

THE RESEARCH ON ENTERPRISE E-TECHNOLOGY

R. Malo

Received: November 30, 2011

Abstract

MALO, R.: *The Research on enterprise E-technology*. Acta univ. agric. et silvic. Mendel. Brun., 2012, LX, No. 2, pp. 197–206

Today, a lot of enterprises use e-technologies as a tool that can help to improve their efficiency and enhance their position within competitive environment. An implementation of e-technology itself depends on the needs of business, resources availability and also understanding advantages and possibilities of e-technology.

There are a few interesting questions in the given field from research's point of view. In our research, we aimed to theoretical and methodical issues of e-technologies in the context of e-business and technical support for providing and processing e-business and related e-activities. The main goal of the research is to provide a complex information platform for implementation and utilization of e-technology within enterprises.

Results of our research are based upon analysis of literature, surveys of e-business and e-technologies and own survey. In this paper, we describe especially basic information about our research, objectives, theoretical background, and selected information gained from processed survey because the research is still in the progress. Our work is a kind of contribution to exploring the current state and the importance of economic informatics and its impact to business efficiency, competitiveness and progress.

e-technology, e-activities, e-technology research, enterprise e-technology, business model

Basic ICT infrastructure, such as simple computer networks and access to the internet, has become a commodity for a majority of enterprises in all sectors. These technologies have become so widely used that they are now essential in daily business (European Commission, 2008).

Besides the basic role of ICT, its strategic potential for enabling new business models influences value chains and increasing process efficiency. In fact, increasing the efficiency of internal processes remains a key objective of ICT use. Available case studies demonstrate the potential of ICT in this regard, both for large companies and for SMEs. The cases also show that gains in efficiency tend to go hand in hand with more transparency in business processes. This facilitates planning and decision making (European Commission, 2010).

However, ICT implications are ambivalent for small and medium-sized businesses, but large enterprises can gain a disproportionate advantage

from e-business by exploiting economies of scale (European Commission, 2008).

Studies of European Commission (2008) also prove ICT are increasingly recognised as an important tool for innovation and increasing revenues by enabling new services and new ways of working within value networks. One of the most important benefits provided by new information technology and services relates to the improvement of communication and information flows. New information services foster direct and flexible communication inside and across organizations. Internet-related technologies enable both asynchronous and real-time communication, and global access to information at any time. Compared to traditional media, Internet services offer companies the possibility to quickly disseminate large volumes of information (Pérez-Valls, Ortega-Egea, Plaza-Úbeda, 2006).

These new services enabled by e-technologies are important part of "online" or "web" information

society. E-technologies are usually understood as a complex of technical and communication tools together with software applications enabling support of the electronic activities. In information society e-technology represents basic platform for building high competitiveness enterprise with possibility to impact dynamic changes on global markets. Because of this impact to business e-technologies are sometimes understood as e-business technologies.

Formal definitions used in the literature vary from technical point of view to business point of view.

Tassabehji, Wallace and Cornelius (2007) define e-technology as a new and continuously evolving platform from that an organization can exploit new opportunities and understand e-technologies as a subset of information technologies used mostly on internet.

In fact, e-technology can provide increased speed, centrality, and cost savings, thus, firms should focus the bulk of their efforts on building e-technology enhancements that benefit both parties over the long term (Kiele, 2001).

E-technology itself is defined as the architecture, technologies and components that enable and support e-business (Wei, De Boer and Chen, 2009).

The clients interviewed in the Kiele's survey (2001) indicated the following advantages:

- speed/time savings;
- centralization of data;
- cost savings;
- availability of information;
- submitting pay requests;
- receipt of topographic surveys;
- direct deposit capability;
- invoice payment capability.

However, it has to be noted that not only advantages were indicated. There are also disadvantages which are mostly interconnected with technical point of view as follows (Kiele, 2001):

- security issues;
- incompatibility issues;
- differences in stage of integration;
- loss of personal interaction;
- higher costs;
- too much reliance;
- inflated expectations;
- illusion that it is very easy to use.

