

## A COMPARISON OF ICT USE (E-BUSINESS TOOLS) IN COMPANIES OF SELECTED COUNTRIES

Jan Petřtyl, Ludvík Eger

### INTRODUCTION

Information and communication technologies (ICT) are definitely a phenomenon that has been able to change the world, both positively and negatively. Households, companies, and even governments have tools that can make performances of many of their tasks and activities easier. If implemented and used correctly, the information and communication technologies can increase competitiveness of national economies, organizations and individuals.

According to the European Commission (2008a, p. 13), ICT can be defined as follows: "ICT is an umbrella term that encompasses a wide array of systems, devices and services used for data processing (the information side of ICT) as well as telecommunications equipment and services for data transmission and communication (the communication side)".

Following this we also respect the approach of OECD when defining ICT products (OECD, 2009, p. 18): "ICT products must primarily be intended to fulfill or enable the function of information processing and communication by electronic means, including transmission and display". According to the UNCTAD (2011) we underline that ways and possibilities of business, provision and realization of government (administration of national concerns) etc. are basic areas ICT have a significant impact. The issues of ICT use in a company are fairly wide. The technologies connected with a term ICT are so called "General Purpose Technology" since all economic sectors use ICT within their production process (OECD, 2003, p. 23, cf. Brynjolfsson & McAfee, 2014). We add that the General Purpose Technology is used naturally in a non-profit sector, too.

The development of ICT is also linked to the development of information and knowledge

society. The term 'information society' (Pintér, 2008, Soumitra & Mia, 2011, p. vii) is related to the issues of ICT use everywhere; the use in business creates the context of our research study. Nevertheless, information society could be studied from various points of view. For instance, the United Nations emphasizes primarily the consequences of the existence of information society in economic, social and environmental area (UNCTAD, 2011, p.2).

Framework model of the ICT influence is presented i.e. by UNCTAD (2011). Relevant data in basic areas are e.g. provided by the Eurostat (2011). For the purpose of our study, also the conceptual model according to the OECD (2009) is appropriate since except the conceptual model of ICT use in society a model for the measurement of the impact of this use is formulated. These resources are then the basis for international comparison model. This leads to searching for relevant variables and construction of overall index.

The purpose of this study is to present one possible approach to the construction of composite ICT indicator as a means of international comparison in the field of business ICT/e-business intensity.

In fact we are looking for an answer to the question "How do particular states differ in use of selected tools of e-business, and does company-size matter?" We will build on this in our further research while focusing on the real impacts of such technology.

ICT is a rapidly evolving area, and has profound impacts on whole society. It has become powerful tool for participating in global economy and for offering (not only) new business opportunities. ICT improve public and private services and increase economic productivity.

For example Reynolds (2010, p.33) adduces that: "...the benefits of appropriate ICT

investment in general are potentially huge, leading to lower transaction costs, higher productivity, and the enhanced capability for innovation and revenue growth...”.

This statement can clearly be applied everywhere: to a business sphere, a sphere of households, as well as to a national sector (cf. Legris, Ingham & Collerte, 2003).

The European commission dedicates itself intensively to the issues of ICT extension support. It is stated in one of its key documents (Europe's Digital Competitiveness Report i2010) that: “In the context of the current economic and financial crisis, it is important to remember the central role played by the production and take up of ICT in driving innovation, productivity and growth.” (European Commission, 2009, p. 82). The same source adduces that:

- ICT producing industries contribute directly to productivity and growth through their own rapid technological progress,
- ICT use improves the productivity of other factors of production (or inputs),
- there are ‘spill over effects’ on the rest of the economy as ICT diffusion leads to innovation and efficiency gains in other sectors.

From the point of view of the national economy, ICT have impact on the area of gross domestic product creation. The European Commission (2010) states that ICT participate directly by 5 % in the European GDP and they contribute to the total growth of productivity by 20 % directly through the ICT industry, by 30% through the investments in the ICT area).

The World Economy Forum could be considered as another important organization that deals with a comparison of ICT influence on society. This institution examines within so called Network Readiness Index (NRI) three main areas that relate to ICT (Dutta & Mia, 2011):

- the conduciveness of national environments for ICT development and diffusion, including the broad business climate, some regulatory aspects, and the

human and hard infrastructure needed for ICT;

- the degree of preparation for and interest in using ICT by the three main national stakeholders in a society (i.e., individuals, the business sector, and the government) in their daily activities and operations; and
- the actual use of ICT by the above three stakeholder groups

The Economist Intelligence Unit (2010) also presents its ranking since 2000; it was changed in 2010 to ‘Digital economy rankings’ that by its name depicts the way of development of ICT use.

The information about the global ICT market is considered to be of great importance. Therefore, we suggest an indicator covering ICT development, that reflects ICT adoption in the field of e-commerce and e-business (cf. EITO Report, UNCTAD, 2013; OECD, 2013). Moreover, in the following period, it will be more and more important to observe also the cross-border impacts of e-business that are important especially for e-commerce (Gomez-Herrena, Martens & Turlea, 2014).

### **E- business**

The nature, scope, and impact of e-business technologies are connected with development of ICT. „These technologies range from hardware to software, from web browsers to email and social network, from mobile web to location based services and from e-procurement hubs to enterprise resource planning system.“ (Reynolds, 2010, p. 1)

Alongside with the increasing importance of information and communication technologies in the area of entrepreneurship (cf. McAfee & Brynjolfsson, 2008) the necessity to capture and describe this issue theoretically has emerged. The IBM company was probably the first one that used the term e-business. Some possible definitions of this notion follow:

- A generic term covering information definition and exchange requirements within and between enterprises by electronic means (UN/CEFACT, 2001).

