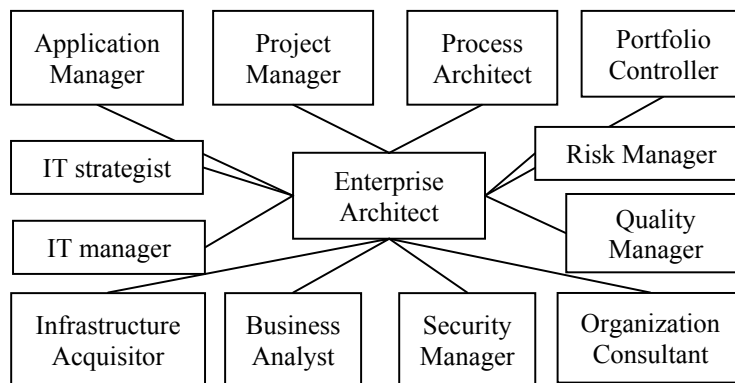


Fig. 1. The Enterprise Architect in Actor Network

The EA is typically to provide management with an outlook on the coming of 3-5 years. The EA facilitates decision making processes by providing a holistic view of the enterprise, leading to better decision making. The enterprise architect is placed in a network of stakeholders (see Fig. 1). They are important only where presence of various diverse interests and elements of negotiations is apparent. Each of them represents a number of interests, which may include the achievement of the whole EA goals. As actors in network, they achieve their significance by being in relation to other actors. Actor Network Theory was devel-

oped by Latour and Callon to describe the creation and evolution of socio-technical networks [CaLa81]. In the theory an actor is defined as an entity making other elements dependent upon itself. The position of the architect in the enterprise determines the associated controls of the EA development activities. Techniques used frequently to clarify responsibilities are RACI and RAEW [VaVa06]. RACI model includes the Responsibility (the individual delivering the end result), Accountable (the person bearing the ultimate responsibility for the result), Consulting (the persons providing input to reach the result), Informed (the individuals informed about the result). In RAEW model, the enterprise architect should be Responsible (the individual is expected to deliver the end result), Authority (the person checking and approving the results), Expert (the individuals giving advice based on certain purposes), Work (the persons collaborating in producing the results).

Conclusion

The paper is concerned with the enterprise architects as the professionals who are responsible for the creation of the EA products. The paper covers explanations of architect's role, as well as the basic competencies and relations to other stakeholders. The enterprise architects are like traditional architects who deal with site, space and place and whose goal is to convert a site into a place where space can be experienced. The enterprise architects' mission is to convert enterprise information site into a place where users can experience the digital information space and where information will be utilized to support their daily activities.

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KREATYWNOŚĆ ARCHITEKTA PRZEDSIĘBIORSTWA

Streszczenie

W opracowaniu przedstawiono zasadnicze problemy rozwoju architektury korporacyjnej i dokonano analizy wybranych metod (tj. metoda Zachmana, FEAF, MODAF i CIMOSA) w aspekcie kreatywnej roli architekta. W drugiej części, w nawiązaniu do teorii aktor-sieć, przedstawiono pozycję architekta w sieci relacji z innymi interesariuszami rozwoju architektur przedsiębiorstwa.

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WHY RE-INVENTING THE WHEEL? CREATIVE SOLUTIONS FOR OVERCOMING BARRIERS IN LEARNING FROM OTHER PROJECTS

Introduction

In the knowledge-driven world assets such as experience, know-how, corporate culture and skills of the employees are the key competitive factors and the most valuable resources for the organization. Proper knowledge management is perceived to be essential for ensuring knowledge sharing within and across projects, which is a fundamental factor for project success. Knowledge management consists of procedures and techniques used to benefit mostly from organization's knowledge assets such as tacit and explicit knowledge [Teec00]. It focuses on how organization create, retain and transfer knowledge [ArMR03].

The subject of knowledge management in project-based environments has been broadly discussed in the literature. The explanation for wide attention paid to this area can be found in arguments emphasizing the value of knowledge management: it provides a competitive advantage, supports decisions making, and reduces negative results of knowledge loss [BenM09]. Managers are seeking ways to make knowledge more accessible throughout the projects and the organization. The key challenge for project-based organizations is to ensure learning from project experience which can be done by knowledge re-use and sharing both within and among different projects.

Riege [Rieg05] noticed that better and more efficient process of knowledge transfer and sharing in organization leads to the development of better products, which are delivered faster to the market. It seems to have a crucial meaning for projects with regard to their demanding nature as undertakings aimed to deliver

unique products within limited time and resources. Through encouraging effective knowledge share and re-use in project it contributes to deliver products, which better meet the clients' needs.

There are a many reasons for knowledge management implementation problems. A literature identified a wide variety of inter and intra-project learning barriers such as: time pressure, the unwillingness of employees to share their knowledge, the incompetence of employees to use the new technology, lack of engagement of the top management, unfavorable organizational culture and so on. All barriers can generally be grouped into three major categories: organizational barriers, human barriers and project-related barriers. All of them are considered as potential inhibitors of learning from project experience.

1. Barriers to project transfer

There is a widespread agreement that sharing project knowledge and experience within and among the projects may contribute to project success (e.g. achieving goals on time, within the budget, meeting stakeholders' expectations, etc.) and may help to prevent mistakes in the future. Nevell, Bresnen, Edelman, Scarbrough and Swan [NeBE06] referring to Prusak [Prus97] noticed that there was a tendency to 'reinvent the wheel', rather than to learn from the experience of previous projects. In building project management maturity described as the development of repetitive processes and systems which provide a high probability of project success [Kerz04] it is important to understand what kind of barriers to learning from previous projects can occur in organization. Knowledge management is linked with different aspects of organization including corporate culture and policies, documents and the employees [JoCR06], that is why attention should be paid to all of them. The literature on the subject has identified several barriers to knowledge transfer, which can be grouped into three categories:

1. Barriers related to organizational context – the degree, to which the organizational context facilitates the knowledge transfers and learning from other projects [Szul96].
2. Barriers related to human context – factors connected with people and their behavior, the degree, to which individuals are motivated and involved to share knowledge within and among the projects.
3. Project-related context – related to the nature (characteristics) of project.

The important problem in knowledge share is that many organizations focus only on explicit knowledge and do not use the tools enhancing exchange of tacit knowledge.

2. Organizational barriers

Riege [Rieg05] noticed that the most important issue related to sharing project knowledge in an organizational context includes proper corporate environment and conditions. Prencipe and Tell [PrTe01] stated, that functionally-based firms and their departments were prepared to gather and share the knowledge, inversely, project-based organization do not have the mechanism to transfer project knowledge between the projects or such a mechanism is unclear. The challenge is to integrate project knowledge management and sharing initiatives into organization's goals [Rieg05]. Usually different teams are not able to see, which knowledge is available from other projects because no procedures of knowledge sharing is implemented in the organization. Lack of proper organizational structure that supports strategy of learning from experience is viewed as an important barrier. Organizational structure (organizational structure of the company involved in the project implementation as well as the project team structure) should facilitate and enable knowledge transfer.

Usually project teams (or task teams) are numerous so they are hard to manage, which results also in their inability to share knowledge in an efficient way. Adequate resources to support learning from experience need to be allocated [Rieg05]. Project knowledge and experiences are often tacit and personal, thus positive climate to facilitate knowledge sharing should be implemented. It means a positive project culture, tolerance towards mistakes and commitment of the top management. Usually activities regarded to knowledge share have a low priority for project managers as they are focused only on implementation of project activities and delivery of project products. The lack of engagement and managerial involvement can results in weakening knowledge share practices. Another barrier can also be low awareness of the need for implementation of project knowledge management. The barrier for knowledge share would be the lack of reward system that would motivate team members to share knowledge and experiences. Moreover, organizations usually do not use appropriate tools or the tools used are not user friendly, which results in people's reluctance. The ICT used for communication and knowledge storage can facilitate inter and intra-project learning.

3. Human barriers

They involve barriers originated from humans behaviors, perceptions, and actions. The first group of barriers can be classified as psychological ones. Project team members may perceive knowledge sharing as not useful. They may not understand the benefits and the value of project knowledge sharing and learning from other projects. Moreover, people may be afraid that sharing knowledge will reduce their influence, weaken their position in the project team. They would fear of losing the ownership of intellectual property. During project implementation both positive and negative experiences may occur. People often do not want to look back at what went wrong during the project, because they are afraid this will have negative effects for themselves. People perceive process of knowledge management as an additional activity in project. Because of lack of time they are unlikely to implement procedures facilitating mutual learning among the projects. Moreover, from the receiver's point of view if people do not trust the knowledge they receive they are not willing to make a full use of it. Some people do not want to learn from others and they rely on that they already know. Another group of barriers connected with people are the technical barriers. Nowadays knowledge sharing require use of ICT tools which can present a challenge especially for elder team members. People involved in projects may not be skilled enough to use new technology properly and benefit from it. Moreover, another barriers can be the level of people's abilities to share knowledge which depends mainly on their communications skills.

4. Project-related barriers

The specific characteristics of project as a temporary organization makes challenges to knowledge sharing even more vital. Working content as well as project team compositions are not continuous which cause that project knowledge of individuals and organization is fragmented and disintegrated (especially in international projects, geographically dispersed, implemented in intercultural environment). Moreover in case of temporary organizations such as project teams there is a lack of mechanism of learning [Boh07] thus process of project knowledge share is limited.

Temporary organizations are usually focused on product delivery, whereas knowledge management requires a long-term strategy, which results in insufficient knowledge transfer among projects [LiWa10]. Each project is unique and

in many essential aspects differs from other projects. Different location, design, stakeholders, environment results in that no project may be the same. It can cause difficulties in knowledge sharing, re-using, and learning from previous projects.

5. Sample methods to facilitate learning from projects

As learning from previous experiences is the prerequisite to effective project management, project managers' attention must be focused on developing mechanism to facilitate knowledge share between projects. Effective knowledge transfer occurs when appropriate solutions are implemented. The most commonly used methods to learn from experiences are the documentation-based ones (project reviews, lessons learned repositories etc.). Below are some of the creative methods which could increase the process of learning within and among projects.

Intranet – the network existing within organization would enhance generation and share of the knowledge of different team members. It can include: access to database, forums for discussions, training courses for the team members on different positions, distribution of the project documentation, questions and answers and so on [Naft11]. It can help to store and share explicit knowledge.

Social networking – Wiewiora, Trigunarsyah, Murphy and Chen [WiTM09] stated that social networks such as informal meetings or coffee breaks are effective means to a knowledge transfer. Based on [NeGS08], they noticed that social networks were more efficient in knowledge sharing than IT techniques, which should only support social communication. Social networking sites such as Facebook, YouTube or Twitter could facilitate informal learning from others experience and provide the opportunity to share the information with team members of different projects.

Project Management Office – it is widely known that lessons learned defined as important experiences, which can be relevant for future projects [WiTM09] play essential role in learning from projects. The most common mean to transfer project experiences are lessons learned repositories which serves for project teams as a key source of project knowledge. But lessons learned can be stored and disseminated also by Project Management Office (PMO), the entity responsible for improvement of project management effectiveness in the organization. According to Julian [Juli08], PMO leaders facilitate cross-project improvement by embedding accumulated knowledge from past project experiences into project management.

6. Empirical investigation

The survey aimed to investigate knowledge management practices in organizations engaged in project management. Data was collected through a paper-based questionnaire from 62 persons. The respondents represented the project managers and project team members from organizations of different size and different industries as well as a broad variety of different projects types. The survey was conducted in Rzeszow on the sample size of $n = 83$ persons. The response rate was 74,7%.

Interviewers identified the most important barriers in project knowledge sharing, which are consistent with the division underlined by the literature. Respondents mentioned both human and organizational barriers, but the point of view varied depending on role played in project team.