Users are able to indicate all advantages and disadvantages according to own experiences with e-technologies. It means that users work with various applications. Brown and Locket (2004) proposed basic classification of these e-applications (Tab. I)

In fact, importance ICT and e-technologies is clear, e-applications are used more and more, but it is not easy for businesses to recognize a potential for

I: *Classification and examples of e-applications*

Category	Examples
Communication	E-Mail, Web access
Marketing	Web site
Productivity	Intranet, e
E-commerce	Buying and Selling on-line
Collaborative	Extranet
Enterprise	eERP
Marketplace	E-marketplaces
Collaborative enterprise	eSCM, eCRM
Collaborative platform	E-business platforms

progress support hidden in the using e-technology and e-activities. Recommendations for using e-technologies in various groups of enterprises missing and ways and means for comparing the level of e-technology utilization are a little bit low. Broadly speaking, the main objectives of our research are the analysis of the current state of e-technology utilization and preparation of the methodical framework for measuring and comparing level of e-technology or e-activities utilization to be able to claim that particular enterprise has optimal level of used e-technology or any deficiencies existing in this context.

METHODS AND RESOURCES

The basic platform for initial definition of the research on enterprise e-technologies is represented by the survey of the E-business Research Network (Verboom *et al.*, 2003). In this survey authors found basic areas of e-business research. Their survey indicated the most important from researchers' point of view (Tab. II)

We analysed results of Verboom's survey and found the main aspects can be divided into two groups:

1. business-oriented aspects;
2. technology-oriented aspects.

We adopted this idea in our research and that is why our research is aimed to e-technologies. In fact, there is strong relation between e-technologies and their business utilization and importance. We accepted e-technologies as a subset of business information technologies together with claim that e-technology has positive impact to business efficiency.

However, we didn't found relevant information about e-technology utilization within Czech enterprises, so our research is oriented to the Czech Republic. Only partial information are now available in resources offered by Czech Statistical Office (2010) and we will use this source as the secondary one for preparing the research report.¹

¹ Results of CSO are not part of this paper as our research is still not finished.

II: *Research on specific aspects of e-business (Verboom et al., 2003)*

E-Business aspects	N ²	Mean ³	SD ⁴
B2B (business to business)	191	3.14	1.27
e-business models	191	3.05	1.36
B2C (business to consumer)	187	2.93	1.32
B2B marketplaces	186	2.67	1.37
e-learning	189	2.59	1.33
electronic marketing	188	2.43	1.34
e-procurement	183	2.23	1.35
information and data management	184	2.17	1.22
B2G (business to government)	186	2.14	1.28
web site design/usability	187	2.14	1.31
B2E (business to employees)	184	2.08	1.28
internet start ups	188	2.08	1.17
intelligent agents	183	2.03	1.26
data mining	182	1.99	1.12
enterprise information portals	184	1.97	1.14
intermediation	180	1.94	1.20
corporate intranets	184	1.89	1.12
enterprise application portals	184	1.88	1.16
business integration portals	186	1.85	1.08
data warehousing	183	1.83	1.05
e-HRM	184	1.82	1.13
multi-dimensional databases	183	1.72	1.05
personal/workspace portals	184	1.67	1.00
Trusted Third Parties (TTP)	181	1.66	0.97
client server infrastructures	181	1.52	0.86
operating systems architecture	183	1.48	0.88

We identified also another crucial problem in the e-technology research. As we know, e-technology has important impact to business efficiency, but what is the optimal selection of the e-technologies for the concrete enterprises? That is why we aimed the whole our research to the area of possible measurement and comparison of e-technology level within various businesses.

In fact, our research has two related phases (Malo, 2010):

1. Analysis and survey of current state of business e-technology. A set of pieces of knowledge coming from this phases covers:

- a) an identification of basic problems of e-technology implementation and utilization;
- b) an identification of typical e-activities and e-technologies used and supported by various businesses.

2. Synthetic of gained results into the set of e-technology models for various types of businesses. These models will allow comparing and measuring the level of e-technology utilization in concrete business subjects.

Although, our research is not finished, there are not presented results of phase two. This text is oriented only to phase one. That is why we processed from the methodical point of view next steps:

1. Definition of theoretical framework for the e-technology research based upon literature overview. The main concepts have been described together with relations between them.
2. Basic survey with questions aimed to e-technology utilization and e-activity support within business. Respondents were different enterprises and firms from various sectors of economy.

For definition of enterprises we used EU Commission Recommendation 2003/361/EC (European Commission, 2003), so we recognize four group of enterprises according to staff number – micro, small, medium sized and large enterprises (Tab III.).

