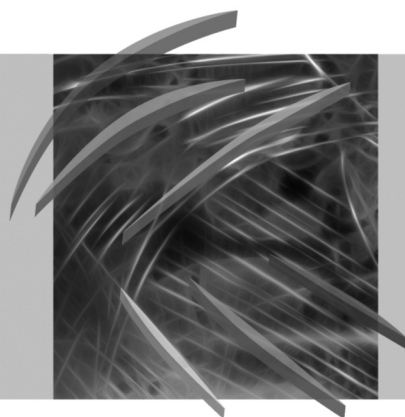


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THE DETERMINANTS OF KNOWLEDGE-BASED ECONOMY DEVELOPMENT – ICT USE IN THE SILESIA ENTERPRISES

Abstract: In the article entitled “The determinants of knowledge-based economy development: the fundamental assumptions” we have described four determinants of knowledge-based economy (KBE) development: education, innovativeness, economic and institutional policies, and ICT (Information Communication Technology). The purpose of this study is an analysis of the ICT use, especially the Internet in the Silesian enterprises, particularly in the context of KBE development. We have analyzed the use of ICT in Silesian enterprises, shown projects that promote the use of ICT in the Silesian enterprises and presented the conclusions based on the conducted research and made recommendations. This paper is addressed to representatives of enterprises, and other players who intend to participate actively in the KBE development by leveraging ICT.

Keywords: knowledge-based economy, ICT in enterprises.

1. Introduction

The research results and achievements of developed countries confirm that the construction of KBE [*A New Economy?*... 2000; Hanna 2009; Kahin, Foray 2006; Leydesdorff 2006] is associated with widespread use of information and communication technologies (ICT) [Hanna 2010; Olszak, Ziemia 2009, 2011; Olszak, Ziemia (Eds.) 2010; Tapscot, Williams 2006; Kasscieh 2010]. The concept of KBE is often equated with such terms as: digital economy, network economy, e-economy. But this point of view is, in our opinion, rather dubious. We believe that ICT is one of the most important pillars of KBE.

The main beneficiaries of the ICT users are companies, public administration and citizens at the same time. The use of ICT revolutionizes the way of conducting business, work, study, and concluding relationships.

The purpose of this study is an analysis of the ICT use, especially the Internet in the Silesian enterprises, particularly in the context of KBE development. 176 enter-

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prises participated in our study. Cross-sectional studies and questionnaire were used as a research tool. The research analysis was carried out by means of the Statistical Package for the Social Sciences (SPSS) for Windows. Furthermore, we used a case study to analyse projects that promote the use of ICT in the Silesian enterprises.

Our research results may be helpful in decision-making processes to improve the use of ICT by businesses, particularly to improve their activities and to develop business relationships.

2. Research methodology

The necessity to transform the socio-economic model in Silesian voivodeship in Poland induces complex, interdisciplinary research of KBE development. Its results could enable action for improving ICT and the Internet use by enterprises, administration and individual consumers [*Strategia rozwoju...2009*].

A field of major importance within the KBE research framework is the ICT implementation in enterprises. In order to do the research, cross-sectional survey was conducted in Upper Silesia. The study took place at the turn of years 2009 and 2010.

176 enterprises participated in the research, most of which (45% of the sample) were micro-enterprises (employing up to 9 employees). Every fourth company sampled was a small enterprise (from 10 to 49 employees), about 19% were medium-sized enterprises (from 50 to 249 employees), and 12% – large enterprises (over 250 employees). The services sector was the most numerous, followed by manufacturing and trade (23 and 22%, respectively). However, a mixed-type enterprise accounted for only about 7% of the sample. Nearly every third business carried out the activity on the domestic or international market, and every sixth on the regional one. Over 22% of enterprises focused their activities on the local market exclusively.

The aim of the study was to diagnose the use of ICT (especially the Internet) in enterprises in support of selected business processes and tasks. The following discussion will cover findings organized into these areas:

- communication and cooperation within an organization;
- communication and cooperation with business partners;
- communication and cooperation with public administration;
- primary and support activities;
- economic and financial analysis.

3. Research findings

3.1. The diagnosis of ICT and the Internet use in the Silesian enterprises

The study results have revealed that in the area of communication and cooperation within an organization, the Internet is mainly used for correspondence (64.9%), and search and recruitment of staff (49.4%) (Table 1). Other processes and tasks are supported poorly. These have to do with issuing instructions to departments (about 26%), the exchange of knowledge (about 17%), performing routine procedures (approximately 22%), cooperation of staff (approximately 33%) and a social integration (10% of indications). Only a few companies have confirmed that in order to solve these problems they use specialized computer software. The fact that many enterprises communicate with employees by the use of traditional paper and pencil and do not see the need for cooperation among employees raises a concern.