Regarding to the human barriers, half of the respondents agreed, that the critical barrier for knowledge flow is the lack of perception on the benefits of project knowledge transfer. Almost the same number of respondents indicated that process of gathering the lessons learned is perceived as an additional and useless work. Regards to the organizational barriers 40% of respondents admitted, that the critical barrier for knowledge flow is lack of time for knowledge collection and sharing. The same number of respondents pointed that activities regarded to knowledge share has low priority for project managers. Lack of mechanism for searching project information and time pressure were the most frequently mentioned barriers described as a extremely critical for learning form project experiences (pointed respectively by 16% and 19% of the respondents). Surprisingly, very little number of respondents indicated human barriers as extremely critical (they were mentioned by less than 10% respondents).

The respondents represented variety of different position in project team including the project team members, project managers and members of Steering Committee. The summary is shown in Fig. 1.

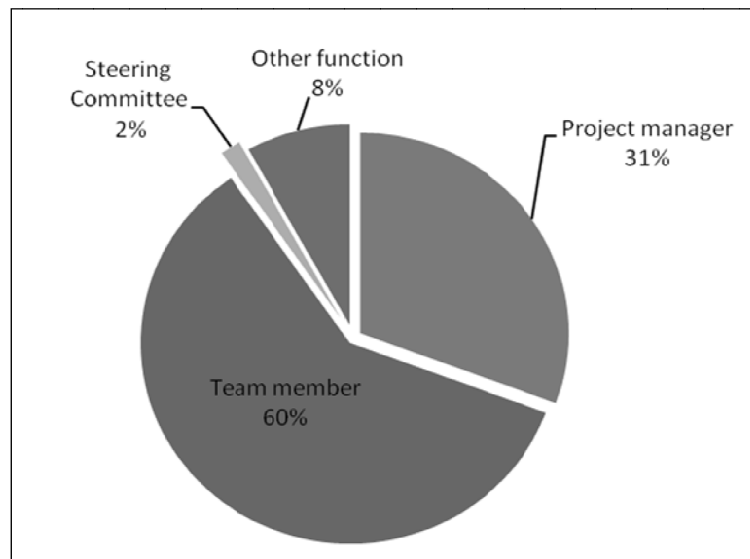


Fig. 1. An overall breakdown of respondents interviewed

Source: Developed for this study.

Results of the survey on how different stakeholders perceive most critical barriers in inter-project learning are presented in Table 1. The group of team members pointed human barriers as critical or extremely critical ones to a knowledge transfer (each barrier was indicated by more than 70% of project team members). Among organizational barriers the time pressure was suggested by the highest number of project team members (near to 100% of the group). Conversely, slightly over the 50% of asked project managers consider this barrier as a critical or extremely critical one.

Surprisingly, a relatively small number of project managers considered human barriers as a critical barriers in knowledge sharing (only up to 54% of them). According to that stakeholders, the most important constraints in knowledge flow are the organizational solutions: lack of mechanism for searching project information and lack of financial resources for knowledge management. Almost 60% of them is aware that the key constraint in knowledge share is the unfavorable organizational culture which do not encourage to discuss the failures of past projects. The rarely pointed barriers are connected with the attitudes of the top management of organization and project managers. Similarly to project managers, the member of Steering Committee do not indicated human barriers as a key constraints for knowledge share but all organizational barriers were mentioned.

Table 1

Summary of the knowledge share barriers from the point of view of different stakeholders
[as a % of the group which pointed barrier as a critical or extremely critical]

HUMAN BARRIERS	TEAM MEMBERS	PROJECT MANAGERS	STEERING COMMITTEE
Team members cannot see the benefits and the value of project knowledge sharing	70%	42%	0%
Team members consider the collection of lessons learned as an additional, needless work	81%	53%	0%
Team members do not want to use others experience, they think that they can do it better	76%	26%	0%
Team members do not want to share their knowledge and experience	73%	47%	100%
ORGANIZATIONAL BARIERS	TEAM MEMBERS	PROJECT MANAGERS	STEERING COMMITTEE
Lack of mechanism for searching project information	62%	58%	100%
Time pressure – team workers do not have time to collect the lessons learned	95%	53%	100%
Lack of financial resources for knowledge management	76%	58%	100%
Organizational culture – there is no tolerance towards the mistakes	59%	58%	100%
Top management cannot see the need for implementation of a knowledge management system	76%	26%	100%
Activities regarded to knowledge share has low priority for project managers	84%	47%	100%
Difficulties to possess tacit knowledge	59%	42%	100%

Source: Developed for this study.

Conclusion

The challenge for project-based organizations is to provide mechanism to encourage and enhance project knowledge flow within and between projects. Since similar problems could be encountered in other projects, the effective project knowledge flow can reduce the organizational costs of duplicating efforts to invent the same solutions [Boh07]. This paper has outlined barriers to a knowledge transfer discussed by the literature and has identified them through the survey. As human and organizational barriers can prevent effective inter- and intra-project learning it is important to identify and then overcome them. To overcome human barriers managers should use methods facilitating formal and informal communication such as intranet or social networking sites used to share knowledge. Learning from projects requires also organizational support such as corporate culture, ICT use or top management commitment.

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BY NIE WYWAŻAĆ OTWARTYCH DRZWI... KREATYWNE METODY PRZEWYCIĘZENIA BARIER W UCZENIU SIĘ Z DOŚWIADCZEŃ INNYCH PROJEKTÓW

Streszczenie

W organizacjach zorientowanych na projekty często istnieje tendencja do „wyważania otwartych drzwi”, co oznacza, że zespoły projektowe nie czerpią z doświadczeń pozyskanych z realizacji projektów [Prus97]. Każda organizacja dążąca do doskonałości w zarządzaniu projektami powinna skoncentrować się na zbudowaniu takich systemów, procedur i narzędzi, które pozwolą na efektywne pozyskiwanie, transfer oraz ponowne wykorzystanie wiedzy z innych projektów. W przewyżnianiu barier organizacyjnych oraz ludzkich, będących hamulcami w wykorzystywaniu posiadanej wiedzy, pomocne mogą okazać się nowe, kreatywne rozwiązania stymulujące uczenie się z doświadczeń projektowych.

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ATTITUDES OF POLISH STUDENTS TOWARDS WEB 2.0 TECHNOLOGY

Introduction

Many articles devoted to the subject of Web 2.0 solutions and their utilization in companies work and educational institutions have recently appeared. Most of them refer to USA and Western Europe. Therefore, the question asked to polish students about their level of knowledge about Web 2.0 tools and their attitude toward utilization of these solutions in the formal education seems interesting. The article which aims at answering this question consists of three parts; the first one explains what Web 2.0 is, the second one presents advantages and disadvantages of Web 2.0 utilization in higher education, while the last one is devoted to the discussion about the results of the research.

1. What is the Web 2.0?

The term Web 2.0 appeared for the first time in the brainstorm organized by Tim O'Reilly and MediaLive International in 2004 [Orei06]. A month later, there was another conference organized due to a new phenomenon [WWW1]. The term Web 2.0 started to be widely used since then; moreover, on its basis new terms such as E-learning 2.0 or Company 2.0 have been generated. Despite the fact that no accepted uniform definition of Web 2.0 has been created, most authors agree to the fact that the following are the fundamentals for Web 2.0 solutions [Mall09]: (1) Content: generated, shared and managed by users; the contents are tagged, marked, and promoted by users via social bookmarking, for example; (2) Conversations: they take place mainly on the blogs, forums and chats; during such conversations the collective wisdom is reached; (3) Connections: users' profiles, contacts, friends, and interest groups' functions, tools for searching and building relations between people with similar interests; (4) Col-

laboration: social members' collaboration is realized mainly through wiki, long-distance teamwork environment, support of remote project execution, web calendar, web 'massive' events. It is believed, that Web 2.0 services change the interaction paradigm between services' owners and their users due to the fact that most contents are created by the users themselves.

Web 2.0 solutions would be impossible to execute if it weren't for manifold information technologies responsible for the most common applications such as [Ande07]: (1) AJAX technology allowing the communication between the user and the server without sending the whole HTML page every time; (2) REST architectural style connected to the http protocol containing good practices of creating extended applications; (3) a set of API commands which enable fast generation of user's interface; (4) Mashup, i.e. webpage joining applications from different sources; (5) format of JSON data exchange used in applications based on AJAX; (6) system of distributed authentication and users identities distribution in Open ID web services; (7) RSS family of markup languages used for sending and putting the message topics and news on the users pages. The above mentioned technologies are essential for implementing education of new generation despite the fact that end-users may not be aware of that.

2. Advantages and disadvantages of Web 2.0 solutions utilization in higher education

Let's take a look at advantages connected to Web 2.0 tools usage. The most frequent are [Boeh09], [Brow00], [Bajt11], [Hugh09], [Gros09]:

- reduction of e-learning materials preparation costs, internet is full of high quality materials, it is a teacher's responsibility to choose the most valuable ones;
- greater focus on the content and didactic process improvement rather than the technical aspects of long-distance learning, students are taught the abilities such as team work or creativity in problem solving, building network, adaptation of existing content and ability to absorb new information using up-to-date technologies; all these abilities are required on labour market;
- team collaboration by means of Web 2.0 tools teaches how to be more innovative and more creative than when working individually;
- better access to knowledge, for instance through RSS channels or social bookmarks;
- possibility to get to know experienced people's opinions – people who are specialists in given fields – by reading their blogs or a company's microblog;

-
- no technical problems with tools implementation, no need for e-learning platform implementation, a computer with a web browser installed is sufficient;
 - reduction of time necessary to provide students with new contents;
 - more flexibility in providing students with various levels of knowledge and abilities with different contents;
 - reduction of university operational costs of e-learning, fewer people are involved in technical courses development;
 - students are required to possess only basic abilities regarding information technology;
 - students' greater satisfaction who can take an active part in courses' preparation.

During the Web 2.0 tools implementation into the formal teaching in higher education there are the following possibilities [MaPI09]:

1. The possibility of checking the correctness of alternative views enriches the learning process. Many students do not take part in discussions during traditional classes due to their different views or lack of self-confidence. You may always find a small group of people with similar views on Internet. What's more, it is easier to overcome your shyness when speaking online. From the university point of view, it means greater creativity on the part of students, calling authorities into question, looking for people with similar views outside university, which allows you to gain greater knowledge in a given field.
2. Online community working dynamically enriches the scientific environment. Students who are centrally placed in the process of learning and who are given the possibility of affecting the learning process after getting a diploma will be more attached to home university.

Web 2.0 tools utilization has many opponents as well. Their main charges are as follows:

1. Most available contents are not censored, which means that student may have problems with separating the valuable piece of information from the incomplete or untrue one.
2. Students who make use of other people's works and make a scissors-and-paste job may infringe the copyrights [Kawa10], because in most cases they do not think about them. Colleges which make use of Web 2.0 tools during lessons and then put the students results on website may be accused of copyrights infringement.
3. Making use of ready-made patterns may reduce students' creativity and their innovative approach [Gogo09]. Using personalized results gained from individual teaching environment may limit creativity and innovative approaches.

4. There might be problems with security of students and university workers data.
5. There might be technical problems as well. Users should make use of broadband internet, they shall have the newest version of Java Script installed on their computers.

Despite so many disadvantages, it seems that Web 2.0 tools utilisation is inevitable particularly that, two thirds of the internauts use social media and the percentage may be even higher among students.

3. Research results

Similar research was conducted in Great Britain and Romania. However, the questionnaires used in Polish universities were different [ChSt08, Pope10, CILo09].

Students of University of Information Technology and Management in Rzeszów (UITM) took part in the research. They all were students of second and third year with various specialities on one major, namely Information Technology. This group was chosen due to its highest technology awareness. All new technologies are tested by UITM students. Firstly, their technological abilities are certainly the greatest, therefore, they have no problems with using new solutions. Secondly, they may spot all the implementation mistakes and suggest ways of improving the tools used. 73 students filled in the survey, only 53 of them (15 women, 37 men) filled all the blanks in the surveys and these were taken into account in the research. The average age of participants was 19.6 years (the youngest was 17, the oldest was 22). The low age level is caused by the fact that many students come from Ukraine where pupils take Matura exam when they are 17. The survey was available to the students in the electronical form during the classes. It was proceeded by a short introduction regarding the Web 2.0 term. The survey consisted of three parts. The first one pertained to Internet using patterns, the second one referred to the basic Web 2.0 tools knowledge, while the third one allowed students to express their opinion about new tools utilisation in education.