- Prieger and Heil (2010) use the term “e-business” in its most general sense: any use of ICT by a firm to conduct its business.”
- e-Business: automated business processes (both intra-and inter-firm) over computer-mediated networks. (OECD). e-Business covers the full range of e-transactions as well as collaborative business processes, such as collaborative online design processes which are not directly transaction focused. (European Commission, 2010). This definition is considered as initial for our purposes.

We can summarize, that e-business (electronic business) means the execution of business processes over the Internet, or at least with use of computers and/or their networks. And these electronic business processes include buying and selling products, supplies and services; servicing customers; processing payments; managing production control; communicating and collaborating with business partners; creating and sharing information; supporting and running automated services for customer and employee; also recruiting; and more.

In the European Union, significant research in the e-business area was realized for instance in 2008 (Renner, Vetter & Sheiding, 2008), and later more known E-Business W@tch (it was finished at the beginning of 2011), see also Soto-Acosta & Meroño-Cerdan (2008).

Also Eurostat deals in the long term with a monitoring and classification of ICT in firms, and there are also national studies of member states of the EU. Except those main information sources, others are available, for instance CIO Top 100 (CIO Businessworld 2012).

Publications and other outputs from the OECD and the European commission are regarded as important source for realization of the presented study. By unifying methodology, the Eurostat creates also necessary platform for the international comparability of data.

## 1. METHODOLOGY

For the purposes of the research study, data available from the Eurostat's open electronic

database for analyses of ICT use in a business sector (Eurostat, 2013) were used. In total, there are several hundreds of variables for the analysis. For the purposes of this study, some of them were analysed (in total 14 in 4 categories) – chosen on the basis of expertly set requirements.

The aim of the research study was to create a description tool that could enlighten the intensity of use of selected e-business tools in enterprises in various EU countries. We used data provided by Eurostat, put them in weighted groups, and constructed an index while having considered the approach of similar index construction like in case of European Commission (2008c).

### Research questions

What is the level of the implementation of particular e-business tools in companies of selected EU countries?

The term Selected Tools covers: ERP systems, CRM systems, sharing of information within SCM, electronic sale/purchase, automated data processing, co-operation with suppliers and customers, employees' remote electronic access, various means of electronic communication, and use of e-learning. Is there any difference in the implementation of e-business tools between large, small and medium-sized enterprises in the selected countries.

### Procedure

We started with creation of a composite indicator of the intensity of use of e-business tools in companies on the basis of literature research (particularly OECD - conceptual model, 2009, European Commission, 2010, 2008c, Reynolds, 2010, the project E-Business W@tch, 2011), and the evaluation of Eurostat database (2013) that was kindly provided to us.

### Set of selected countries

The data for the research study are covered by several member states of the EU, i.e. the Czech Republic (CZ), Slovakia (SK), Poland (PL), Hungary (HU), Slovenia (SI) and Germany (DE). Some of the introduced countries belong to the Visegrad Group (CZ, SK, PL, HU); Slovenia is considered to be a country with relatively high level of development in the monitored area and Germany is regarded as a prominent state of the EU countries.

If possible, the data about the whole EU (EU27) are adduced. Data from four groups of variables are used for the calculation of the intensity indicator of e-business tools for individual states (see later in the text).

Small and medium-sized enterprises (SMEs) and large enterprises were included in the research. For the purposes of this work, small and medium-sized enterprises are defined as having 10-250 employees; according to the EU definition, large enterprises have more than 250 employees.

The division into large enterprises and SMEs is useful particularly since on the ground of historical data it could be expected that the rate of various ICT implementation is higher at larger enterprises than at SMEs. It was supposed that above mentioned division of companies into two categories would better display the real state rather than the data about all companies in all. Very small companies and micro-enterprises (i.e. companies having less than 10 employees, or individual businessmen) were excluded from the research.

### Data

The data for the research were gained from the European Statistical Office (Eurostat, 2013) that represents an extensive database in MS Access format having ca. 388 MB. By its extent it covers member states of the EU and it could be stated that the data included in the database

are representative and have high information value.

The data comes from 2010 and 2011, exceptionally from 2009. The mentioned delay of data is usual in this type of extensive supranational data gathering. The outputs are still valid for trends presented in tables 1 – 14 and in figures 1 – 6.

The database consists of various objects (tables) from which the answers to relevant questions by means of SQL language could be given. Main objects used during the work with the database are:

**Variables** (780 in total)

**ExpVariables** (code of a variable)

**ExpVariableCaption** (verbal description of a variable)

**Year**

**Unit** (monitored unit)

**ExpCountry** (country code)

**ExpBrkDwn** (a group of units)

**DataWithAggregates** (a table including values assigning to variables)

## 2. MONITORED CATEGORIES, VARIABLES AND PARTIAL OUTPUTS

There are four groups set up for the construction of an indicator of the use of e-business tools in companies, i.e. categories of variables; with regard to their characteristics the categories create logically ordered and internally compact units. In the tables, the data are presented by means of decimal numbers. The data are relative values and if multiplied by 100, the data would be given in [%]. Characteristics and importance of the categories and their variables are as follows:

The category: 'Business information systems' constitutes the core of ICT at enterprises. In this group, the variables indicating the use of ERP systems and CRM systems by companies are included (table 1 and 2).