RESULTS

Theoretical framework

In the initial phase of our research, it was crucial to describe the formal relations between terms and concepts of e-business, e-activities and e-technology because of various authors define it in the different way. We overviewed available case studies and created theoretical framework for enterprise e-technologies and their implementation.

We developed formal description of the e-activity as a triple (c, s, e) , where c is “content” of the e-activity, s is subject using or working with e-activity and e is e-technology itself (Fig. 1)

E-technology represents a platform for providing e-activity with the concrete content for the particular subject (usually user group). E.g. e-selling as the e-activity enables online selling (content) for customers (subject). In this case e-technology is usually any kind of electronic shop (Malo, 2010).

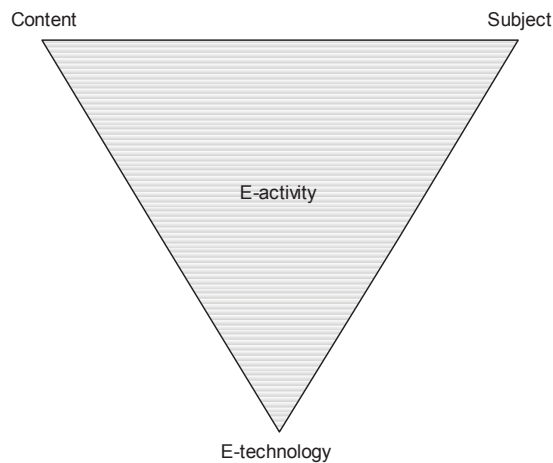
III: *Definition of groups of enterprises*

Enterprise	Micro	Small	Medium-sized	Large
Staff number	< 10	< 50	< 250	≥ 250

2 Number of respondents

3 Average score on a five-point scale from 1 [= no part of my research], to 5 [= all my research activities]

4 Standard deviation

1: *E-activity's triple*

In order to the enterprise advantage e-activity, the e-technology has to be implemented. Both

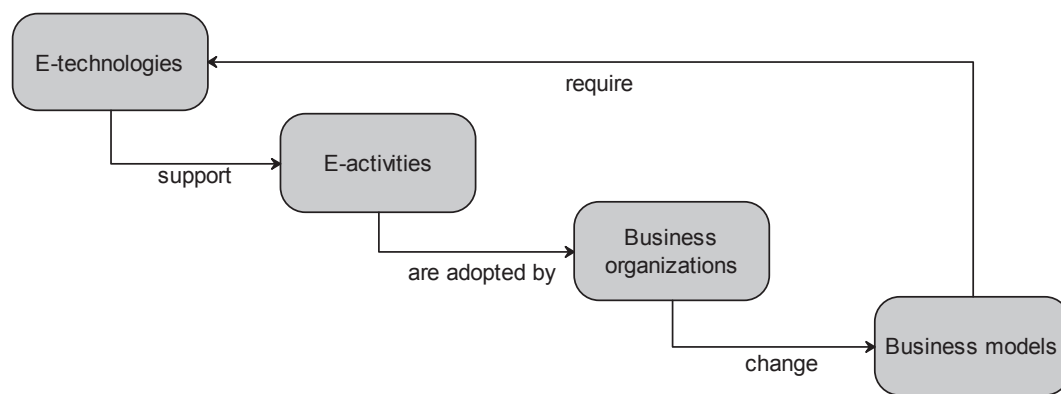
actions (e-activity utilization and e-technology implementation) have interconnections to business model modification.

Piccinelli and Stammers (2001) remind that the distance between business models and information technology (IT) is shortening and aggressive business models impose new requirements on IT. Conversely, according to Osterwald (2004) new technology opens new challenges that request a redefinition of current business models and their periodical changes in cycles according to businesses changes, market progress or new opportunities.

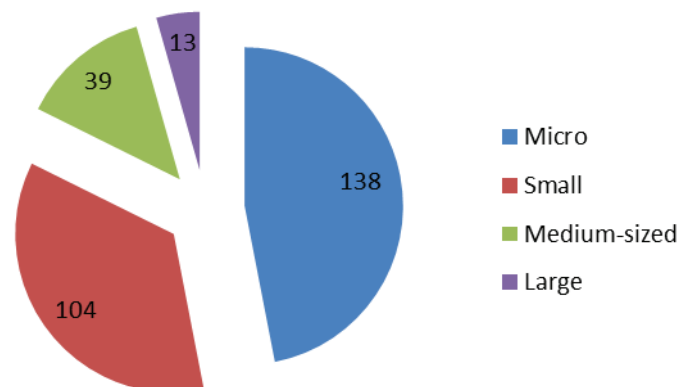
Introduced conclusions lead into main delimitation of our research depicted at the Fig. 2.