Part 1

All students make use of Internet and have access to it at work and at home. In order to connect to Internet students use various devices such as laptops, mobile phones, the stationary computers and PDAs (no one pointed to other device). The high percentage of people using mobile phones is quite striking. Maybe the universities should customize their educational offer and pay more attention to m-learning.

What equipment do you use to connect to a network?

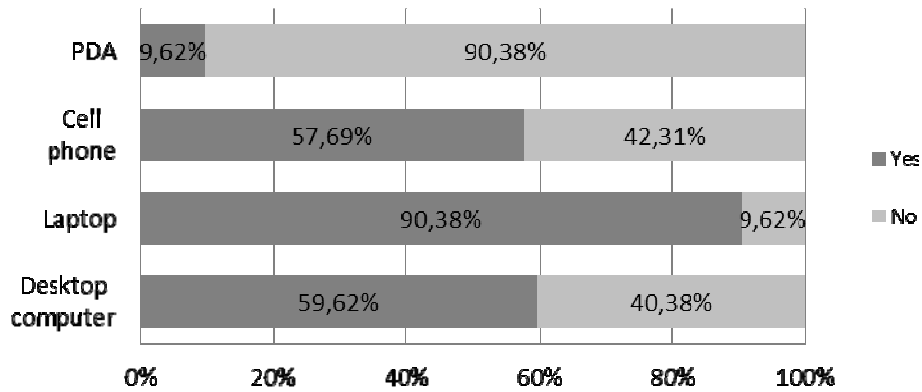


Fig. 1. Equipment students use to access the Internet

Source: Self-reported data.

Students connect to Internet mainly through wireless network (75%), modem (32.69%), broadband connection (28.85%), local network (21%) and cable television connection (7.69%). It is obvious that wireless network has become a standard and students expect all higher education institutions to provide them with this kind of Internet access.

What type of network connection do you use?

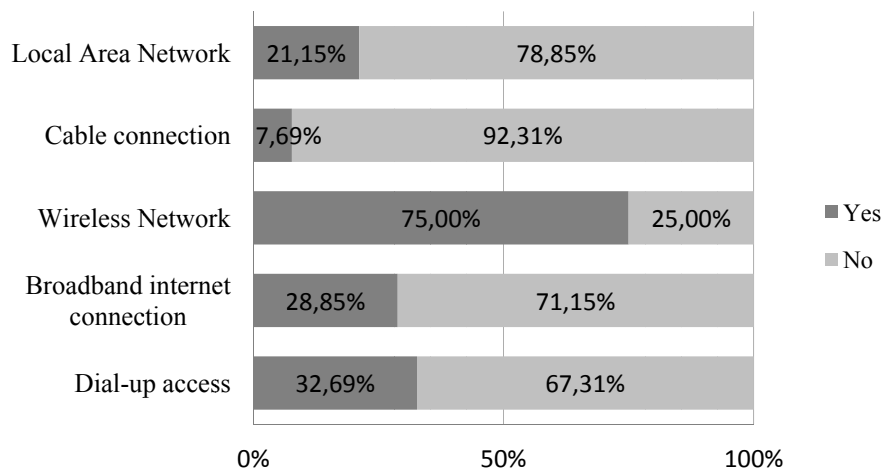


Fig. 2. Types of Internet connection

Source: Ibid.

At an average, students spent online 37 hours per week (the record was 100 hours). This result is not surprising since the research was conducted among Information Technology students. Most people connected to Internet in the evening and at night, many people pointed to 6 pm till 11 pm, 7 pm till 10 pm, 4 pm till 10 pm, 7 pm till 1 am.

Students connect to Internet mostly to learn, entertain themselves, to talk to others and to work.

How do you spend your time online?

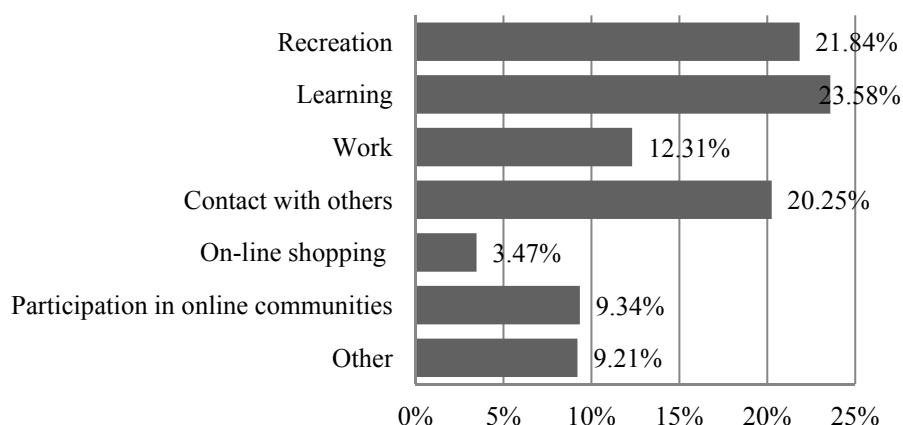


Fig. 3. Time spent on the Internet, according to activity

Source: Ibid.

Part 2

Next questions applied to students' self-assessment referring to their knowledge of chosen Web 2.0 tool and its utilisation. All students, who took part in the research met together and used each tool at least one time. The answers show that the students' knowledge of services used for file sharing and social networks is the greatest. The number of students who claim their knowledge of tools to be good or very good is as follows:

- Services of file exchanging (86.54%),
- Social services (86.54%),
- Social bookmarks (81.91%),
- Wiki pages (78.85%),
- Blogs (40.38%),
- Podcasts (36.54%),
- RSS (26.92%).

No one claimed to be an expert in using the above mentioned tools, on the contrary, they claim their knowledge to be on the intermediate level.

Table 1

Knowledge of Web 2.0 tools

	Blogs	Wikipedia	Social networks (Facebook, Nk, etc.)	Podcasts	RSS	File sparing sites (YouTube, SlideShare, ImageStock, etc.)	Social bookmarking sites (Del.icio.us, Digg, Wykop, etc.)
Very good	13.46%	25.00%	36.54%	7.69%	7.69%	40.38%	35.34%
Good	26.92%	53.85%	50.00%	28.85%	19.23%	46.15%	46.57%
Neither good nor bad	44.23%	17.31%	9.62%	42.31%	40.38%	9.62%	8.76%
Wrong	9.62%	1.92%	1.92%	11.54%	23.08%	1.92%	3.57%
Very bad	5.77%	1.92%	1.92%	9.62%	9.62%	1.92%	1.10%

Source: Ibid.

Another question applied to Web 2.0 tools webpages visits and how much time people devoted to these pages. It turned out that students spent their time online mostly for social networks (17.10 h), services of file exchanging (7.96 h) and social bookmarks (5.08 h). The most visited webpages, in turn (once a day or several times a day), were:

- Social bookmarks (48.08%),
- Social networks (46.2%),
- Services of file exchanging (36.54%),
- Blogs (30.77%),
- Wiki pages (17.31%)
- Podcasts and RSS (9.62%).

Table 2

Patterns of use Web 2.0 tools

	Blogs	Wikipedia	Social networks (Facebook, Nk, etc.)	Podcasts	RSS	File sparing sites (YouTube, SlideShare, ImageStock, etc.)	Social bookmarking sites (Del.icio.us, Digg, Wykop, etc.)
Several times a day	3.85%	11.54%	36.54%	1.92%	1.92%	28.85%	34.62%
Once a day	26.92%	5.77%	9.62%	7.69%	7.69%	7.69%	13.46%
Few times a week	32.69%	21.15%	44.23%	26.92%	15.38%	17.31%	25.00%
Once a week	5.77%	15.38%	3.85%	17.31%	17.31%	5.77%	11.54%
1-2 times a month	13.46%	25.00%	1.92%	15.38%	21.15%	17.31%	3.85%
Never	17.31%	21.15%	3.85%	30.77%	36.54%	23.08%	11.54%
Hours a week on average	4.60	8.34	17.10	2.75	2.43	7.96	5.08

Source: Ibid.

The next question was 'Do you put any files on the services of file exchanging and sharing?'. Its aim was to check if students put new contents online or if they are only consumers. The results only confirmed what was already known. Only 13.46% of students put new contents online on a regular basis, 69.23% of them do it rarely while 17.31 % never do it. Table 3 presents answers to the remaining questions which further confirmed the above conclusions.

Table 3

Students activity in Web 2.0 services

Did you have/ had	Blog	Wiki	Social networking sites account
Yes	38.46%	21.15%	86.54%
No	61.54%	78.85%	13.46%

Source: Ibid.

Although 86.54% students have an active account on social services it is difficult to state if they use it to publish news about themselves or checking the messages from their friends or to cooperate with others and to build the net of cooperation.

Part 3

The last part of the survey was dedicated to students' attitude toward Web 2.0 tools and their utilisation in the higher education. The first question was as follows: 'Why do you use Web 2.0 webpages and tools?'. The most frequent answers were (14 students did not answer):

- easy access to information required during learning process or for work,
- visual attractiveness of webpages and ease of use,
- the possibility of exchanging your views with others,
- make the teamwork easier (at work and at school as well),
- to search for experts or people with similar interests,
- to be in touch with family and friends,
- to check if there is a solution to a problem (time saving),
- for entertainment,
- they contain many interesting facts.

The above answers shall be treated as a guideline for university webpage designers since the webpages are often perceived as out-of-date and complicated. The diagram below presents the students' attitude toward Web 2.0 tools utilisation.

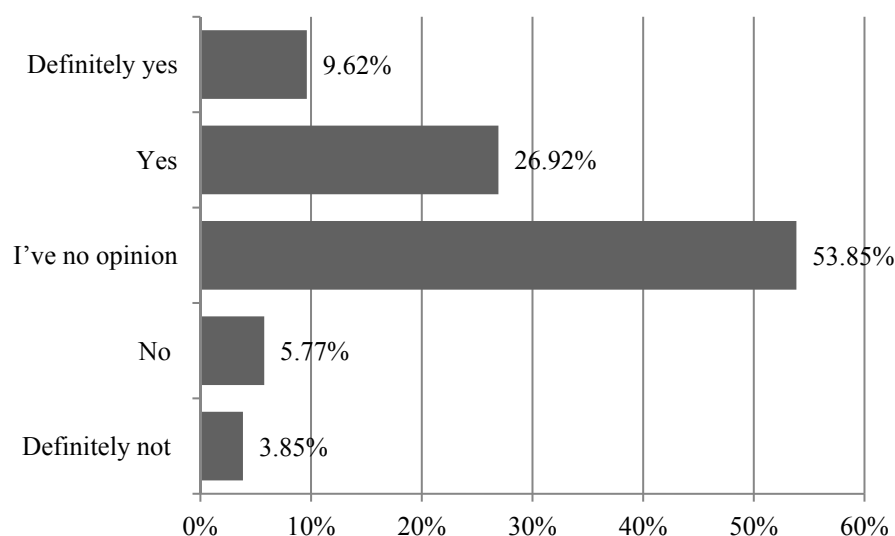


Fig. 4. Should be web 2.0 tools included into formal education?

Source: Ibid.

More than one third of students declares to have a positive attitude toward the idea of using Web 2.0 tools in education. However, 54% have no opinion which may result from the difficulty in a notion of given solutions. Some students are afraid of more workload required to get a credit.

The answers to the question 'What are the advantages of Web 2.0 tools utilisation' were similar to the question about motivation to use these tools. Also, students highlighted:

- the possibility to communicate in real time,
- the possibility to work on shared files,
- the high content of multimedia,
- the multifold forms of information presentation,
- free access to information,
- ease of absorbing new information, even by accident.

The main disadvantages of Web 2.0 tools utilisation that students pointed to were:

- these tools are often addictive ('give me just 5 minutes' syndrome and one hour or two passes);
- they contain a lot of unnecessary pieces of information, it is difficult to spot the valuable ones;
- the plausibility of information is often questionable, information found on university webpages is usually plausible;

- in case of technical problems, there are problems with tracing the newest entries;
- no real contact with a person on the other side of the screen;
- easy access to personal data on social webpages;
- access to many forms of entertainment, they disturb the process of learning.