**Tab. 1: Enterprises who have ERP software package to share information between different functional areas (E\_ERP1)**

Year	Country	All enterprises	Large enterprises	SMEs
2010	DE	0.29	0.76	0.27
2010	SI	0.21	0.81	0.19
2010	CZ	0.21	0.73	0.19
2010	EU27	0.21	0.64	0.19
2010	SK	0.17	0.59	0.16
2010	PL	0.11	0.57	0.10
2010	HU	0.08	0.50	0.07

Source: Eurostat and own calculation

**Tab. 2: Enterprises using software solutions like Customer Relationship Management (CRM) (E\_CRM)**

Year	Country	All enterprises	Large enterprises	SMEs
2010	DE	0.43	0.70	0.42
2010	SK	0.30	0.46	0.29
2010	EU27	0.25	0.54	0.25
2010	PL	0.18	0.49	0.17
2010*	SI	0.16	0.33	0.13
2010	CZ	0.15	0.49	0.14
2010	HU	0.10	0.28	0.09

\*for SMEs and large enterprises, the data comes from 2009

Source: Eurostat and own calculation

Germany is found in the first place and above the EU27 average. Slovenia and the Czech Republic lie in the ERP area on the average of EU27, but they are sinking in the area of CRM systems use; contrarily, the situation in Slovak enterprises is evaluated better.

The category: 'Purchase and sale'. In this category, three variables were examined – an electronic purchase, an electronic sale and an electronic invoicing (table 3, 4 and 5).

**Tab. 3: Enterprises purchasing online (at least 1% of orders) (E\_EBUY)**

Year	Country	All enterprises	Large enterprises	SMEs
2010	DE	0.40	0.54	0.40
2010	CZ	0.33	0.51	0.32
2010	EU27	0.27	0.41	0.26
2010	HU	0.17	0.26	0.17
2010	SI	0.16	0.29	0.16
2010	SK	0.14	0.19	0.14
2010	PL	0.12	0.27	0.12

Note: For SMEs and large enterprises, the data comes from 2009.

Source: Eurostat and own calculation

The information for SMEs was expertly estimated. Considering minimal differences between the SMEs category and All enterprises the entry 12% was added in order not to exclude a variable from a category or not to exclude a country from the whole sample due to one missing piece of information.

**Tab. 4: Enterprises selling online (at least 1% of turnover) (E\_ESELL)**

Year	State	All enterprises	Large enterprises	SMEs
2012	CZ	0.25	0.42	0.24
2012	DE	0.22	0.42	0.21
2012	SI	0.14	0.38	0.13
2012	EU27	0.14	0.35	0.13
2012	SK	0.12	0.25	0.12
2012	HU	0.10	0.24	0.09
2012	PL	0.09	0.28	0.08

Source: Eurostat and own calculation

**Tab. 5: Enterprises sending and/or receiving e-invoices (E\_INV)**

Year	State	All enterprises	Large enterprises	SMEs
2010	DE	0.36	0.55	0.35
2010	SK	0.34	0.43	0.34
2010	EU27	0.31	0.47	0.30
2010	CZ	0.17	0.44	0.16
2010	PL	0.16	0.30	0.16
2010	SI	0.10	0.27	0.10
2010	HU	0.08	0.19	0.07

Source: Eurostat and own calculation

In this category, Germany lies again above the average; however, at electronic sale and purchase of companies, also Czech enterprises come to the fore. In comparison to the EU27 average the decrease of SMEs in the electronic invoicing is considerable at enterprises of other monitored countries.

The category: 'Cooperation within a customer-supplier chain'.

By means of electronic network the relationship between supply and demand side of a market (not only in B2C, but also in B2B environment). For the purposes of this study, six variables were monitored that are closely related to the mentioned issues (table 6, 7, 8, 9, 10 and 11).

**Tab. 6: Enterprises whose business processes are automatically linked to those of their suppliers and/or customers (E\_SISC)**

Year	Country	All enterprises	Large enterprises	SMEs
2012	SK	0.39	0.55	0.39
2012	PL	0.25	0.41	0.24
2012	SI	0.24	0.37	0.24
2012	DE	0.23	0.50	0.22
2012	EU27	0.23	0.46	0.22
2012	CZ	0.15	0.38	0.14
2012	HU	0.11	0.30	0.11

Source: Eurostat and own calculation

**Tab. 7: Enterprises that share electronically information with customers on inventory levels, production plans, demand forecasts or progress of deliveries (E\_SICU2)**

Year	Country	All enterprises	Large enterprises	SMEs
2012	SK	0.29	0.40	0.29
2012	PL	0.17	0.32	0.17
2012	EU27	0.16	0.34	0.15
2012	SI	0.16	0.27	0.15
2012	DE	0.11	0.37	0.10
2012	CZ	0.11	0.31	0.10
2012	HU	0.07	0.22	0.07

Source: Eurostat and own calculation

**Tab. 8: Enterprises that share electronically information on the SCM with suppliers/customers or send/receive information in a format that allows its automatic processing (reduced comparability) (E\_SIEXT2)**

Year	Country	All enterprises	Large enterprises	SMEs
2012	PL	0.77	0.95	0.76
2012	SI	0.76	0.98	0.75
2012	SK	0.64	0.80	0.63
2012	HU	0.62	0.91	0.61
2012	EU27	0.58	0.84	0.58
2012	DE	0.50	0.82	0.48
2012	CZ	0.44	0.78	0.42

Source: Eurostat and own calculation

**Tab. 9: Enterprises that share electronically information suitable for automatic processing within the enterprise and with external business partners (E\_SIEXTINT)**

Year	Country	All enterprises	Large enterprises	SMEs
2012	PL	0.77	0.95	0.76
2012	SI	0.76	0.98	0.75
2012	SK	0.64	0.80	0.63
2012	HU	0.62	0.91	0.61
2012	EU27	0.58	0.84	0.58
2012	DE	0.50	0.82	0.48
2012	CZ	0.44	0.78	0.42

Source: Eurostat and own calculation

**Tab. 10: Enterprises that share electronically information with suppliers on inventory levels, production plans, demand forecasts or progress of deliveries (E\_SISU2)**

Year	Country	All enterprises	Large enterprises	SMEs
2012	SK	0.30	0.44	0.29
2012	PL	0.23	0.35	0.23
2012	SI	0.20	0.27	0.20
2012	DE	0.19	0.41	0.19
2012	EU27	0.19	0.36	0.18
2012	CZ	0.13	0.29	0.12
2012	HU	0.08	0.24	0.07