Survey

Part of the research is based upon own surveys we processed during the research solving. In this paper we present information about 294 respondents from various business organizations. The structure of respondents is described by Tab. IV and Fig. 3.

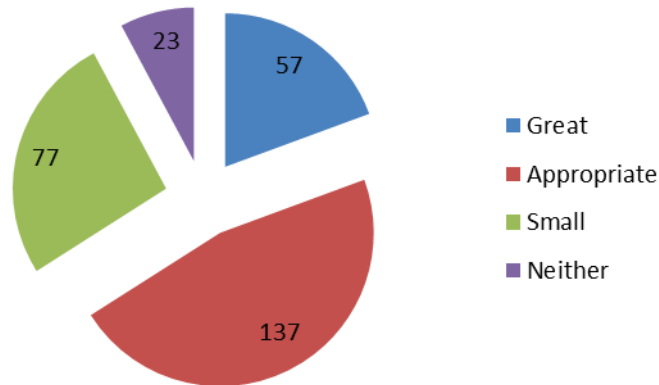
2: *Conceptual schema of the research*IV: *Respondents of the survey*

	Micro	Small	Medium-sized	Large
Respondents	138	104	39	13
Rate	46.94%	35.37%	13.27%	4.42%

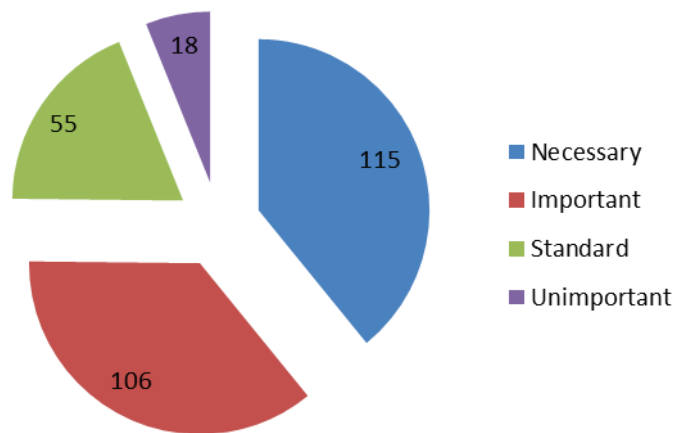
3: *Structure of respondents*

V: *Electronic processes*

	Great	Appropriate	Small	Neither
Respondents	57	137	77	23
Rate	19.39%	46.60%	26.19%	7.82%

4: *The part of electronic processes conducted in the enterprise*VI: *Need of e-technology utilization*

	Necessary	Important	Standard	Unimportant
Respondents	115	106	55	18
Rate	39.11%	36.06%	18.71%	6.12%

5: *Need of e-technology utilization*

Although, we addressed the survey to IT specialist, CIOs (chief of information office) or persons responsible for using information technology within surveyed enterprises, a questionnaire contained also supporting text with explanation for answer. So the relevance of results should be high.

Selected results of survey

We present here selected information from our survey. The focus is put specially on the current state of e-technology utilization and also opinions about e-technology utilization within enterprises.

Question: What part of processes in your enterprise/firm is conducted electronically?

In this question, we surveyed an idea about the level of electronic activities in the enterprises. It is interesting only 34% of respondents sign the small or neither part of processed electronically. It is a proof of the increasing utilization of electronic means within enterprises (see Tab. V and Fig. 4)