From these responses, the students are mostly aware of the risks that may arise from the application of new solutions. These defects also coincide with those which can be found in the literature. The opinions of students appeared in the proposals how the tools of Web 2.0 should be implemented in their school. Most proposed:

1. *Creating Wiki pages* – in order to prepare the credit essays, which seems worthy of consideration of the proposal. The students emphasized that their work put into the learning in this way will be appreciated and created documents can be helpful to subsequent users, and do not reach the “drawer”. Use this tool also allows the elimination of old documents such as pdf, doc. and jointly edit the content of the course by the students themselves, teachers and other persons involved in the teaching process). Changed content becomes quickly available to all online.
2. *The use of theme or scientific blogs in the classroom* – the use of industry-specific blogs that allow to know the real problems that students will have to face at work and to keep track of the latest market trends. Respondents emphasized that the textbooks from which they learn are often outdated and useless especially those for practical subjects.
3. *Creating a blog of the course* – this solution also enables collaboration. Such blog can be written by multiple users and you can get the latest posts by RSS, which allows you to keep track of events.
4. *YouTube* – for enrichment the content of a lecture or video tutorials during exercises. The video, in the opinion of students enlivens and enriches the traditional presentations. In some cases, carry out experiments in the classroom for various reasons is not possible (lack of adequate equipment, too high costs, lack of time), but do not have to be abandoned, because you can play it on film.
5. *Use social bookmarking in the classroom* – use by students, companies like Delicious allow to organize the content of the Internet and build your own database of links to valuable sites. Respondents indicated that a university teacher should create a database of links associated with his subject or particular topics and share it with a group for instance presenting in graphic form (tag cloud) the most important content.

6. *RSS* – with the most important information about the classes. Most respondents estimated sending emails with news about the course (course date, a reminder of the credit essay, time of consultations) as the outdated and time-consuming form of communication.
7. *Social Network* – desire to quick communicate with other students in the group was mainly indicated. Extramural students especially emphasized that they often do not know each other, and if they do not have any form of e-learning in a current term, where is a discussion forum and chat then there is lack of space for information exchange. Employed students also emphasized that, like business applications through a resilient network can reach a large group of people gathered in a subset of the thematic group or to experts in the field and take advantage of their knowledge.
8. *Common work on documents and file sparing (Google+)* – Students complained that giving a job they usually receive only assessment or a vague information about the mistakes they made, the use of tools for common making a presentation or spreadsheet would allow teacher to mark the students mistakes and adding comments.
9. *Educational games* – which permit to verify in simulation and in competition with others. Students who participated in games like Marketplace stressed that this was the most effective form of learning with which they met. Considering in the classroom theoretical problems is difficult to obtain a high level of knowledge and skills.

It should be emphasized that there were also students who are satisfied with the current-learning platform Blackboard and not wanting to introduce new products, principally due to the high time-consuming Web 2.0 solutions. That opinion appeared mainly among students and professionals studying at the same time, which seems understandable.

Conclusion

The results of discussed study show that universities should not ignore trends such as Web 2.0. Students agree on the need to integrate Web 2.0 tools into formal education. Each university should develop a coherent strategy for their use to ensure a higher level of competence and knowledge of graduates.

Using Web 2.0 tools should be preceded by a precise determination of educational processes to be supported and identify recipients among students and faculty. It should be also developed use cases or complete scenarios using different Web 2.0 tools.

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POSTAWY POLSKICH STUDENTÓW WOBEC TECHNOLOGII WEB 2.0

Streszczenie

Celem opracowania jest przedstawienie wyników badań przeprowadzonych wśród studentów Wyższej Szkoły Informatyki i Zarządzania w Rzeszowie, dotyczących postrzegania technologii WEB 2.0. Na początku zbadano przyzwyczajenia studentów podczas korzystania z Internetu, wiedzę o technologiach WEB 2.0 oraz sposób korzystania ich użycia (częstotliwość odwiedzin poszczególnych serwisów, rodzaje podejmowanych aktywności). Ostatnia część badań poświęcona została problemowi włączenia narzędzi Web 2.0 do formalnej edukacji. Artykuł szczegółowo przedstawia uzyskane rezultaty oraz ich interpretację.

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AGILE DEVELOPMENT IN THE CONTEXT OF USER-CENTERED SYSTEM DESIGN

Introduction

Agile methods of software development have existed for many years, and are based on much older concepts. This kind of methods achieved its greatest success in small- to mid-sized, commercial applications. In recent years, Agile methods matured and the users became skilled in applying this methodology. It is capable to provide both tactical and strategic benefits. The tactical benefits of lower cost within schedule and increasing quality are important; however, the strategic benefits of being responsive and being able to adjust to the needs of the users more rapidly might be of even greater value. This could be a huge factor in today's world, where the companies need to get results faster. Given this backdrop, the question is: Can Agile methods produce a better software product in terms of usability?

1. User-Centered Design

Usability in the systems context means that continuous feedback from end users during all phases of design and the development is necessary. Cooperation and feedback between end users and development team are the main itineraries of the so called user-centered design (UCD). In the literature there is plenty of general and non-specific definitions of user-centered design. For example: "UCD is an iterative process whose goal is the development of usable systems, achieved through involvement of potential users of a system in system design" [Kara96].

It may be seen that user-centered design in the systems area is a process which focus is set on usability throughout the entire development process and further throughout the system life cycle (Fig.1) [GGB03]. Then the main question is: How to merge practises of Agile development with principles of user-centered system design?

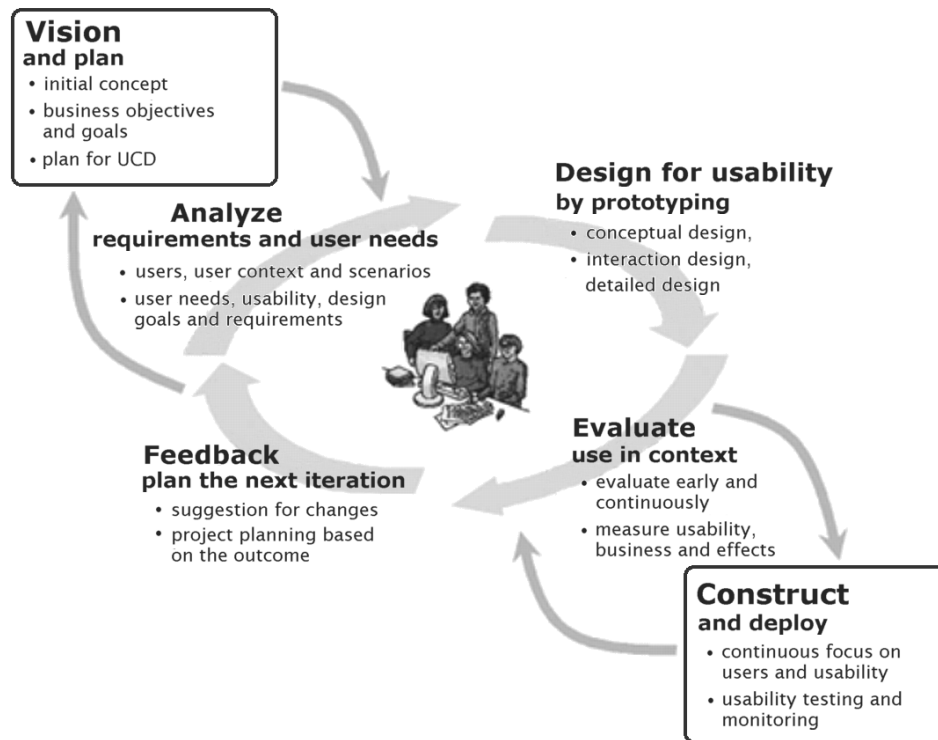


Fig. 1. UCD is a process focusing on usability either during the development or throughout the system life cycle

The key principles of UCD are as follows:

1. User focus – the goals of the activity, the work domain or context of use, that should early guide the development [GBU97, ISO13407]. It consists of descriptions of real and potential users with their needs, tasks, and scenarios. This helps in creating and maintaining a focus on the users' needs instead of a technical focus. Activities, such as identifying user profiles, contextual inquiries and task analysis, must be a natural part of the development process.
2. Active user involvement – representative users should actively participate, early and continuously throughout the entire development process and throughout the system lifecycle [GBU97, ISO13407]. The users should be di-

rectly involved, both in the development project and in related activities, such as, organizational development and designing of the new work practices. Plans, which identify appropriate phases and ways of user participation, should be specified from the very start of the project.

3. Evolutionary systems development – the systems development should be both iterative and incremental [GBU97]. UCD requires an approach, which allows continuous iterations with users and incremental deliveries, which allow them to evaluate the effects before they are made permanent. An iteration should contain a proper analysis of the users' needs and the context of use, a design phase, a documented evaluation with concrete suggestions for modifications and a redesign in accordance with the results of the evaluation. These activities do not have to be formal.
4. Simple design representations – the design must be represented in a straightforward way that can be easily understood by the users and all other stakeholders. The representations must also be usable and effective. Abstract notations, such as use cases, UML diagrams or requirements specifications are not sufficient to give the users and stakeholders a concrete understanding of the future use situation.
5. Prototyping – from the very start of design, prototypes should be used to visualize and evaluate goals and solutions in cooperation with the end users. It is essential to start with the conceptual design on a high level and not to step down to detail too quickly. It is advised to create several different prototypes in parallel, since this helps the designers in maintaining an openness and creative attitude to what is being built.
6. Evaluate use in context – baselined usability goals and design criteria should control the development. Critical usability goals should be specified and the design should be based on specific design criteria. Evaluate the design against the goals and criteria in cooperation with the users, in context. Early in the development project, the users' reactions to paper sketches and mock-ups should be observed, recorded and analysed. Later in the project, users should perform real tasks with simulations or prototypes.
7. Explicit and conscious design activities – the development process should contain dedicated design activities [Coop99]. The user interface (UI) design and the interaction design are of great importance for the success of the system. Far too often, the UI and interaction design are a result of somebody doing a bit of coding or modeling rather than being the result of professional interaction design as a structured and prioritized activity.

8. A professional attitude – the development process should be performed by effective multidisciplinary teams [ISO13407]. Different aspects and parts of the system design and development process require different sets of skills and expertise. The analysis, design, and development work should be performed by teams of, for instance, system architects, programmers, usability designers, interaction designers, and users.
9. Usability master – usability experts should be involved early and continuously throughout the development lifecycle. There should be an experienced usability expert, designer or possibly a usability group on the development team. The usability designer must be given the authority to decide on matters affecting the usability of the system and the future use situation.
10. Holistic design – all aspects that influence the future use situation should be developed in parallel [GBU97]. Software does not exist in isolation from other activities in the organization. The most frequent outcome of implementing newly created software is the necessity of change in the organization in many behavioral aspects. This includes work/task practices and work/task organization, user interface and interaction, on-line help, manuals, user training, work environment, health and safety aspects, etc. Other parts of the context of use such as: hardware, and social and physical environments, must also be considered in the integrated design process.
11. Processes customization – the UCD process must be specified, adapted and/or implemented locally in each organization. There is no one-size-fits-all process. Thus, the actual contents of the UCD process, the methods used, the order of activities, etc. must be customized and adapted to the particular organization and project. A UCD process can be based on existing software development process, where activities are added, removed or modified. It seems that Agile methodology could be particularly useful in this aspect because of its natural flexibility regarding adaptation to local needs.
12. A user-centered attitude should always be established. UCD requires a user-centered attitude throughout the project team, the development organization and the client organization. All staff engaged in the project must be aware of and committed to the importance of usability and user involvement, but the degree of knowledge may differ depending on the role and project phase.

Several benefits come out of applying the above principles, such as their help in maintaining the focus on the users and the usability throughout the entire development process. It is important to comply with the principles to as high a degree as possible and adopt them gradually at any point in time.