Source: Eurostat and own calculation

**Tab. 11: Enterprises that share electronically information with suppliers and customers on inventory levels, production plans, demand forecasts or progress of deliveries (E\_SISUCU2)**

Year	Country	All enterprises	Large enterprises	SMEs
2012	SK	0.25	0.34	0.25
2012	PL	0.15	0.26	0.15
2012	SI	0.14	0.20	0.14
2012	EU27	0.13	0.26	0.12
2012	CZ	0.09	0.22	0.08
2010	DE	0.08	0.27	0.07
2012	HU	0.06	0.19	0.05

Source: Eurostat and own calculation

In this category, German and Czech companies lie often below the average of EU27, contrarily, the evaluation of Slovak, Polish and Slovene companies are found mostly above the average (tables 6 – 11).

High values emerge in the variable 'intensity of automated data processing' (table 9). Average values are very high in case of large enterprises; the average of EU27 is even 84%. It is apparently a key area whose correct use

means not only a competitive advantage, but also competitive necessity.

The category: '**Internal education and remote access of employees to company data and applications, communication**'.

Last examined group of variables includes factors that are oriented rather on the inside of a company – remote access to company applications and data, internal education by means of ICT and ICT use for the efficiency improvement of communication processes.

**Tab. 12: Enterprises using e-learning applications for training and education of employees (E\_IEDU)**

Year	Country	All enterprises	Large enterprises	SMEs
2008	SK	0.42	0.42	0.42
2008	SI	0.40	0.68	0.39
2008	CZ	0.29	0.54	0.28
2008	PL	0.21	0.38	0.20
2008	HU	0.15	0.39	0.14
2008	DE	0.13	0.34	0.13

Note: The figure for EU27 is not available.

Source: Eurostat and own calculation

**Table 13: Enterprises that provide to the persons employed remote access to the e-mail system, documents and applications (E\_ENVRA)**

Year	Country	All enterprises	Large enterprises	SMEs
2011	SI	0.55	0.95	0.54
2011	CZ	0.53	0.93	0.52
2011	SK	0.41	0.82	0.40
2011	EU27	0.40	0.85	0.39
2011	PL	0.40	0.80	0.38
2011	DE	0.37	0.87	0.35
2011	HU	0.36	0.77	0.35

Source: Eurostat and own calculation

**Table 14: (Companies that...) Have policies for using telephone, web or video conferencing instead of physical travel (E\_ENVTRV)**

Year	Country	All enterprises	Large enterprises	SMEs
2011	SK	0.48	0.72	0.47
2011	EU27	0.38	0.68	0.37
2011	SI	0.38	0.65	0.37
2011	DE	0.31	0.72	0.30
2011	CZ	0.29	0.59	0.28
2011	HU	0.24	0.59	0.23
2011	PL	0.13	0.31	0.13

Source: Eurostat and own calculation

In this category, the enterprises in Slovakia and Slovenia reach high results. In the area of remote access to applications and e-learning, these countries along with the Czech Republic overcome even Germany that lies in two preceding categories in the first place.

### 3. COMPOSITE INDICATOR OF THE USE OF E-BUSINESS TOOLS - EBSN

The introduced values of variables that are created on the basis of individual categories present the level of the use of e-business tools in enterprises of selected European countries (tables 1 – 14). They create data/information base that could be used also for a comparison of countries in the research study. The outputs of the analysis could be interpreted complexly

and clearly in a graphic form. For this purpose, so called composite indicator (total indicator) of a use of e-business tools in European enterprises was established. For the indicator establishment, the data from the Eurostat (2013) database were used and then processed into the categories of the selected variables.

The structure of composite indicator EBSN

The composite indicator is designed as weighted total in the partial categories. The score of the partial categories is weighted total of the scores achieved in the individual indicators.



$$EBSN = \sum_{i=1}^4 v_i S_i \quad (1)$$

where

EBSN = the compound composite indicator of the use of e-business tools in companies

i = the number of a partial group of indicators

v = the weight of a partial group of indicators

S = the score achieved within the variable of a partial group of indicators

The score calculation in a given partial group of indicators is explained by the following equation

$$S = \sum_{k=1}^n w_n P_n \quad (2)$$

where

k = the serial number of a given variable

w = the weight of a variable in a given partial category

n = the highest ordinal number within a given partial category

P = the value (score) that was achieved

### The weights of individual categories and variables

For individual categories and variables that belongs to them the weights were expertly set. Their values are displayed in table 15.

**Tab. 15: The weights of individual categories and variables**

Category/Variable	Weight
Business Information Systems	0.29 ( $v_i$ )
E_ERP1	0.65 ( $w_n$ )
E_CRM	0.35
Purchase and sale	0.29
E_BUY	0.4
E_SELL	0.4
E_INV	0.2
Cooperation within SCM	0.29
E_SISC	1/6
E_SICU2	1/6
E_SIEXT2	1/6
E_SIEXTINT	1/6
E_SISU2	1/6
E_SISUCU2	1/6
Education, communication and remote access	0.13
E_IEDU	0.3
E_ENVRA	0.35
E_ENVTRV	0.35

Source: own

All weights were qualifiedly set on the basis of the executed literature research (mainly European Commission, 2008c) and consultation with other experts from the area of e-business. Business information systems, Purchase and sale and Cooperation within SMEs are prominent partial categories that have the same weight – 0.29. The partial category Education, communication and remote access was valued on the weight 0.13 (the weights were set by means of paired comparison with the set intensity of preference).