Analyzing the area of communication and cooperation with business partners, it can be noted that most of problems in this field are solved by using the Internet (Table 2). It is primarily used for searching for business partners and conducting negotiations (61.9%), sending and receiving offers (78.6%), ordering (64.2%), receipt of orders (63.1%), issuing invoices (17.7%), receiving invoices (21.7%), settlement of payables (67.5%), settlement of receivables (67.3% indications), the exchange of experience and knowledge (44.9%). The exception here is the issuing and receiving of invoices, as most businesses still prefer paper versions.

Table 1. The use of ICT and the Internet in an internal communication and cooperation (% of the companies sampled)

Specification	The issue does not concern the company	The company uses the Internet	The company uses		The company is not capable of dealing with the issue
			Paper and pencil	Computer and software	
Search and recruitment of staff	30.4	49.4	14.6	4.4	1.3
Correspondence (e.g. bulletins, notice boards)	16.6	64.9	7.9	9.3	1.3
Passing official orders	26.1	29.9	29.3	14.0	0.6
Exchange of knowledge and experience	17.3	28.7	34.0	16.7	3.3
Conducting routine procedures (e.g. business trips, holiday leave applications)	22.1	21.4	38.3	18.2	0.0
Horizontal cooperation	32.5	23.6	31.8	11.5	0.6
Vertical cooperation	33.8	29.9	26.0	9.7	0.6
Social integration	55.5	10.3	22.6	6.5	5.2

Source: [Olszak, Ziemia 2011].

Table 2. The use of ICT and the Internet to communicate and cooperate with business partners (% of the companies sampled)

Specification	The issue does not concern the company	The company uses the Internet	The company uses		The company is not capable of dealing with the issue
			Paper and pencil	Computer and software	
Searching for business partners and negotiations	20.0	61.9	14.2	2.6	1.3
Sending and receiving offers	9.4	78.6	5.7	6.3	0.0
Ordering	13.2	64.2	12.6	10.1	0.0
Receipt of orders	13.4	63.1	14.0	9.6	0.0
Issuing invoices	13.3	17.7	20.3	48.7	0.0
Receiving invoices	14.6	21.7	36.3	27.4	0.0
Settlement of payables	12.1	67.5	10.8	7.6	1.9
Settlement of receivables	10.1	67.3	13.2	8.2	1.3
The exchange of experience and knowledge	21.2	44.9	23.1	9.6	1.3

Source: [Olszak, Ziemia 2011].

The diagnosis of communication and cooperation with public companies shows that more than a half of the companies surveyed use the Internet to adjust the tax (56.8% indications) and insurance liabilities (59.9% indications), and send a declaration of insurance (50.3% indications). 65% of companies use the Internet Public Information Bulletin. However, only to a very limited degree, internet technologies are used for communication with customs authorities, the city authorities (municipalities, counties) or the exchange of correspondence with the Inland Revenue Offices and ZUS (a social insurance institution). Many of the processes concerning communication with the administration are conducted by using traditional means, i.e. pencil and paper (Table 3).

Table 3. The use of ICT and the Internet for communication and cooperation with public authorities (% of the companies sampled)

Specification	The issue does not concern the company	The company uses the Internet	The company uses		The company is not capable of dealing with the issue
			Paper and pencil	Computer and software	
Sending tax return forms to tax authorities	11.9	37.1	35.2	15.7	0.0
Exchange of correspondence with tax authorities	13.8	24.5	43.4	17.6	0.6
Settling tax liabilities	11.6	56.8	22.6	9.0	0.0
Communication with customs authorities	62.3	10.4	18.8	3.9	4.5
Sending ZUS returns	13.4	50.3	25.5	10.8	0.0

Table 3 (cont.)

Specification	The issue does not concern the company	The company uses the Internet	The company uses		The company is not capable of dealing with the issue
			Paper and pencil	Computer and software	
Exchange of correspondence with ZUS	13.0	29.2	42.9	14.9	0.0
Settlement of social insurance liabilities	10.2	59.9	22.9	7.0	0.0
Communication with city, municipal or county offices	22.2	19.0	46.2	12.0	0.6
Access to the Internet Public Information Bulletin	25.0	65.0	7.5	1.9	0.6

Source: [Olszak, Ziemia 2011].

Technologies that are most often used by companies for internal communication and cooperation with business partners and public administration are: email (99.4%), electronic bulletins and newsletters (80.4%), instant messengers (65%), intranet (62.9%), forums (50%), social networking sites (40.5%) and teleconferencing (34%).