2. Agile approaches and UCD

Recently, agile approaches to software development have gained a lot of attention. The rationale behind the agile perspective is to shift the overall focus of software development to a more “lightweight” perspective. This shift can be seen as a contrast to more formal commercial processes. Agile is not a single, well defined process, instead, it is a generic name for several different processes or methods, sharing a set of core ideas, values and principles of software development. The principles are defined in the Agile Manifesto [AgAl01]. The values for the agile developers are known as well [AgDe12]. The best known of the agile processes is probably XP, eXtreme Programming [Beck00].

What is interesting about agile methods is that they are addressing some of the problems known to be part of traditional attitudes to the development process. With regard to the usability it may be pointed out that Agile methods are “closer” to the end user than older methods. In consequence, Agile methods could create software which meets the users needs much better. Agile processes emphasize the pragmatic use of light, but sufficient rules of project behavior and the use of human and communication oriented principles. Hence, people are more important than processes and tools. Working software is more important than comprehensive documents and model building. Models and artifacts are only means of communication; consequently prototyping and simple design representations are preferred. Agile developers argue that projects should be communication centric, which implies that effective human communication with project members and users are important, e.g., face-to-face is the ideal way of communicating within a project and with users. Usually, there is a direct collaboration with users and customers – preferably, users and developers should sit in the same room during the development.

The problem with the Agile approach is that it does not guarantee by itself better usability of software produced. For example, the user interface of the system created using Agile “style” could be either carefully crafted about user expectations or just generated on used persistence layer. The main aspect of agile methods is focused on delivering working software. This is of course excellent, as usable software also must be delivered and ready to work. But to get there, the development is focused on making coding effective and there is a risk that usability issues get lost as there could be no explicit user-centered focus. Agile projects include some roles that are supposed to work with user interface design and user requirements, but this is in most cases not enough. The whole project must be committed to the importance of usability. Another problem is that the users

involved in the development are not always end users. Sometimes they are customers or domain experts. For the agile approach it seldom makes a difference.

The core practices of Agile are as follows [AgPr10]:

1. **Active Stakeholder Participation.** An expansion of eXtreme Programming's On-Site Customer which describes the need to have on-site access to users that have the authority and ability to provide information pertaining to the system being built and to make pertinent and timely decisions regarding the requirements, and prioritization thereof. This practice assumes that project stakeholders – including direct users, their management, senior management, operations staff, and support (help desk) staff – are actively involved in the project. This includes making timely resourcing decisions by senior management, public and private support for the project by senior management, active participation of operations and support staff in the development of requirements and models pertaining to their respective areas.
2. **Model With Others.** When one man models with a purpose he often finds out that he is modeling to understand something, that purpose of modeling is to communicate ideas to others, or that he is seeking to develop a common vision on the project. This is a group activity, in which every person involved wants the input of several other people working together effectively in order to create the core set of models critical to the whole project. For example, to develop the metaphor or architecture for the system, someone will often need to model with a group of people to develop a solution everyone agrees on as well as one that is as simple as possible. Most of the time the best way to do this is to talk the issue through with one or more people. Modeling with others is an example of “Non-Solo Development”, as is pair programming.
3. **Apply The Right Artifacts.** Each artifact has its own specific applications. For example, a UML activity diagram is useful for describing a business process, whereas the static structure of the database is better represented by a physical data or a persistence model. Very often a diagram is a better choice than just source code. The implication is that the developer team needs to know the strengths and weaknesses of each type of an artifact in order to apply them properly or to not apply at all. This can be very difficult because a developer team often has Multiple Models available.
4. **Iterate To Another Artifact.** When someone is working on a development artifact – such as a use case, CRC card, sequence diagram, or even source code – and finds that is stuck then he should consider working on another artifact for the time being. Each artifact has its strengths and weaknesses, each artifact is good for a certain type of job. Any obstacles during work on one artifact should be treated as sign of necessity to iterate to another artifact. By it-

erating to another artifact the developer immediately becomes able to act again and to make progress in terms of the whole work. Furthermore, changing the developer's point of view can help him to find out what caused him to be stuck in the first place.

5. **Prove It With Code.** A model is an abstraction, one that should accurately reflect an aspect of whatever has to be built. In order to determine whether a model will be working, it should be proved with the code. It means that it should be coded and tested using a given input set of data. Then the resulting interface should be presented to the users for feedback. Such tasks (amongst other things) should be performed continuously in each iterations of development.
6. **Use The Simplest Tools.** The vast majority of models can be drawn on a whiteboard, on paper or even the back of a napkin. Whenever someone wants to save one of these diagrams he can take a picture of it with a digital camera, or even simply transcribe it onto paper. This works, because most diagrams, are throwaways; their true value comes from drawing them to think through an issue, and once the issue is resolved the diagram does not offer much value. As a result a whiteboard and markers are often the best modeling tool alternative: Use a drawing tool to create diagrams to present to important project stakeholders and occasionally use a modeling tool if and only if they provide value to programming efforts such as the generation of code.
7. **Model In Small Increments.** Incremental development in which a larger effort is organized into smaller portions that could be released over time, hopefully in increments of several weeks or a month or two, increases the agility of the development process by enabling to deliver software to the end users faster.
8. **Single Source Information.** Information should be stored in one place and one place only. In other words, not only the right artifact should be applied, also a concept should be modeled once and once only, storing the information in the best place possible. One person involved in modeling should always be asking the questions: "Do I need to retain this information permanently?", "If so, where is the best place to store this information?", and "Is this information already captured elsewhere that I could simply reference?". Sometimes the best place to store information is in an agile document, often it's in source code.
9. **Collective Ownership.** Every member of the development team can work on any model, and in fact any artifact on the project, if he needs to.
10. **Create Several Models in Parallel.** Because each type of a model has its strengths and weaknesses no single model is sufficient for given modeling needs. For example, while exploring requirements, one man may need to develop some essential use cases or user stories, an essential UI prototype, and some business rules.

In combination with the practice of iterating to another artifact agile modelers will often discover that they are far more productive working on several models simultaneously than if they are only focusing on one at any given time.

11. Create Simple Content. The actual content of created models – requirements, analysis, architecture, design – should be kept as simple as possible while still fulfilling the needs of project stakeholders. The implication is that there should not be added any additional aspects to models created unless they are justifiable. This is along the lines of XP's practice of Simple Design.
12. Depict Models Simply. While considering the potential diagrams that could be applied (UML diagrams, user interface diagrams, data models, and so on) developers quickly realize, that the majority of time they require only a subset of the diagramming notation available in the toolset. A simple model that shows the general structure of the modeling solution, perhaps a class model depicting the primary responsibilities of classes and the relationships between them, often proves to be sufficient.
13. Display Models Publicly. Created models should be displayed publicly, often on something called a “modeling wall” or a “wall of wonder”. This supports open and honest communication on the development team because all of the current models are quickly accessible to every member, as well as to the project stakeholders. A modeling wall is a place where all models and design concepts are posted for everyone to see. Such a wall may be physical, perhaps a dedicated whiteboard for architecture diagrams or just a place for taping the printouts of physical data model. Modeling walls can be virtual, such as an internal Web page that is updated with scanned images.

Conclusion

The aforementioned practices of Agile development are a general set of advises for use in IT systems design and development. The effective delivery and implementation of usable software require to conform to Agile practices and principles of UCD as well. This is particularly true in order to keep the project properly aligned with the needs of users. It may be seen that given lists of Agile practices and UCD principles are complementary and very close in many points. Especially that is true regarding active user participation and the necessity to use the simplest design representation possible. Although there is no guarantee that acting according to Agile practices alone can lead to the creation of usable software in terms of UCD definitions, but keeping the development process aligned with the two given lists should be effective.

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AGILE DEVELOPMENT W KONTEKŚCIE USER-CENTERED SYSTEM DESIGN

Streszczenie

W artykule zaprezentowano zasady projektowania wymagane podczas tworzenia oprogramowania najbardziej użytecznego dla odbiorcy końcowego. Skonfrontowano te zasady z praktykami Agile. Zdaniem Autora postępowanie zgodne z obiema podanymi listami wytycznych podczas modelowania, projektowania, kodowania i testowania oprogramowania, powinno prowadzić do tworzenia systemów możliwie najbardziej użytecznych dla odbiorców końcowych.

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PROBLEMS WITH THE ASSESSMENT OF WEB ACCESSIBILITY OF PUBLIC ADMINISTRATION OFFICES

Introduction

Companies use the World Wide Web to promote their products and services in various ways. Some firms employ it only to a minimum extent, whereas others devote vast amounts of money to Internet promotion. The most popular form of company's promotion is creating its own website, mostly to present its products/services and the most important information about a company and its offer. There is a slight difference in the way how public administration offices use their website. Their major task is to inform local community about the region's current events and assist in providing inhabitants of a given area with specific services. Regardless of the purpose of a given website, it should look nice, be functional and accessible. However, the objective assessment of website design, functionality and accessibility poses serious problems; in particular, the assessment of website accessibility seems to be highly difficult.

1. What does web accessibility mean?

At the beginning of 1990s Pearrow together with Molich [Pear02] prepared the list of 10 principles of website heuristics. Although these rules still apply today, due to the rapidly changing technology they are not always sufficient. Webmasters most often pay attention to two first WWW features, i.e. nice design and functionality ignoring the importance of website's accessibility. The number of characteristics comprising the feature of functionality is rather high analysing the publications of Nielsen [Niel06], Pearrow, Zeldman [Zeld07], whereas website design depends on the webmaster's graphical skills and the taste of its users. In the majority of cases design is the most widely discussed and analysed ele-

ment while designing a website. On the contrary, website's accessibility is the most underestimated element, often ignored or introduced in a limited scope. Whereas website's accessibility can be unappreciated in company's websites with small number of visitors, in case of public administration offices their websites have to take into consideration the needs of the disabled and fulfil the appropriate criteria.

Web Accessibility is the domain concerning the interaction between a human being and a computer devoted to the issue of designing websites and Internet services available to the widest possible range of receivers, including the disabled in particular [Wiki11]. The accessibility of an Internet service means the level a website can be perceivable, understandable and viewable by all users regardless of their characteristics or impairments, as well as software and hardware they use.

2. Web accessibility – legal framework

The binding regulation in USA is the Rehabilitation Act, which „Section 508” [Sect11] obliges public institutions to ensure accessibility of information and electronic services. In the European Union by the eEurope 2002, eEurope 2005 and i2010 (European Information society in 2010) Directives public administration of every Member State is required to provide accessibility of its services without discrimination of users.

The obligation of compliance with law on non-discrimination of the disabled in the access to public information was also the subject of the court proceedings in Canada. On 29th November 2010 the Canadian court by its decision obliged authorities to adjust government Internet services to the requirements of the Charter of Rights and Freedoms within 15 months. It all began, when Donna Jodhan, who was blind, could not fill in the electronic form to apply for a job in public administration [Wagl11].

Although in Poland no domestic legal act obliges institutions directly to meet the accessibility standard, there are regulations concerning the citizen's equal right to public information without discrimination in any way, including performance status. They include art. 32 and 69 of the Constitution of the Republic of Poland, the Act on Access to Public Information on 6th September 2001, the Act on activity informatisation of entities performing public tasks on 17th February 2005 and the Chart for the Disabled Rights on 1st August 1997. However, recently on 16th May 2012 the Official Journal published the Regulation of the Council of Ministers on 12th April 2012 on the National Interoperability Framework, which determines the minimum requirements for public registers and information exchange in electronic form, and ICT systems

[Regu12]. It constitutes a breakthrough in regulation of the IT infrastructure of public administration, including web accessibility. The regulation requires all entities performing public tasks such as ministries, voivodeship offices, marshal offices, city halls and municipality halls, etc. to adjust their WWW services to the AA Conformance level of the WCAG 2.0 standards determined in the Appendix 4 to the aforementioned regulation.

3. WCAG Standard

The institution in charge of the accessibility standard providing adequate guidelines a website should meet is the W3C consortium. The current recommended version of the web accessibility standard is the Web Content Accessibility Guidelines 2.0 [WCAG11].