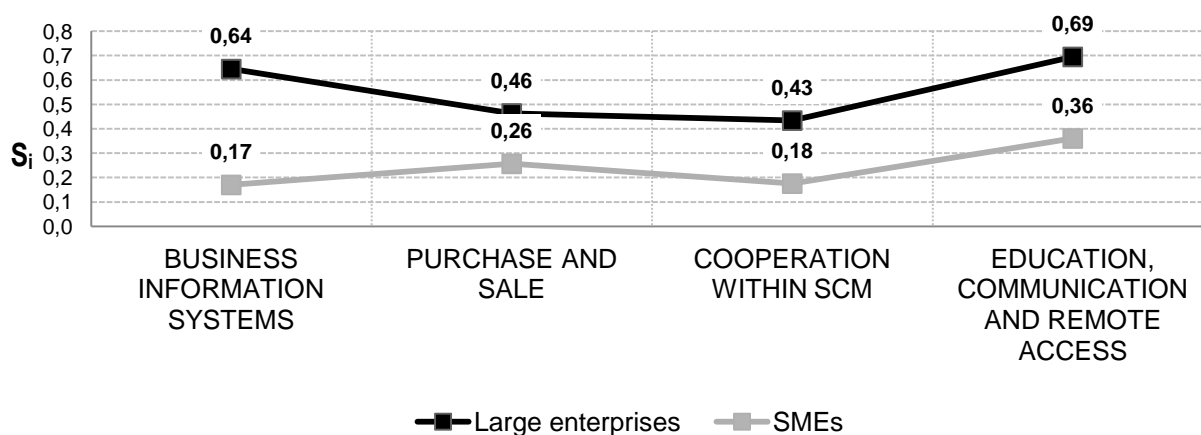
The weights of individual categories and variables reflect their expertly set importance, i.e. for instance E\_ERP1 is more important than E\_CRM, E\_SISC is equally important variable as E\_SISUCU2, etc.

#### 4. GRAPHICAL OUTPUT – INTERPRETATION OF THE RESEARCH RESULTS

Following outputs are presented for individual selected countries and the level in each

category is always presented separately for large, medium-sized and small enterprises.

**Fig. 1: Indicator of the use of e-business tools in Czech enterprises**

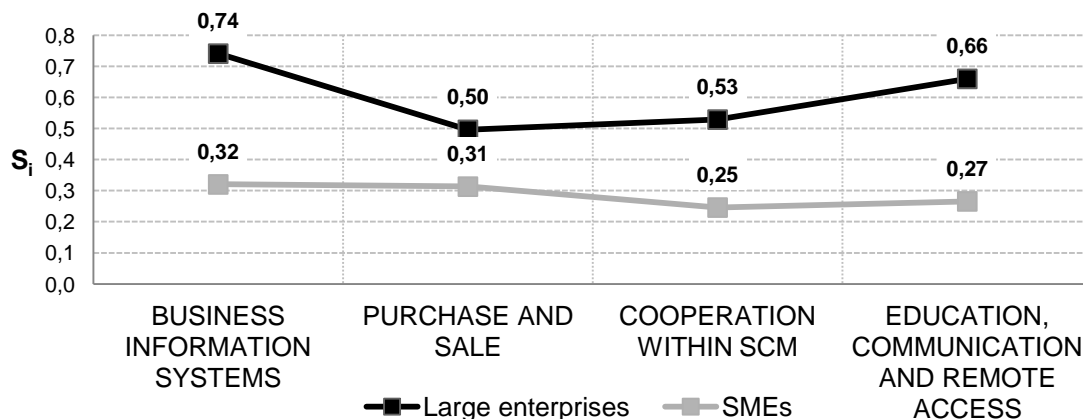


Source: own

The extent of the ICT use, more precisely of defined e-business tools, is generally higher at larger enterprises (Figure 1). The largest difference between large companies and SMEs lies in the ICT implementation. The slightest difference is evident in the area of purchase

and sale. The highest score was reached in the category Education, communication and remote access. Relative simplicity of the implementation of those tools is a possible cause.

**Fig. 2: Indicator of the use of e-business tools in German companies**

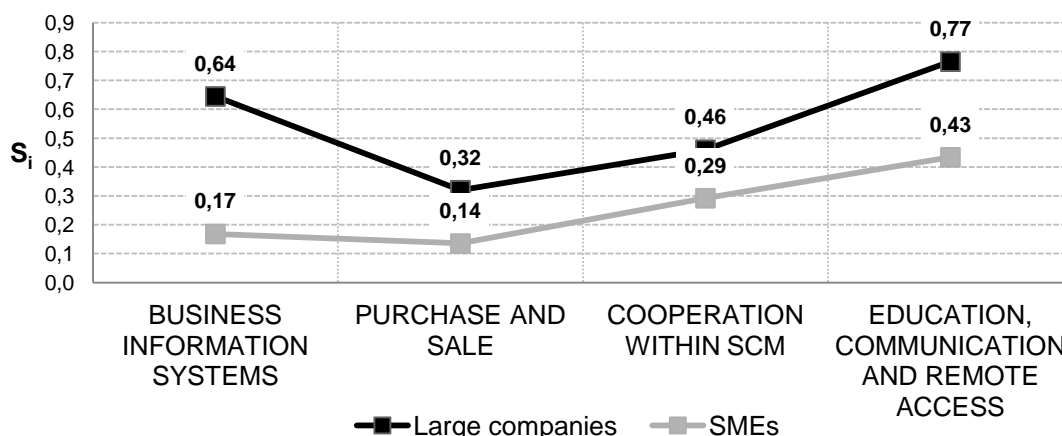


Source: own

Figure 3 presenting the situation in Slovenia shows interesting differences when compared to the situation in the Czech Republic and in Germany. The curve of largest enterprises is similar to those in above introduced Figures 1 and 2. At SMEs, there is a difference. The intensity of electronic purchase and sale is very low; however, the cooperation of small and medium-sized enterprises within SCM is even slightly higher than in Germany, in comparison

with the Czech Republic even by one third. The slightest difference between large companies and SMEs does not lie in the area of purchase and sale, but in the category Cooperation within SCM. The course of the SMEs curve is different from the two above mentioned countries; the highest score is reached in the area of education, communication and remote access, including SMEs.