The KBE requires enterprises to use the Internet in primary and support areas of activity, such as purchasing, sales, inventory service, human resources, payroll, marketing, finance and accounting, manufacturing, and transport (Table 4). In the surveyed companies the Internet is used mainly in marketing activities (58.9%) and supplies (51.2%). Specialized software supports finance and accounting for 44.2% of respondents, staff records management (38.9%), and payroll processing (35.8%). Less frequently used are document management systems (29.7%), competency management systems (12.5%), and workflow systems (10.9%). In order to run the primary and support operations, most of organizations use conventional means, such as paper and pencil.

Table 4. The use of ICT and the Internet in the primary and support activities of an organization (% of the companies sampled)

Specification	The issue does not concern the company	The company uses the Internet	The company uses		The company is not capable of dealing with the issue
			Paper and pencil	Computer and software	
Purchasing	21.0	51.2	17.3	10.5	0.0
Sales	22.8	31.5	17.9	25.9	1.9
Inventory service	43.0	12.0	13.3	31.0	0.6
Human Resources	24.1	19.8	17.3	38.9	0.0
Payroll	18.5	31.5	14.2	35.8	0.0
Marketing	22.7	58.9	5.5	12.3	0.6

Table 4 (cont.)

Specification	The issue does not concern the company	The company uses the Internet	The company uses		The company is not capable of dealing with the issue
			Paper and pencil	Computer and software	
Finance and accounting	17.2	25.2	13.5	44.2	0.0
Manufacturing	64.4	6.9	15.6	13.1	0.0
Transport	62.1	14.3	18.0	5.0	0.6

Source: [Olszak, Ziemia 2011].

The research has confirmed that the Silesian organizations do not attribute much importance to the use of ICT while performing a more complex economic and financial analysis (Table 5). Over 50% of the companies do not appreciate the quality control and business audit processes. 46.8% of the organizations do not carry out the analysis of investment projects. Quite a number of organizations (54.4%) use the Internet for the market, product/service and macro-analysis. Specialized software is used for the realization of such tasks, and particularly for word processing (98.8% indications), spreadsheets (91.9% indications), and databases (46.8% indications). Data warehousing has been used by only 20% of organizations. But even they do not take a full advantage of this technology, since only 4.7% of respondents confirmed the use of multidimensional OLAP analysis and business intelligence tasks. Data mining tools (e.g. Statistica, SPSS, Oracle Data Mining) are used by only 11.7% of enterprises.

Table 5. The use of ICT and the Internet for economic and financial analysis (% of the companies sampled)

Specification	The issue does not concern my company	The company uses the Internet	The company uses		The company is not capable of dealing with the issue
			paper and pencil	computer and software	
Quality control	55.7	8.2	23.4	11.4	1.3
Business processes audit	57.4	11.6	14.2	12.3	4.5
Investments audit	46.8	19.9	12.8	18.6	1.9
Market analysis	29.5	54.5	5.8	9.0	1.3
Product/service analysis	29.9	47.4	9.1	12.3	1.3
Environmental scanning (economic, political, social factors)	33.5	51.6	8.4	3.2	3.2

Source: [Olszak, Ziemia 2011].

The study also showed that enterprises are faced with the need to overcome barriers of implementation and application of ICT and the Internet. These include the lack of financial resources (36% of respondents), lack of information about the existence of relevant services (36%), lack of appropriate services (33%), lack of skills of workers (27%), lack of technological conditions (21%).

On account of the presented outlay, it may be said that the situation in enterprises with regard to the implementation of challenges of knowledge-based economy related to the widespread use of ICT and the Internet requires to be improved. It is necessary not only to introduce technology to organizations, but also to increase technology awareness, knowledge and skills in them.

3.2. Projects that promote the use of ICT in the Silesian enterprises

An answer to the identified problems and barriers to the KBE development is to provide the Silesian region with the Strategy for Information Society Development of the Silesian Voivodship by 2015 [*Strategia rozwoju...* 2009]. This strategy involves a lot of projects. The most interesting include:

- Regional Broadband Network;
- Regular competition for the best company in the ICT sector “The Silesian e-Leader”;
- Silesian Virtual ICT Incubator.