The WCAG 2.0 guidelines are focused on 4 principles:

- Principle 1 – Perceivable (i.e. all content has to be presented in such way that users can perceive it);
- Principle 2 – Operable (i.e. User interface components and navigation have to be operable);
- Principle 3 – Understandable (i.e. content and navigation have to be clear and understandable);
- Principle 4 – Robust (i.e. website's content should be robust enough to work with user's current and future software).
- The significant elements of this standard are the conformance levels called also priorities in other sources [WCAG¹1]:
- Level A (Level 1, Priority 1) means that a webmaster has to fulfil its criteria. Otherwise, one or more groups of people will encounter difficulties in getting access to information in a given document;
- Level AA (Level 2, Priority 2) means that a webmaster should fulfil its criteria;
- Level AAA (Level 3, Priority 3) means that a webmaster may fulfil its criteria.

4. The assessment of website accessibility – general issues

The problems with web accessibility are not recognised by Internet users with no impairments or disorders who use standard browsers. Such users constitute the vast majority of the people browsing websites most often. Problems with web accessibility occur in the group of people, who use non-standard tools for browsing WWW content.

These difficulties are highlighted in the documentary prepared by Janmedia [Janm11], where the blind person, a student and network administrator at the same time, talks about advantages of the Internet for the disabled and the problems with access to website content.

Many an article have been written about the web accessibility problems in Poland and all over the world providing accessibility analysis of a selected website or a group of websites [ThRe03]. For this purpose one applied various research methods starting from observation and interview with the blind people using such screen readers as JAWS [JAWS11] or WindowsEyes [Wind11], by appliance of validators of the website source code correctness ending with opinions of independent experts designing websites [WBBW10]. Experts mainly examined if certain elements enhancing website's accessibility were present [FuWi11], [KaKe07].

The research carried out by Chmielarz demonstrates that objective assessment and ranking of websites is not as simple as it seems to be [Chmi08]. For small sample of websites the best results were provided by AHP, the method of Saati [Saat99]. For larger number of website the best and simplest solution is a grading system for specific elements of the websites investigated by experts.

The assessment of a website proves to be quite challenging task although there are number of competitions for the best website [Inor11]. Quite often the criterion of accessibility is treated as a part of functionality; therefore, the number of accessibility features is restricted or lost in the vast quantity of functionality elements.

In spite of the fact that the large number of the same features affects website's accessibility and functionality, the author is of the opinion that accessibility and functionality should be separated. Web accessibility is particularly important for the disabled. In general assessment, where accessibility is only a narrow part of it, shortages in this respect may not be highlighted clearly enough.

5. The assessment of accessibility of the websites of the cities associated in GZM – methodology

The pre-research of the accessibility of the websites of the city halls associated in the Upper Silesian Metropolitan Union (GZM) was carried out in May and June 2011. The research covered 14 website of the city halls belonging to GZM.

One applied one's own scoring method assessing the accessibility of the websites of the selected city halls divided into 4 stages:

1. The analysis by means of the online XHTML Markup Validation Service validator [VW3C11].
2. The analysis by means of the TotalValidator 6.12 accessibility validator [VTOT11].
3. The analysis by means of the Fujitsu Web Accessibility Inspector 5.11 accessibility validator [VWAI11].
4. The analysis of the selected technical solutions improving web accessibility according to WCAG 2.0 guidelines [WCAG11].

Table 1

The addresses of the websites of the GZM city halls

Id.	City	Website
1	Bytom	http://www.bytom.pl/
2	Chorzów	http://www.chorzow.eu/
3	Dąbrowa	http://www.dabrowa-gornicza.pl/
4	Gliwice	http://www.gliwice.eu/
5	Jaworzno	http://www.jaworzno.pl/
6	Katowice	http://www.katowice.eu/
7	Mysłowice	http://www.myslowice.pl/
8	Piekary	http://www.piekary.pl/
9	Ruda	http://www.rudaslaska.pl/
10	Siemianowice	http://www.um.siemianowice.pl/
11	Sosnowiec	http://www.sosnowiec.pl
12	Świętochłowice	http://www.swietochlowice.pl/
13	Tychy	http://umtychy.pl/
14	Zabrze	http://www.um.zabrze.pl/

Source: Own elaboration (15th June 2011).

In the first three stages of the website assessment by validators one decided to examine one selected webpage in the investigated services with respect to errors. The assessment of homepage only would not bring satisfactory results due to the fact that for the most examined services homepage served only for navigation purposes directing to specific thematic blocks of a service (e.g. for citizens, tourists, entrepreneurs, etc.). Additionally, the author decided to conduct the research with regard to the highest accessibility level defined in WCAG 2.0 standard (Fig. 1).

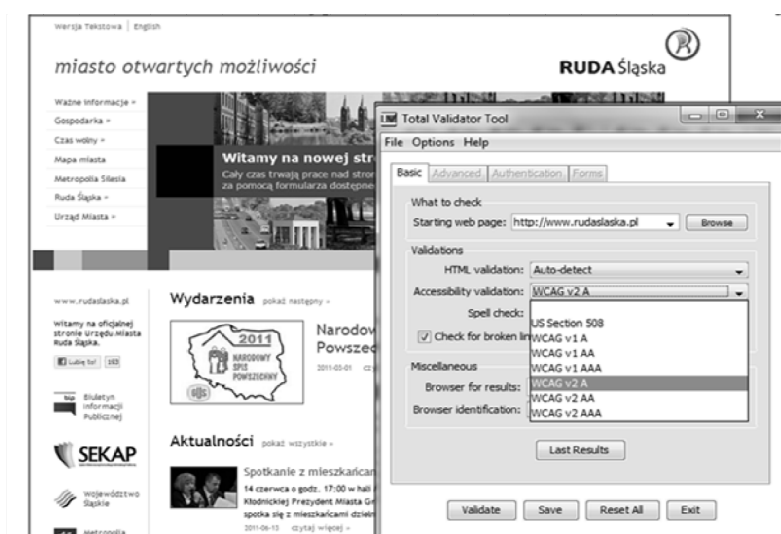


Fig. 1. Total Validator Tool – configuration of the application

Source: Own elaboration (June 2011).

The problem the author encountered for every validator (Fujitsu Web Accessibility Inspector 5.11 and Total Validator) was how to take into consideration and unify of the number of errors detected and comments (Fig. 2).

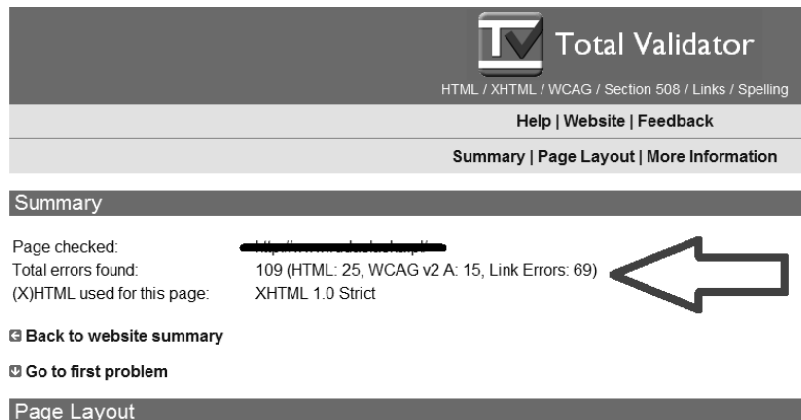


Fig. 2. Total Validator Tool – results of the application

Source: Ibid.

The forth stage consisted in the examination whether the investigated services include the 6 selected elements: search engine, font magnification, contrast increase, contact form, choice of language, and site map. Due to the fact that some elements were present in limited form (e.g. choice of language), one applied the following scores and the corresponding verbal grading scale (1 – very good, 0.75 – good, 0.5 – average, 0.25 – satisfactory, 0 – poor or lack of a given element).

Those 6 aforementioned elements were selected among wide group of components improving website accessibility. The selection process involved interviews with webmasters, author's own experience from the previous studies of the thematic website assessment [ZdZd10] and the WCAG 2.0 standard requirements.

6. The research results

Taking into consideration the subjectivism of the assessment and the changeability of city halls' websites one decided not to rank websites from the best to the poorest ones. Such ranking could be unjust and non-objective. The purpose of the research was to select the best websites meeting the requirements of web accessibility and analyse various methods and tools for the examination of accessibility of the websites of public administration offices.

During the first stage, the websites were subjected to the analysis of source code by means of the most popular validator, i.e. Markup Validator (validator.w3.org). According to the results, the increased number of errors was demonstrated in 5 out of 14 investigated websites (Fig. 3).

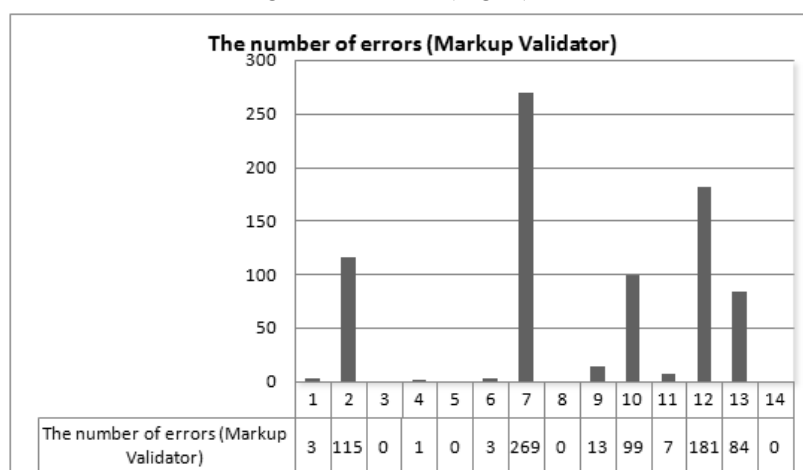


Fig. 3. The number of errors of the investigated webpages according to Markup Validator (validator.w3.org)

Source: Ibid.

Having assessed the websites with another validator for the purpose of the web accessibility assessment according to the level A of the WCAG 2.0 standard, it turned out that 7 out of 14 services showed relatively similar level of errors, whereas only one of them demonstrated surprisingly high number of errors (Fig. 4). Another interesting thing was that according to this validator, no service fulfilled all requirements of the level A of the WCAG 2.0 standard.

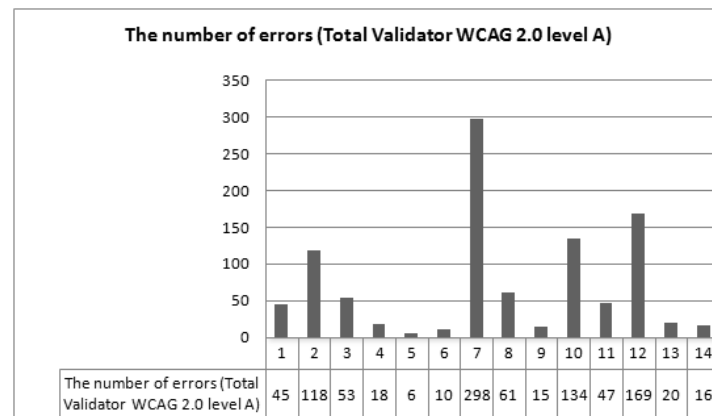


Fig. 4. The number of errors of a webpage in Total Validator WCAG 2.0 level A

Source: Own elaboration (June 2011).

Another validator applied in the research for the indication of errors and comments was Fujitsu WAI 5.1.1. To standardise the value of errors and comments, the author assumed that a comment constitutes 0.5 of the value of an error. In the analysis 8 services demonstrated low number of errors and comments. And, similar to the above, no service fulfilled all criteria of the level A of the WCAG 2.0 standard.

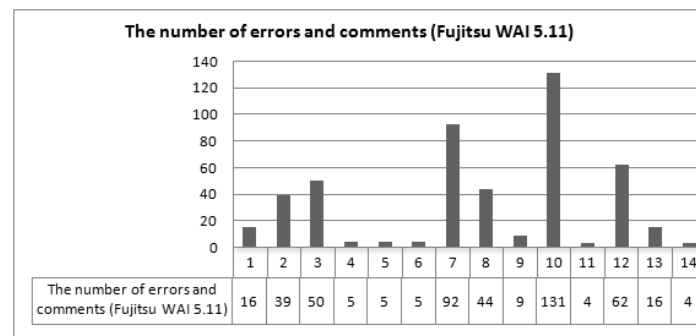


Fig. 5. The number of errors and comments (webpage) in Fujitsu WAI 5.11

Source: Ibid.