Fig. 3: Indicator of the use of e-business tools in Slovene companies

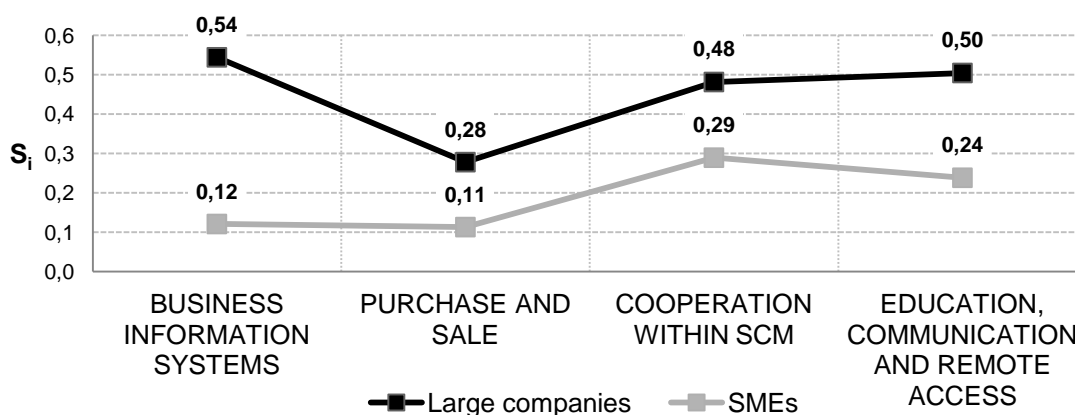


Source: own

For Poland, the lowest intensity of purchase and sale in the whole set is typical – the score is only 0.11 (see Figure 4). Very low score is also in the category Education, communication and remote access. Within the set, relatively high score was reached in the category

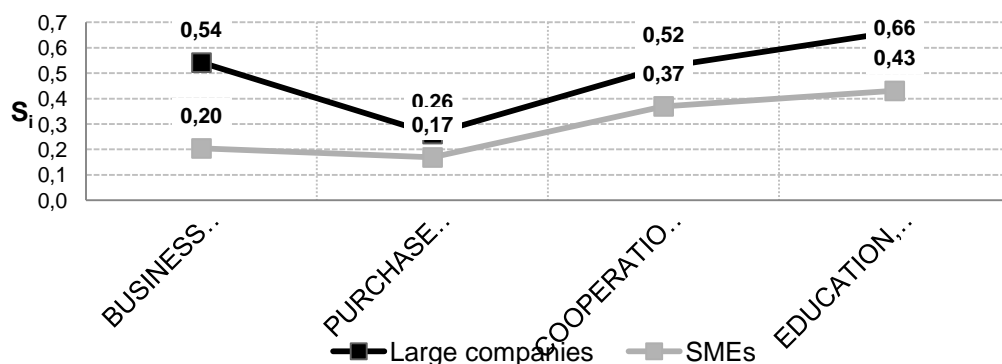
Cooperation within SCM at small and medium-sized enterprises – 0.29. This value is even higher than for Germany. Only Slovakia reached higher score in this category (SMEs) – see later in the text.

Fig. 4: Indicator of the use of e-business tools in Polish companies



Source: own

Fig. 5: Indicator of the use of e-business tools in Slovak companies

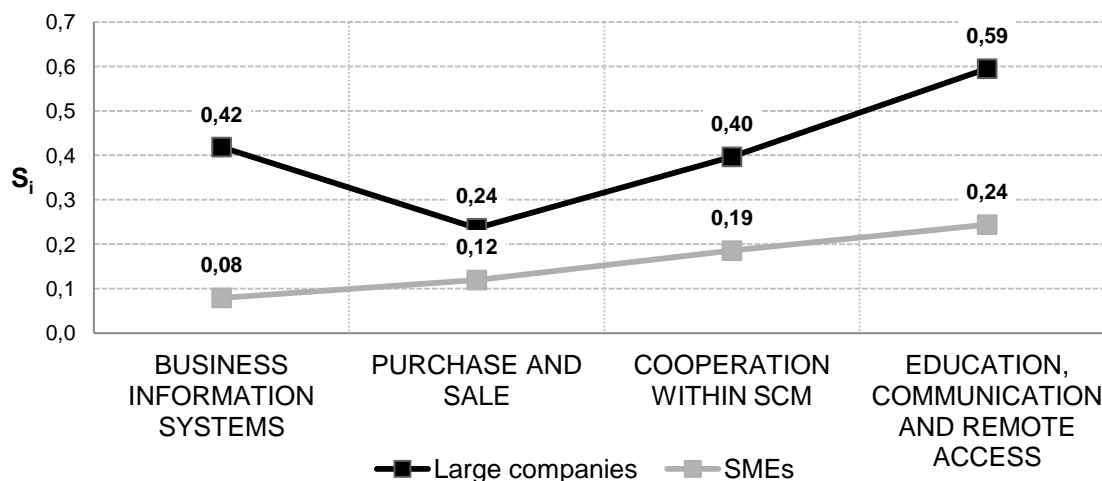


Source: own

Slovak companies show reserves primarily in the category Purchase and sale where the difference in the score between SMEs and large enterprises is only 0.09 and the value 0.26 (large companies) is the second lowest

within the whole set. Impressive results were reached in the category Cooperation within SCM where the values 0.52 and 0.37 shows relatively high level of advancement.