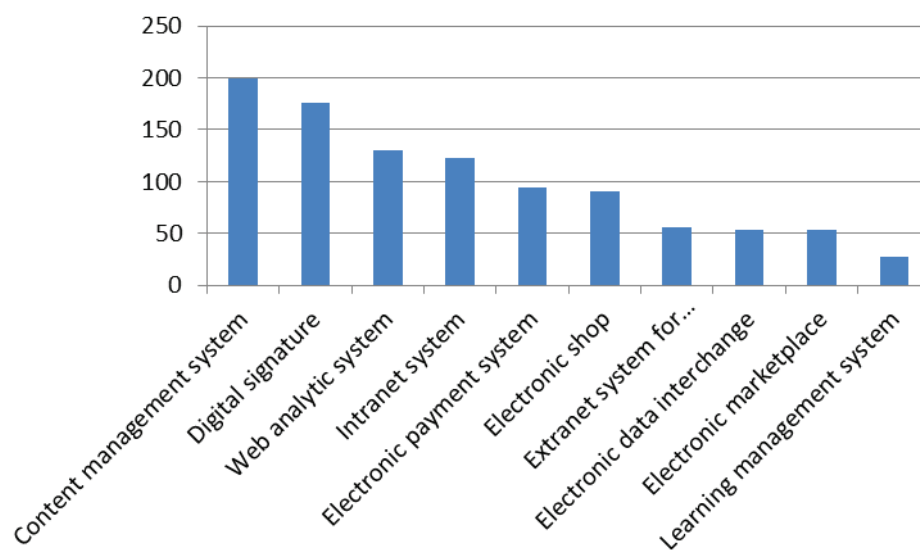
Question: How would you characterize the need of e-technology utilization in your enterprise/firm?

Also answers to this question prove the importance of e-technologies. More than 75% respondents consider e-technologies at least as important for their enterprise (see Tab. VI and Fig. 5).

Question: What e-technologies does your enterprise implement?

VII: *Used e-technologies*

E-technology	Number of respondents	Rate of respondents
Content management system	200	68.03%
Digital signature	176	59.87%
Web analytic system	130	44.21%
Intranet system	123	41.84%
Electronic payment system	94	31.97%
Electronic shop	91	30.95%
Extranet system for customers and partners	56	19.05%
Electronic data interchange	54	18.37%
Electronic marketplace	53	18.03%
Learning management system	27	9.18%

6: *Number of enterprises using selected e-technologies*

In fact, this is only virtual question. In our survey, we asked more questions about partial e-technologies, so tab. VII and Fig. 6 are the summaries from a list of questions.

We surveyed the level of utilization of selected e-technologies within enterprises. Because our respondents are from different enterprises (Tab. IV) and rate respondents from large enterprises and also medium-sized is quite small, we suppose that introduced rates of e-technology using within enterprises are influenced by micro enterprises where e-technologies don't play so important role.

Question: Which of selected e-technologies or e-activities do you plan to implement or extend in the enterprise within 2 years?

Respondents should select e-technologies or e-activities that we considered as important according to various studies (EC 2008, 2010; CSO 2007). The result order of e-technologies follows (see Tab. VIII and Fig. 7).

In the question, we didn't differentiate e-technologies and e-activities but we selected understandable terms to be selected by respondents. In fact, the tab. VII shows plans for next expansion

of e-technologies. If any e-activity could be supported, then the implementation of appropriate e-technologies is expected. Only 5.10% surveyed enterprises do plan none of electronic activities.

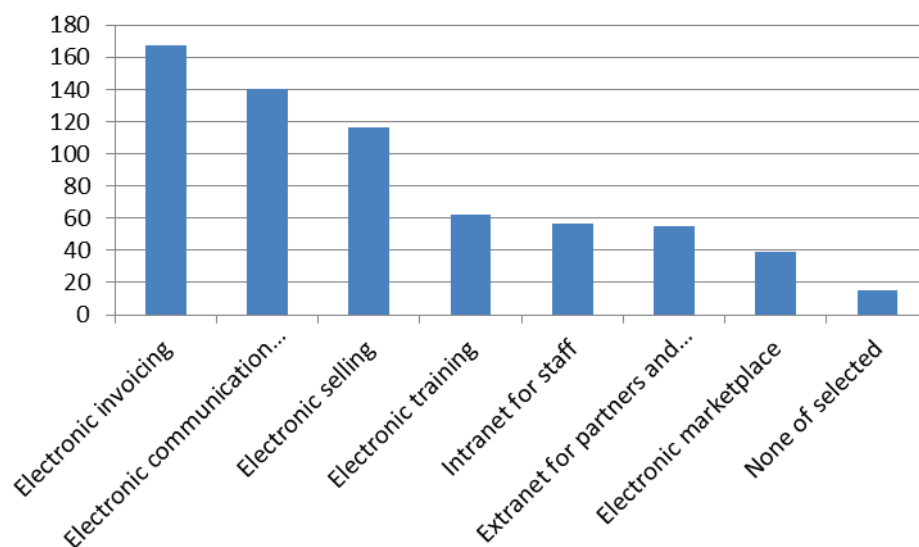
DISCUSSION

One of current priorities within enterprise subjects is effort to expand own business territory and to improve efficiency of internal processes. The one of suitable tools are information technologies. E-technologies, as new information technologies supporting mainly electronic business, create a modern platform for an expansion of business electronic activities and services. Although, the most of enterprises have to go through problems of e-technology implementation and utilization from global point of view, it is part of a transformation of enterprise information technologies and important milestone in their expansion.