The results obtained by three validators enabled the author to undertake scoring of the selected services on the basis of the number of errors detected. One distinguished the following criteria presented in Table 2.

Table 2

Criteria of scoring on the basis of the number of errors detected

The number of V1 errors (Markup Validator)	The number of V2 errors (Total Validator)	The number of V3 errors (Fujitsu WAI 5.11)	Score	Verbal grade
(0-10)	(0-20)	(0-10)	1	Very good
(11-20)	(21-40)	(11-20)	0.75	Good
(21-40)	(41-80)	(21-40)	0.5	Average
(41-60)	(81-120)	(41-60)	0.25	Satisfactory
(over 60)	(over 120)	(over 60)	0	Poor

Source: Ibid.

On the basis of the score list the author decided to indicate 3 services demonstrating definitely too many errors and 4 services with low number of errors in all stages which received “very good” grade (Fig. 6).

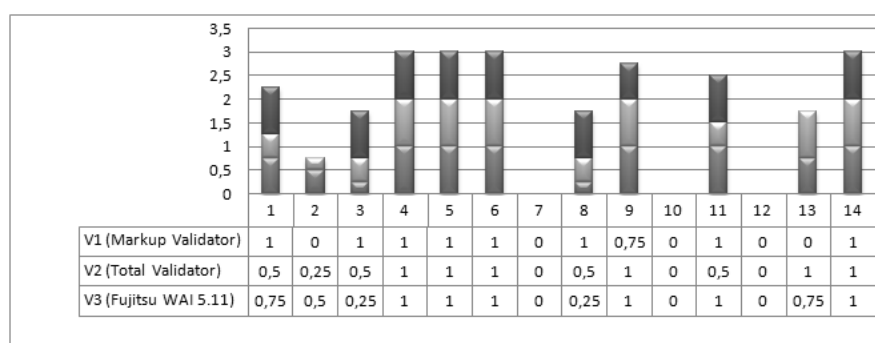


Fig. 6. The list of scores

Source: Ibid.

In the next stage the author collected all results concerning the presence of the 6 selected elements of a website affecting its accessibility. Each element was assessed by the following grading scale: 1 – very good, 0.75 – good, 0.5 – average, 0.25 – satisfactory, 0 – poor or lack of a given element with respect to its correctness level (Fig. 7).

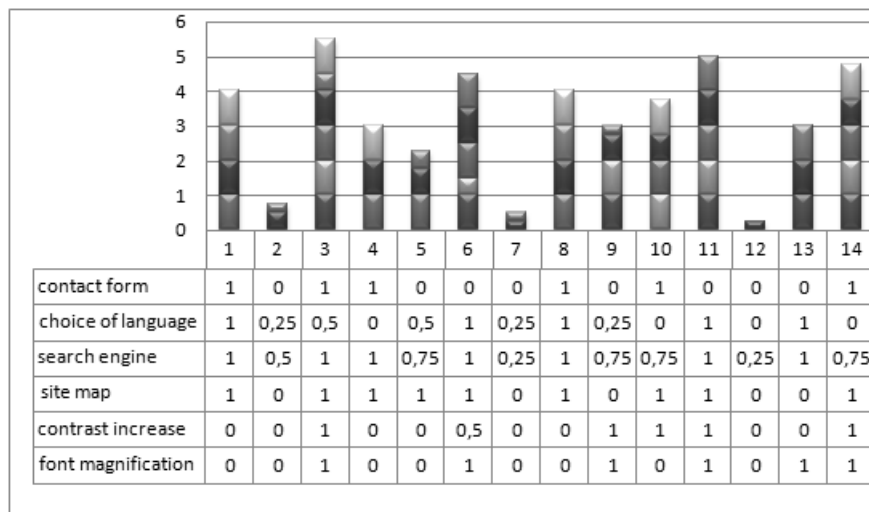


Fig. 7. The assessment of the selected website's elements affecting web accessibility of the investigated 14 websites (June 2011)

Source: Ibid.

After summing up the results it turned out that no service fulfilled all criteria determined by the author concerning the web accessibility in 100% (Fig. 8).

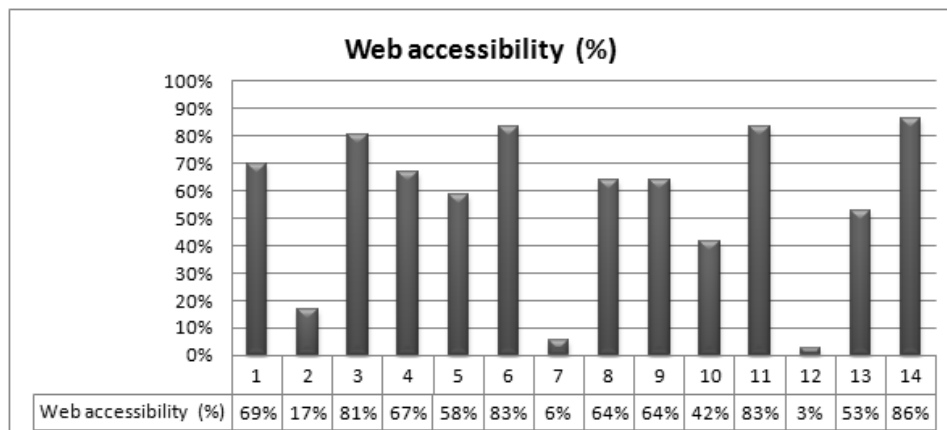


Fig. 8. The results of the pre-research on the assessment of the web accessibility of the websites of the 14 city halls associated in GZM on the basis of selected criteria

Source: Ibid.

The three services among the selected city hall websites presented very low level of web accessibility (over 20%); they hardly meet any accessibility criteria and should be reconstructed diametrically.

On the contrary, four services stand out positively due to their high level of web accessibility (over 80%) constituting benchmarks for others. These are:

- Dąbrowa Górnicza City Hall – <http://www.dabrowa-gornicza.pl>,
- Katowice City Hall – <http://www.katowice.eu>,
- Sosnowiec City Hall – <http://www.sosnowiec.pl>,
- Zabrze City Hall – <http://www.um.zabrze.pl>.

The rest of the investigated services need further examination to adjust them to the WCAG 2.0 standard at the defined and socially acceptable level.

Conclusion

It is not possible to expect that every website of a public administration entity will be perfectly and faultlessly designed with respect to web accessibility. Nevertheless, some practical requirements concerning web accessibility should be defined and incorporated, in particular by public administration offices.

The pre-research of web accessibility of the websites of the city halls associated in the Upper Silesian Metropolitan Union presented above illustrates the problem of the selection of tools and methods for the reliable assessment. The appliance of validators could serve only as a secondary method. The research shows that the validator results may differ depending on the producer. On the contrary, the analysis of each website separately with respect to all accessibility guidelines and standards is a time-consuming and tedious task. Therefore, one needs to compromise between methods that are quick and less accurate (e.g. validator appliance) and detailed, costly and time-consuming (e.g. descriptive or expert methods). It could be a sequence method, where validators are applied in the first stage, and further some selected elements affecting web accessibility are examined by experts. On the basis of results and adopted level of accessibility (%) one will be able to determine if a given service meets the web accessibility standards and to what extent. Such method could be useful to assess and oblige rapidly developing public administration Internet services to abide by the principle of accessibility on a regular basis.

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PROBLEMY OCENY DOSTĘPNOŚCI STRON INTERNETOWYCH INSTYTUCJI ADMINISTRACJI PUBLICZNEJ

Streszczenie

Instytucje użytku publicznego i przedsiębiorstwa komercyjne w różnym stopniu wykorzystują Internet w swojej działalności. Jedne angażują się w to medium w stopniu minimalnym, a inne przeznaczają na promocję w nim ogromne ilości środków finansowych. Najbardziej popularną formą wykorzystania Sieci jest stworzenie własnej witryny internetowej. Niezależnie od przeznaczenia danej witryny internetowej powinna ona być ładna, funkcjonalna i dostępna. Dokonanie obiektywnej oceny witryn internetowych instytucji administracji publicznej, a w szczególności stron WWW urzędów miejskich pod względem tych trzech kryteriów nie jest proste. Wyraźne niedostatki odczuwalne są zwłaszcza w kwestii dostępności stron WWW. Dlatego celem artykułu stała się analiza metod i problemów oceny stron internetowych pod względem dostępności. W pierwszej części artykułu skupiono się na przybliżeniu pojęcia dostępności stron internetowych i jej znaczeniu dla osób niepełnosprawnych. Poruszono również aspekty prawne obowiązujące w Polsce i na świecie w obszarze dostępności e-usług. Określono kryteria wpływające na dostępność według obowiązującego na świecie standardu WCAG 2.0. W drugiej części artykułu przeprowadzono ocenę dostępności stron internetowych urzędów miejskich zrzeszonych w Górnośląskim Związku Metropolitalnym. Badaniu poddano strony internetowe 14 urzędów miast. Wykorzystano własną punktową metodę oceny dostępności stron internetowych urzędów miejskich. Metoda ta była 4-etapowa i w jej skład wchodziły: analiza validatorem online XHTML Markup Validation Service, analiza validatorem dostępności TotalValidator 6.12, analiza validatorem dostępności Fujitsu Web Accessibility Inspector 5.11, analiza występowania wybranych rozwiązań technicznych poprawiających dostępność według zaleceń WCAG 2.0. Na podstawie dokonanej analizy oraz przeprowadzonych badań przedstawiono we wnioskach najważniejsze problemy związane z wiarygodną i rzetelną oceną dostępności stron internetowych instytucji administracji publicznej.

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INTEROPERABILITY OF UBIQUITOUS SYSTEMS WITH THE USE OF SOFTWARE AGENTS

Introduction

The need to develop IT systems for devices that surround us in our everyday life gives rise to the necessity of creating software that would possess properties exceeding those seen in currently built solutions. When driving a car, using domestic appliances or communicating through mobile devices, we make choices that define our preferences. The lack of integration of the devices that we use is the reason why we do not feel the consequences of the decisions that we make in terms of such devices' ability to gather information about us. Consequently, such solutions will become more intelligent and capable of gathering information about the actions taken by the user, as well as facilitating profiling his/her behavior.

For that to be possible, it is necessary to develop solutions that, on the one hand, will enable interoperability of different technologies, and on the other hand, will have mechanisms of artificial intelligence allowing automatic processing of the knowledge possessed. Such solutions may be software agents, which have applications in the concept of ubiquitous processing.

One of the trends in the development of agent technologies is a process approach, which allows modeling processes taking place in multi-agent systems. This approach makes it easier to define business scenarios for using these solutions and to define desirable states of the system, also in the context of using them in ubiquitous systems.

The aim of this paper, to analyze the possibilities of using software agents in the construction of ubiquitous systems. The first section deals with theoretical issues concerning the development of ubiquitous systems. The second section presents concepts of agent technologies relating to their application in ubiquitous systems and interoperability. The third section contains a review of IT solutions supporting the construction of multi-agent systems process approach.