**Fig. 6: Indicator of the use of e-business tools in Hungarian companies**



Source: own

Within the researched sample, Hungarian companies show very poor results (Figure 6). In several categories (namely Business information systems and Education, communication and remote access – SMEs; Business information systems, Purchase and sale, Cooperation within SCM /together with Poland/ - large enterprises), Hungary reached the lowest score within the whole set. Better results were reached identically in the SMEs group and at large enterprises in the last partial category – Education, communication and remote access.

## CONCLUSION

A brief commentary according to the individual examined items (also the variables and their categories) with a final summary follows.

The intensity of the use of ERP systems is significantly different between the categories of small and medium-sized enterprises (SMEs) and large companies. The highest degree of the ERP implementation of these technologies (within the examined sample) is found in Germany and in the Czech Republic. The lowest degree of the ERP implementation is

shown in Poland and Hungary, independently of the company size.

The highest intensity of the use of CRM systems is in Germany, then, the Czech Republic follows. The degree of implementation at large companies is roughly two times higher than at SMEs.

The highest intensity of the electronic purchase within the examined sample is found in Germany. The lowest intensity is shown in Slovakia. Hungarian and Polish companies use least the possibilities of online sale.

Electronic invoicing is related directly to trade transaction; therefore it is suitable to monitor also its intensity. The highest intensity of electronic invoicing is found in Germany and in the Czech Republic. Hungary, Poland and Slovakia show the lowest intensity. Large companies are roughly two times more active than SMEs independently of geographic differentiation.

It seems there still is unused potential in the field of intensive cooperation between suppliers and customers (prediction of demand, production plans, etc.). The degree of the use is

again roughly two times higher at large companies.

The degree of data/information sharing that could be automatically processed is very high primarily at large enterprises, independently of their geographic location. For instance, the average value of E\_SIEXT2 indicator makes in EU27 84%, more precisely 58% at SMEs.

Close cooperation with customers (sharing the information on delivery, prediction of demands, etc.) presents an area that is not still widely used. As for EU27, it is on average 34% of large companies and only 14% of SMEs. The most active companies are in Slovakia and Germany (although big differences between countries in the sample are generally not found). SMEs use such cooperation with suppliers rarely.

Close cooperation with suppliers is more intensively realized in Slovakia and in Germany. Large enterprises cooperate with suppliers by means of ICT almost twice more than SMEs.

Majority of large companies provides their employees with the possibility of remote access to company data and applications. As for the EU27, the degree of intensity in the SMEs category is roughly half than at large companies. In the examined sample, the most active companies are in Slovenia and in the Czech Republic. In this category, the ICT tools are used at the lowest level in Hungary, the most in the Czech Republic and in Slovenia.

Teleconferences, videoconferences, etc. are the most frequently used by large enterprises in Germany (although a significant difference is seen between SMEs and large companies).

E-learning is popular particularly in Slovenia and in Slovakia; in Germany and Hungary, it is used at least. (As for EU27, the data for this indicator are not available.)

On the basis of the executed research investigation, it could be stated that there are significant differences between the use of ICT

at large companies and at small and medium-sized enterprises.

The authors of this study are not aware of the realisation of a similar study in the EU after the finishing of the e-Business W@tch project. They suppose that the information and conclusions resulting from the realized research study could be helpful to both other researchers and representatives of a private sector.

The contribution of the presented study is to mediate the picture of the implementation of e-business tools in the selected EU countries on the basis of large database of the Eurostat (2013) data. Their transparent interpretation is an important output for discussion about e-business development, and so about implementation of ICT at SMEs and large enterprises.

Research limitations are mainly apparent in three cases: the selection of variables, their grouping and weights. The presented indicator (ESBN) uses a combination of existing variables and existing data collected by Eurostat, and puts them in a new combination. The grouping, as same as the weights are based on literature review, discussions with professionals and own experience from both private and academic sector. The authors have also taken into account the models of the OECD, European Commission, United Nations, and other respected international organizations.

In further research it would be interesting to compare the index-scores with scores like Global Innovation Index (2014) that underlines human aspect for business development. Pillars of this index include infrastructure, technology and business. In the year 2013, Germany was the tenth in the world and Hungary (23) was ahead of the Czech Republic (26), Slovenia (34), and Slovakia (45). But in our research – focused on e-business – Hungary is the last from the compared countries, and of course Germany again proves its strong position also in this field.