In order to offer complex information about e-technologies and their benefits for enterprise, it is necessary to analyze available case studies, recognize importance of various e-technologies

VIII: *Planned e-activities/e-technologies*

E-activity/e-technology	Number of respondents	Rate of respondents
Electronic invoicing	167	56.80%
Electronic communication with e-government	140	47.62%
Electronic selling	116	39.46%
Electronic training	62	21.09%
Intranet for staff	57	19.39%
Extranet for partners and customers	55	18.71%
Electronic marketplace	39	13.27%
None of selected	15	5.10%

7: *Number of enterprises planning selected e-activities/e-technologies*

and describe optimal e-technology utilization for enterprises. However, there are a lot of various types of enterprises with a different level of using e-technology and e-activity support in the business environment, so differences in main characteristics of these enterprises as size and economy branch exist. That is why the comparison based upon simple e-activities or e-technology matching is not relevant, results would be misleading. Both cited criterions – business size (number of employee) and type of industry (economy branch) belong to the important internal factors of IT adoption (Ghobakhlo *et al.*, 2011) and will be taken into the account in the detail processing of the survey results.

Thus, main objective of our research is to prepare a set of e-technology models describing various groups of enterprise e-technology utilization. In this paper, we presented main information about this research including the theoretic framework and pieces of knowledge from surveyed enterprises. These activities correspond to the first phase of our research which continues now in the finishing the second part resulting in e-technology models.

Our theoretical framework explains the research's point of view to e-technologies and e-activity together with their impact to business and business models. So, e-technology enables e-activity that is adopted within business and changes business model. On the other hand, also business model changes raise requirements for new e-technologies or changes (improvements), so the cycle is closed.

In the survey and the basic analysis of results, we proved that e-technology is still more and more important for various enterprises and the level of utilization is still increasing. These findings are very important for our research, because the need of complex information in given domain will increase. It is our motivation, but the future work has to take differences between enterprises into account. This work with theoretical background and results of survey are now processing and the research is being finished. The last step of the research reachable until the end this year is a preparation of a set of e-technology models and a synthesis of all relevant information in several recommendations.

SUMMARY

This paper aimed to problems of e-technology research. The main parts are dedicated to information about the research we are finishing in the area of e-technology implementation and utilization.

In this research, e-technologies are understood as the main platform enabling e-activities adopted by enterprises. It usually results into a change of business model and a definition of next requirements to e-technologies.

Main idea of the research is to differentiate various groups of enterprises and describe level of e-technology utilization for each group by the reference model. All reference models should be used for comparing and measuring the current level of e-technology utilization within enterprises.

Thus, we surveyed various enterprises and obtained information about their opinion and idea about e-technologies. The results are described in the text.

Acknowledgement

The paper is related to the project "The Research on Using E-technology in Enterprise Environment" which is supported by the grant 402/09/P271 of the Czech Science Foundation.