1. Development of the concept of ubiquitous systems

The technological development of devices used by a human being is connected with the increasing computing power of such devices. The term Ubiquitous System was first used by Mark Weiser in 1988 [Weis99]. He foresaw this kind of systems to enhance “(...) computer use by making computers available throughout the physical environment, while making them effectively invisible to the user”. Devices using various kinds of computing units are more and more often perceived as solutions that can work with each other and co-process data. In the development of the concepts of application and integration of devices to ensure better support for the user, we can distinguish the following research trends [SZZK12]:

1. **Ubiquitous Computing** – presumes the use of technological solutions surrounding a human being to support his/her activities, assuming that they work together in this process. In particular, this concept refers to the use of constantly increasing computing powers of devices. The assumptions of ubiquitous computing involve the necessity of referring to the aspect of integration of elements of a system, devices and the context of their operation.
2. **Ubiquitous Communications** – research in this area concentrates on the aspect of communication between devices and sharing resources. In the literature, it most often refers to the use of sensors monitoring the environment.
3. **Intelligent user interface** – intelligent user interfaces are designed to facilitate the process of communication with the system through the use of artificial intelligence mechanisms and adaptation to the context of the user's operation in the system. Examples of such solutions include interfaces using software agents.
4. **Ambient Intelligence** – is a trend that presumes creation of user-oriented solutions that support user activities by making contextually sensitive data available to him/her. Such solutions are characterized by self-organization, auto-adaptation, and contextuality in terms of processes they support, which allows them to automate the work of a human being and adjust their actions to the profile of his/her behavior by gathering resources of knowledge about the environment and tasks they were entrusted with.

Due to the variety of used technological solutions, the application of such solutions requires indicating technologies that can facilitate interoperability of heterogeneous solutions on the one hand, and techniques and methods supporting the designing and construction of the system's logic on the other hand.

From the point of view of the concepts presented, the main issues that must be considered in creating ubiquitous systems [QuZa08] include the management of the continuity of the whole system's operation, reconfigurability, that is system's ability to adjust to the change of its structure without a human being's direct intervention, contextuality, which is connected with adjusting the processes performed by the system to the operation context and user's profile, heterogeneity, which is connected with technological variety of devices and variety of methods of their communication, and scalability, which results from the comprehensiveness of processes and the number of devices involved in supporting them.

The problems presented indicate that there are various issues connected with building ubiquitous systems. One of the solutions that support modeling the architecture of such systems may be a process approach, which allows easily defining the system structure and sequence of interoperability of individual devices. In particular, in the case of using software agents as an element of programming.

2. Application of software agents for the purpose of the interoperability of IT systems

The use of process approach in modeling the structure of a system that uses software agents requires looking at the process of building such a solution as consisting of several layers. In the case of solutions connected with the concept of ubiquitous computing, technological, and software diversity of solutions to be integrated makes it necessary to indicate standards that will be used in the process of building them.

However, a key issue that must be explored here is passivity of currently used solutions in the form of mobile devices, communication protocols and web services. From the point of view of building complex systems that ensure co-processing and self-organization, it is crucial to create solutions characterized by a greater autonomy connected with the requirements of self-management, reconfigurability, contextuality, heterogeneity, and scalability. Solutions that can be used here are multi-agent systems, that thanks to autonomy, proactivity, and adaptability indicated in the literature can be used in the process of building such solutions.

The use of agent technologies will make it easier to integrate distributed devices as part of business processes in which a human being participates, dynamically specify processes with their participation, codify such processes as part of the concept of composite software and obtain new knowledge about processes and entities that participate in them.

In order to ensure interoperability in such systems, it is necessary to move from a business model, which aim is to define the significance of connection of devices in the context of the resulting business objective to a technical model that allows using appropriate IT solutions supporting a given business process and ensuring that individual technical solutions work together. A layered division of models from the perspective of their technical orientation has been shown in Fig. 1.

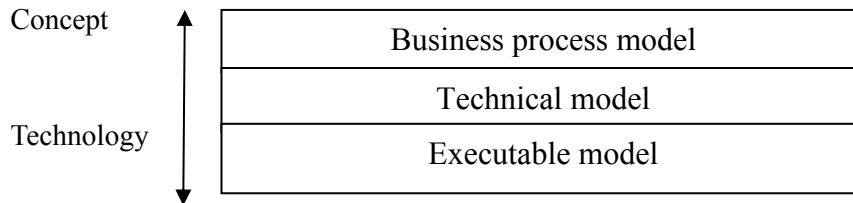


Fig. 1. Proposal of a layered view of modeling business processes with the use of agent technologies in ubiquitous systems

Source: Own research.

From the point of view of developing a technical solution, it is also necessary to refer to an executable model related to the course of communication between devices, where using appropriate standards and multi-agent platforms agents exchange messages following defined patterns.

Supporting interoperability using software agents is also visible in virtual organizations, where the dynamics of changes in the connections among business partners is also high. It is particularly important in the case of an application of heterogeneous IT systems of business partners. The challenges that occur in B2B interactions include [LiGo10]:

- an organization's autonomy, which means that activities, tasks and decisions taking place in an organization should be hidden from the environment,
- an integration of various business processes taking place in the environment as part of own processes,
- a direct integration of management IT systems without the use of intermediary solutions that can impact the exchange of data.

From the point of view of the interoperability of systems, we should indicate a few aspects, which must be considered during building a given system. They include technical, syntactic, semantic, and pragmatic interoperability.

In the case of the technical interoperability, it is necessary to specify the applied technology in the form of the communication among the system elements. In this case, it is necessary to use solutions that enable easy integration of busi-

ness processes taking place among individual partners. From the point of view of modeling business processes in BPMN, it comes down to defining specific actors and indicating the places where messages are exchanged between the processes taking place in them. However, from the technological perspective, it is necessary to clearly define the technical devices that may be applied. In this case, BPMN allows defining tasks of a service type, showing that a given task can be performed through the use of a web service.

A requirement of the syntactic interoperability reaches a consensus in the format of data exchange. In this case, it is possible to use the generally applied standards, e.g., in the form of SOAP (Simple Object Access Protocol) that allows transferring calls of remote components of web services or in the scope of agent technologies, communication languages in the form of the FIPA standard. SOAP alone only specifies a standard for calling remote services without defining the semantics of a transmitted message. Thus, it is also necessary to refer to the semantic interoperability.

The semantic interoperability concerns understanding the messages used while the system elements work together. The use of software agents as the element defining the system logic allows using ontology as the element defining the meaning of specific messages. In this case, it is possible to use such standards as OWL, RDF, RDFS, which allow a much greater expressiveness of the message than XML, which is the basis of SOAP.

The use of the process approach and the SOA concept supports all four layers of interoperability and, as has been shown, the application of agent technologies in this area allows using modern solutions that increase system's functionality. The use of these solutions may lead to the development and popularization of the concept of ubiquitous systems.

3. Review of selected issues

From the point of view of modeling the technical layer of a system based on agent technologies, the currently used solutions involve the application within a given multi-agent platform of the appropriate solutions supporting their integration with the existing business processes. In the area of building and modeling web services in multi-agent systems, we can indicate a range of IT solutions, including:

1. **The Nuin agent platform** [ChuLa02] – a JAVA based solution, which uses the BDI approach in modeling the architecture of agents. In this solution, agents use own interaction mechanisms, however they are also able to use web services delivered by external suppliers. Current research on this platform aims at adding the support of the OWL-S standard.

2. **JASE** [DiWo05] (Java-based Agent-oriented and Service-oriented Environment) – this JAVA-based solution connects agent technologies with web services. The main task of this solution is separating the application from resources, which in accordance with the assumptions should be delivered by a services-oriented software agent.
3. **VSDT (Visual Service Design Tool)** [KuHe08] – a tool that supports designing business processes in BPMN, which allows converting it into the technical version of BPEL. Current works on this platform aim at making it possible to use the JIAC multi-agent platform in modeled processes [KLHH10].
4. **The framework for Rapid Prototyping of SOA** [ZBEFV05] – an extension of JACK platforms, which allows modeling web services as part of BDI agents. Plans of operation of BDI agents may in this case be represented as workflows, where specific tasks are performed using web services. At the same time, web services may be published here to be used by external systems.
5. **WSIG (JADE WEB SERVICES INTEGRATION GATEWAY)** [Gre05] – an addition to the JADE platform. Integration of this type of multi-agent platform enables quick conversion of messages in ACL into WSDL format and the other way round, which makes it easier to integrate a multi-agent system as part of web services. Thanks to defining standardized interfaces in the communication of a multi-agent system with the environment, such solutions can be more easily connected as part of existing business processes.
6. **WADE (Workflows and Agent Development Environment)** [CGB08] – supports defining the architecture of a multi-agent system based on the ability to define the workflow of individual agents and manage the whole process. An element of the WADE platform is WOLF – which is a plug-in to the Eclipse platform and supports the process of designing and implementing a multi-agent system.
7. **The Agent Modeling Language (AML)** [CTC05] – is a language of semiformal modeling of multi-agent systems. One of its capabilities is modeling web services as part of the architecture of a multi-agent system. It allows modeling a two-way communication between an agent and a service. However, it does not possess mechanisms supporting the implementation of a designed system.

The solutions mentioned above support a process modeling of a multi-agent system in designing the system's architecture and in its implementation, and may be applied in creating ubiquitous systems. Their application supports defining a business context of the working together of individual devices as well as a technical and executable model specifying principles for individual technical devices working together.

Conclusion

The concepts of using a process approach in building IT solutions, presented in the paper, in particular in creating IT systems based on agent technologies, require, as has been shown in the paper, a comprehensive presentation of not only the structure of an IT solution, but also the business process it is to support.

The three-layer view of an IT system's process modeling with the use of multi-agent systems requires first of all examining the model of the business process itself, which can be designed using currently applied design notations. Thanks to the currently used solutions based on a business process model, it is possible to create process oriented software ensuring interoperability of devices as part of the concept of ubiquitous processing.

Summing up, it can be stated that using the process approach in building a multi-agent system requires a broad look at the architecture of such a system in the context of its environment. It is especially important in the applications of software agents in the theory of ubiquitous agents and related necessity of interoperability of different technical solutions.

Thanks to the use of software supporting the use of the process approach in building software agents, as indicated in the paper, a multi-agent system can be treated as an element of the business process. Then it can be viewed as a participant of the process, constituting an element of the software of a technical devices, proactive web service or, thanks to a certain internal logic, it can oversee the process of different devices working together.

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INTEROPERACYJNOŚĆ SYSTEMÓW WSZECHOBCNYCH Z ZASTOSOWANIEM AGENTÓW PROGRAMOWYCH

Streszczenie

Potrzeba rozwoju systemów informatycznych w zakresie urządzeń otaczających człowieka w życiu codziennym, prowadzi do konieczności tworzenia oprogramowania, które posiadałoby cechy wykraczające poza te, jakie można spotkać w obecnie budowanych rozwiązaniach. Jadąc samochodem, używając urządzeń gospodarstwa domowego, komunikując się za pomocą urządzeń mobilnych, dokonujemy wyborów, które określają nasze preferencje. Brak zintegrowania stosowanych urządzeń powoduje, iż nie odczuwamy konsekwencji podejmowanych decyzji w zakresie możliwości zbierania przez nie informacji na nasz temat. W konsekwencji rozwiązania te będą dysponować możliwością zbierania informacji na temat podejmowanych działań przez użytkownika oraz wspierać profilowanie jego zachowań.

Aby było to możliwe, konieczne jest opracowanie rozwiązań, które zapewnią możliwość z jednej strony interoperacyjności różnych technologii, a z drugiej będą posiadać mechanizmy sztucznej inteligencji, pozwalające na autonomiczne przetwarzanie posiadanej wiedzy. Rozwiązaniami takimi mogą stać się agenci programowi znajdujący swoje zastosowanie w koncepcji przetwarzania wszechobecnego.

Jednym z nurtów rozwoju technologii agentowych jest podejście procesowe, pozwalające na modelowanie procesów zachodzących w systemach wieloagentowych. Dzięki temu podejściu możliwe staje się łatwiejsze definiowanie scenariuszy biznesowych dla zastosowania tych rozwiązań oraz określenie pożądanych stanów systemu, także w kontekście wykorzystania ich w systemach wszechobecnym.

Celem niniejszego artykułu jest analiza możliwości zastosowania agentów programowych w budowie systemów wszechobecnym. W tym celu w punkcie pierwszym ukazano elementy teoretyczne dotyczące rozwoju systemów wszechobecnym. W punkcie drugim wskazano koncepcje technologii agentowych, dotyczące problematyki ich zastosowania w systemach wszechobecnym oraz interoperacyjności. Punkt trzeci ukazuje przegląd rozwiązań informatycznych wspierających budowę procesowo zorientowanych systemów wieloagentowych.