## REFERENCES

- Brynjolfsson, E. & McAfee, A. (2014) *The Second Machine Age*. New York: W. W. Norton & Co., Ltd.
- CIO Business World (2012). Top 100 ICT společností v České republice. *CIO Business World, special issue*, June 2012.
- E-Business W@tch (2011) *European Commission. Enterprise and Industry*. Retrieved March 3, 2014, from <http://ec.europa.eu/enterprise/archives/e-business-watch/>
- European Commission (2010). *ICT and e-Business for an Innovative and Sustainable Economy - 7th Synthesis Report of the Sectoral e-Business Watch (2010)*. Luxembourg.
- European Commission (2009). *Europe's Digital Competitiveness Report – Main achievements of the i2010 strategy 2005-2009*. Luxembourg.
- European Commission (2008a). *An Economic Assessment of ICT Adoption and its Impact on Innovation and Performance*. Berlin/Brussels.
- European Commission (2008b). *The European e-Business Report 2008 — The impact of ICT and e-business on firms, sectors and the economy*. Luxembourg.
- European Commission (2008c). *eBusiness Guide for SMEs – eBusiness Software and Services in the European Market*. Stuttgart.
- Europe's Digital Competitiveness Report i2010*, (2010) Brussels: European Commission.
- Eurostat (2011). *Information society statistics. Eurostat, 2011*. Retrieved December 12, 2011, from [http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search\\_database](http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database)
- Eurostat (2013). *Statistics on ENT (NACE Rev 2)*. [DB MS Access]. Eurostat, version April 29, 2013, Retrieved May 5, 2013, from [http://epp.eurostat.ec.europa.eu/portal/page/portal/information\\_society/documents/Tab/Export\\_20130416\\_ENT2.zip](http://epp.eurostat.ec.europa.eu/portal/page/portal/information_society/documents/Tab/Export_20130416_ENT2.zip)
- Global Innovation Index. (2014).
- Gomez-Herrera, E., Martens, B. & Turlea, G. (2014) The drivers and impediments for cross-border e-commerce in the EU. *Information Economics and Policy*. 28, 83-96. doi:10.1016/j.infoecopol.2014.05.002
- Legris, P., Ingham, J. & Collerte, P. (2003) Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40 (3) 191-204. doi:10.1016/S0378-7206(01)00143-4
- McAfee, A. & Brynjolfsson, E. (2008) Investing in the IT that Makes a Competitive Difference. *Harvard Business Review*, 86(7) 98-106.
- OECD (2013) *Key ICT indicators*. Available at: <http://www.oecd.org/internet/broadband/oecdkeyictindicators.htm>
- OECD (2009). *Guide to measuring the information society*, 2009. Paris: OECD Publishing.
- OECD (2003). *ICT and Economic Growth - Evidence from OECD Countries, Industries and Firms*. Paris: OECD, 2003.
- Pintér, R. et al. (2008) *Information Society - From Theory to Political Practice*. Budapest: Gondolat – Új Mandátum, 2008.
- Prieger, J.E. & Heil, D. (2010) *The Microeconomic Impacts of E-Business on the Economy*. In: Lee, I. *Encyclopedia of E-Business Development and Management in the Global Economy*. New York: Business Science Reference. doi: 10.2139/ssrn.1407713
- Renner, T., Vetter, M. & Sheiding, F. (2008) *eBusiness Guide for SMEs*. Unit D4: ICT Industries for competitiveness and innovation.
- Reynolds, J. (2010) *E-Business: A Management Perspective*. Oxford: Oxford University Press.
- Soto-Acosta, P. & Meroño-Cerdan, A. L. (2008) Analyzing e-business value creation from resource-based perspective. *International Journal of Information Management*. 28, 49-60. doi: 10.1016/j.ijinfomgt.2007.05.001
- Soumitra, D. & Mia, I. (2011) *The Global Information Technology Report 2010-2011: Transformations 2.0*, Geneva: World Economic Forum.
- The Economist Intelligence Unit. (2011) *Digital economy rankings 2010: Beyond e-readiness. IBM in cooperation with The Economist*

*Intelligence Unit*. Retrieved September 15, 2011, from: [http://www-935.ibm.com/services/us/gbs/bus/pdf/eiu\\_digital-economy-rankings-2010\\_final\\_web.pdf](http://www-935.ibm.com/services/us/gbs/bus/pdf/eiu_digital-economy-rankings-2010_final_web.pdf)

UN/CEFACT. (2010) *ebXML Glossary – vision 0.99*. United Nations/CEFACT, 2001. Retrieved Juni 7, 2010, from <http://www.ebxml.org/specs/ebGLOSS.pdf>

UNCTAD (2011) *Measuring the Impacts of Information and Communication Technology for*

*Development*. New York/Geneva: United Nations.

UNCTAD (2013) *E-commerce and Development. Workshop on E-Commerce, Development and SMEs*. (8-9 April, 2013) Available at: [https://www.wto.org/english/tratop\\_e/devel\\_e/wkshop\\_apr13\\_e/fredriksson\\_ecommerce\\_e.pdf](https://www.wto.org/english/tratop_e/devel_e/wkshop_apr13_e/fredriksson_ecommerce_e.pdf)

**Adresa autora (autorů):**

**Ing. Jan Petřtyl, PhD.,**  
University of West Bohemia  
Faculty of Economics  
Department of Marketing, Trade and Services  
E-mail: [petrtyl@kmo.zcu.cz](mailto:petrtyl@kmo.zcu.cz)

**Doc. PaedDr. Ludvík Eger, CSc.,**  
University of West Bohemia  
Faculty of Economics  
Department of Marketing, Trade and Services  
E-mail: [leger@kmo.zcu.cz](mailto:leger@kmo.zcu.cz)

## A COMPARISON OF ICT USE IN COMPANIES OF SELECTED EU COUNTRIES

**Jan Petřtyl, Ludvík Eger**

### **Abstract**

Information and communication technologies (ICT) are definitely a phenomenon that has changed our world. According to the European Commission (2008, p.13): “ICT is an umbrella term that encompasses a wide array of systems, devices and services used for data processing (the information side of ICT) as well as telecommunications equipment and services for data transmission and communication (the communication side)”. Institutions such as for instance Eurostat deal with statistical monitoring and classification of ICT use at companies. The presented research is focused on the comparison of e-business in selected countries.

For the purposes of the research study, the data available from the open electronic database of Eurostat (2013) for analyses of ICT use in a business sector were used. A composite indicator was established and the level of e-business (a notion introduced by the European Commission, 2010) in selected countries in categories: Business information systems, Purchase and sale, Cooperation within SCM, and Education, communication and remote access was monitored. The attention was paid to the differences in monitored categories for SMEs and large enterprises. The contribution of the presented study is to mediate a picture of the implementation of e-business tools in selected EU countries on the basis of the large database of Eurostat (2013). The comparison between the Czech Republic and Germany, but also between other relevant competitors from the Visegrad group shows the Czech level of e-business. The outputs also show that the level of e-business at SMEs is lower than at large enterprises, that is in all selected countries.

**Keywords:** Information and communication technologies, e-business, SMEs and large enterprises, implementation of e-business tools, comparison

**JEL Classification:** O1, O