REFERENCES

- BROWN, D. H. and LOCKETT, N., 2004: Potential of critical e-applications for engaging SMEs in e-business: a provider perspective. In: *European Journal of Information Systems*. Volume 13. Basingstoke: Macmillan Press Ltd., 2004. ISSN 0960-085X.
- CZECH STATISTICAL OFFICE, 2007: *Klasifikace ekonomických činností (CZ-NACE) – systematická část* [cit. 2009-12-12]. Cited from [http://www.czso.cz/csu/klasifik.nsf/i/klasifikace_ekonomicky_cinnosti_\(cz_nace\)_systematicka_cast/\\$File/85048625.xls](http://www.czso.cz/csu/klasifik.nsf/i/klasifikace_ekonomicky_cinnosti_(cz_nace)_systematicka_cast/$File/85048625.xls).
- CZECH STATISTICAL OFFICE, 2010: *Využívání IT v podnicích – výsledky za leden 2010*. [cit. 2011-10-24]. Cited from http://www.czso.cz/csu/redakce.nsf/i/vyuzivani_it_v_podnicich_vysledky_za_leden_2010.
- EUROPEAN COMMISSION, 2008: *The European e-Business Report 2008 – The impact of ICT and e-business on firms, sectors and the economy*. 6th Synthesis Report of the Sectoral e-Business Watch. [cit. 2011-10-25]. Luxembourg: Office for Official Publications of the European Communities. ISBN 978-92-79-09355-5. Cited from <http://ec.europa.eu/enterprise/archives/e-business-watch/key-reports/documents/EBR08.pdf>.
- EUROPEAN COMMISSION, 2010: *ICT and e-Business for an Innovative and Sustainable Economy – 7th Synthesis Report of the Sectoral e-Business Watch (2010)*. [cit. 2011-10-25]. Luxembourg: Office for Official Publications of the European Communities. ISBN 978-92-79-14682-4. Cited from <http://www.empirica.com/themen/ebusiness/documents/EBR09-10.pdf>.
- GHOBAKHLOO, M. et al., 2011: Information Technology Adoption in Small and Medium-sized Enterprises; An Appraisal of Two Decades Literature. In: *Interdisciplinary Journal of Research in Business*, vol. 1, issue. 7. [cit. 2011-11-18]. ISSN 2046-7141. Cited from <http://www.idjrb.com/articlepdf/idjrb7n7.pdf>.
- HAWICK, K. A. and JAMES, H. A., 2009: *Integrating E-Activities with Wide Area Management Information Systems*. Technical Report DHPC-125. 2009. [cit. 2011-10-20]. Cited from <http://www.wseas.us/e-library/conferences/joint2002/451-302.pdf>.
- KIELE, P. J., 2001: Research: *What Clients Expect of e-Technology*. In *SMPS Marketer*. 2001. [cit. 2011-10-20]. Cited from <http://www.docstoc.com/docs/70354121/E-Technology>.
- MALO, R., 2010: E-activities Based Business Model: The Case for E-technology Implementation. In: *Proceedings of the IADIS International Conference on e-Commerce*. Freiburg: IADIS Press, p. 173–176. ISBN 978-972-8939-24-3.
- MALO, R., 2011: Research on using e-technology and e-activities within businesses. In: *Proceedings of the IADIS international conference E-commerce 2011*. 1. vyd. Rome: IADIS Press, 2011. ISBN 978-972-8939-51-9.
- OSTERWALDER, A., 2004: *The Business Model Ontology – A Proposition in a Design Science Approach*. Lausanne: Licencié en Sciences Politiques de l'Université de Lausanne. [Cited 2010-03-28]. Cited from http://www.hec.unil.ch/aosterwa/PhD/Osterwalder_PhD_BM_Ontology.pdf.
- PÉREZ-VALLS, M., ORTEGA-EGEA, J. M. and PLAZA-ÚBEDA, J. A., 2006: *Relationship Between New Information Technologies and Flexible Organizational Forms*. Hershey: Idea group publishing, 2006. [cit. 2011-10-20]. Cited from <http://www.irma-international.org/viewtitle/24806/>.
- PICCINELLI, G. and STAMMERS, E., 2001: *From E-Processes to E-Networks: an E-Service-oriented approach*. 2001, [cit. 2011-10-24]. Cited from <http://www.research.ibm.com/people/b/bth/OOWS2001/piccinelli.pdf>.
- TASSABEHJI, R. et al., 2007: E-technology and the emergent e-environment: Implications for organizational form and function. In: *The Journal*

- of High Technology Management Research*, Volume 18, Issue 1, p. 15–30.
- VERBOOM, M. et al., 2003: E-technology as Object of Business and Management Research. In *Frontiers of E-business Research*. 2003. [cit. 2011-10-20]. Cited from <http://www.ebrc.fi/kuvat/526-535.pdf>.
- WEI, Y, DE BOER, S. J. and CHEN, J., 2001: Management of e-technology in China. In: *Management of Engineering and Technology*, 2001. Portland. [cit. 2011-10-26]. ISBN 1-890843-06-7. Cited from http://doc.utwente.nl/55915/1/Management_e-technology_China_-_Yi_Wei.pdf.

Address

Bc. Ing. Roman Malo, Ph.D., Ústav informatiky, Mendelova univerzita v Brně, Zemědělská 1, 613 00 Brno, Česká republika, e-mail: malo@mendelu.cz