The objective of the Regional Broadband Network project is to undertake actions by the Self-Government of the Silesian Voivodship in order to create a regional broadband network. The beneficiaries of the network will be public administration bodies and enterprises, but also the inhabitants of the region as well as the authorities and services responsible for public safety. The funding of the project comes from public funds, including the regional self-government, the state budget, the EU structural funds, and private funds. A study of broadband networks development in the Upper Silesia will be developed within the scope of this project. The study will be based on the findings and conclusions contained in the inventory currently being drawn up on the broadband network in the region, in particular on the “white spots”, and identified barriers. The next step will be to draw up a feasibility study of broadband network development in the region, including construction and reconstruction of the network, access equipment, and construction and reconstruction of local backbone networks.

The aim of the project “the Silesian e-Leader” is to organize a periodic competition for the best ICT enterprise of the Silesian Voivodship and the best open source solution. Undertaking this initiative will contribute to the promotion of best ICT organisations operating in the area of Silesia, and that, in turn, will underline the importance and the role of companies of this sector in the economy of the region. Implementation of the project will also affect the promotion and development of open source software. Potential beneficiaries of the project are not only organisations in the ICT sector, but also all others who use the achievements of IT enterprises, including open source solutions. The funding for this project is presumed to come from public funds, including the regional self-government, the state budget, the EU structural funds, and private funds.

The project Virtual Silesian Incubator of ICT is to create conditions for accelerating the market development and the ICT sector in the Upper Silesia. As a result, the

project will create knowledge base available on-line, which will be collected, processed and made available basing on the standards of “good practices” and solutions in the field of ICT. This initiative will create a network of experts skilled in ICT use. Potential project beneficiaries are the enterprises planning to start work in the ICT sector and enterprises planning to implement ICT solutions. The project funding will come from public funds, including the regional government, the state budget, the EU structural funds, and private funds.

The undertaking of these projects will depend on organizational opportunities and availability of adequate funding. Their implementation is expected by 2015.

4. Conclusions

Drawing on the findings on the state of ICT use in Silesian enterprises, we arrive at the following conclusions and recommendations.

First, it is necessary to abolish all barriers to the ICT use. This refers primarily to economic barriers. They are related to the cost of access to ICT (computers, Internet access, servers) and can become a factor of the digital divide for citizens and small and medium-sized organizations. Contrary to the general belief, the social status of many citizens, and high operating costs of enterprises often prevent access to ICT. Therefore, it is necessary to take measures to reduce the cost of access to the Internet and ensure the use of it in public places.

Second, there is a need for removing technical barriers that primarily relate to access to the Internet, especially the broadband. Hence, without an efficient, high quality and extensive telecommunications infrastructure it is not possible to achieve high KBE growth dynamics in the region. It is necessary to take measures which will result in laying long-lasting infrastructural and institutional foundations for this development.

Third, use of the Internet in enterprises, especially in SMEs, is not common. They apply Internet technologies primarily to support B2B and B2C relationships. Most Internet technologies are implemented to support marketing activities, primarily to promote the firm and its products, and to create a marketing image. Enterprises rarely offer direct sales, such as selling through online stores. In business dealings with financial institutions market players use just electronic transfers. In turn, in the relationships with public authorities electronic billing statements addressed to the Social Insurance Institution are dominant. Quite often, enterprises use different forms that public administrations place on the Internet. Electronic banking is also developing well, while other areas of e-services are still marginal.

Fourth, it is necessary to support activities aimed at increasing the intensity of competition in the ICT area in the Silesian Voivodship. The region’s significant resources (e.g., road infrastructure, universities, research and development centres, and sizeable population) should be exploited.

Finally, it is necessary to promote the idea of KBE and support the development of competences (in enterprises and among the inhabitants of the region) essential for the effective use of ICT.

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DETERMINANTY ROZWOJU GOSPODARKI OPARTEJ NA WIEDZY – WYKORZYSTANIE ICT W ŚLĄSKICH PRZEDSIĘBIORSTWACH

Streszczenie: W artykule *Determinanty rozwoju gospodarki opartej na wiedzy – podstawowe założenia* opisano cztery determinanty rozwoju gospodarki opartej na wiedzy (KBE): edukację, innowacje, politykę ekonomiczno-instytucjonalną oraz technologię informacyjno-komunikacyjną (ICT). Celem niniejszego artykułu jest diagnoza stanu wykorzystania ICT, w szczególności Internetu, w śląskich przedsiębiorstwach, na potrzeby rozwoju KBE. Przedstawiono obszary wykorzystania ICT w przedsiębiorstwach Górnego Śląska, projekty promujące stosowanie ICT oraz rekomendacje dotyczące rozwoju stosowania ICT. Uzyskane wyniki badań mogą być pomocne w podejmowaniu działań mających na celu poprawę wykorzystania ICT w przedsiębiorstwach.

Słowa kluczowe: gospodarka oparta na wiedzy, ICT w przedsiębiorstwach.