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ICT Driven Public Service Innovation Comparative Approach Focusing on Hungary

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Chapter 3 – Information Systems and Economic Value Added: A Comparative Illustration of Austria and Hungary

3.1 Introduction: the concept of added value and ICT development in organizations

Technology investments both in business and in government applications are seen as key sources of innovation (OECD, 2010), (10 Emerging Technologies, 2011, 2011). Value of these investments – both from economical and from social points of view – are defined by the outcomes that these investments generate (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013), (Bannister & Remenyi, 2003).

In economics we might conclude that ICT investments generate value if this outcome is economically positive, that is it contributes to such measures which improve growth, productivity, efficiency or effectiveness. On the firm level, these outcomes translate into revenue increase or cost savings but since the internet boom of the 1990´s researchers consider more and more significance to the ICT transformational outcomes (Lucas Jr, Agarwal, Clemons, El Sawy, & Weber, 2013). Transformation is closely coupled with radical innovation, or non-incremental change which fundamentally alters traditional ways of doing business. Transformational impacts can result in major disruptions of an industry´s competitive structure (like the internet has caused in the music industry), changes in user experience in consumption (such as on-line shopping), altering business processes (developing digital photography), creating brand new organizations (e.g. Facebook) and many more (Melville, Kraemer, & Gurbaxani, 2004). The term "e-business" in this context places this issue in its focus: what kind of economic value is generated by ICT investments and how this value is secured?

In the public sphere, e-government deals with a similar problem as far as value creation is concerned. The outcome, however, is very different: better governance, democratic transparency, improvement in social life. Below the holistic and broad societal values we can also define lower, public service level outcomes of ICT investments such as improved public service delivery, better coordination across government, improved public engagement, and more efficient process management. Recent research also raises the issue of the transformational ambitions of the e-government concept, and we see the ICT deployment strategies in the heart of many public reforms (Lips, 2012), (Halachmi & Greiling, 2013).

The use of ICT applications makes it effective to handle large amounts of administrative tasks. Data transfer will become faster and cheaper, increasing the dynamics of administration. Sharing databases between various institutions will lead to cost reduction, lessened complexity and the avoidance of unnecessary and redundant solutions. Archiving and data retrieval becomes easier and less expensive; the history of different types of administrative cases and matters gets easier to follow.

However, it is possible to talk about efficiency only in the long run as online and offline services have to be maintained side by side as long as it is requested by the public and business enterprises.

Businesses have been using electronic devices to help their operation at some level since the emergence of computers. The development of computers has helped businesses to improve their information and communication processes. Naturally, it, similarly to all technical innovations, was initially only available for large companies that had enough capital and were able to finance their development (Nemeslaki, 2012)

Computers appeared at these companies for the first time and were initially applied only to perform simple computing tasks. Later corporate databases were formed in which data could be stored. This period is called the period of island systems when each corporate module had its own IT support for fast data processing.

However, with the robust development of the internal computer networks and the Internet, it has become almost inevitable to merge these systems in a single interface in the companies' internal and external information flows. That is how a business society has evolved by now in which market share is substantially dependent on the IT support behind business enterprises.

Information technology put a device in the hands of enterprises with which they can achieve things that were previously considered impossible. Nicholas Carr argues that information technology have reached its maturity to the extent that it is now an integral part of every business enterprise's infrastructure. As the performance of the technology was growing and its size and relative price fell, the use of information stored in computers extended to other fields of application: from the organization of e-commerce to the automation of production. It was not simply about performing tasks, which could also be performed by traditional methods, faster and more efficiently by a computer but it also became possible to give answers to questions with the help of computer that had not even arisen before because they simply could not occur. (Cohen, Delong, & Zysman, 2000)

Our basic assumption is that in countries where the use of IT devices is higher, enterprises have higher capability of manufacturing more complex products, and the production of more complex products leads to higher added value. Added value at basic prices can be simply defined as the difference between gross output (at basic prices) and intermediate consumption (at purchaser prices) and can be decomposed into the following components:

- Compensation of Employees;
- Gross Operating Surplus;
- Mixed Income; and
- Other Taxes on Production less Subsidies on Production (OECD, 2009).

Compared to the EU average of 27 countries, the average added value of the Austrian enterprises was higher by 70% with EUR 530,000 in 2012. In contrast, the average data of the Hungarian enterprises did not exceed EUR 87,000 which was equal to only 27 % of the EU average.

Country /thousand EUR/	Micro-enterprise	Small-sized enterprise	Medium-sized enterprise	Corporation	Average
EU27	71.56	880.52	5,250.82	61,900.78	311.77
Austria	124.19	1,042.24	7,640.42	64,716.60	530.42
Hungary	16.70	315.22	2,269.61	29 495.48	86.58

Table 3. 1 – Average added value by size categories in Austria and Hungary in 2012

The added value of microenterprises in Austria reached 173% and a modest 23% in Hungary in relation to the EU average. It mounted up to only EUR 17,000 thousand in Hungary and EUR 124,000 in Austria per enterprise, which was nearly 7.5 times higher than the Hungarian data in 2012. The added value created by small-sized enterprises was eight times higher in Austria (EUR 1,042,000) and 18 times higher (EUR 315,000) in Hungary compared to microenterprises. The added value generated by the Hungarian medium-sized enterprises was only slightly over 40% of the average of the European Union (EUR 2,270,000). In the meantime, the added value of the medium-sized enterprises in Austria exceeded the EU average by 45%. Regarding the performance of the Hungarian enterprises, the corporations operating in the country lagged behind their Austrian counterparts to the least extent. The added value per enterprise in Austria was three times higher in the case of small- and medium-sized enterprises and two times higher in the case of corporations compared to their peers in Hungary.

3.2 The relationship of ICT development and economic performance

The key strategic motive behind Information System applications are to "*make things better*" which means in economical terms that there should be a correlation between the added value created by enterprises in a country and their ICT development. Higher added value means using more complex Information Systems (IS) and employing more information technology specialists. In order to verify this existing relationship, a linear correlation analysis was performed between the NRI and IDI development of a country and the average added value generated by the enterprises operating there. The analysis was conducted by using the data collected in 27 EU countries.

The information society is an elusive process that is difficult to quantify and approach by economic and sociological methods. The measurements and comparisons, however, raise a number of problems. Simple indices of infrastructure can be measured more easily but the more variables are there to work with, the more difficult it becomes to measure appropriately. The indices are the measurements and comparative methods of various segments of the information society. The weight of separate factors in a given index reflects the viewpoint of governments, intergovernmental organizations and academic workshops in terms of the necessary factors for the development of the information society.

The indicators currently in use can be divided into two groups (Botos, 2010). There are some indicators showing the quantitative aspects of ICT development, while other indicators include more complex measures of development such as skills and usage.

By referring to the overall situation, these indicators are useful for indicating general development level but they do not quite express the real situation. Among these indicators, the following ones can be included: the number of subscribers, the number of ICT devices, subscription fees, the number of ICT employees, the rate of ICT revenues, the contribution of ICT to the overall GDP figure, the number of ICT enterprises. These indicators are used for characterizing the general ICT standards of a country on average. They also make it possible to compare the ICT development level of individual countries to one another, however, they can provide only a distorted image to a certain extent.

Integrated indicators, on the other hand, do not only put an emphasis on measuring ICT infrastructure but they also take quality issues into account. The two most important integrated indicators are the following:

- ICT Development Index (IDI) is an index published by the United Nations International Telecommunication Union (ITU) based on internationally agreed information and communication technologies indicators. It is used to measure the ICT development levels in 155 countries. The index itself, which can be used as an evaluation tool at global, regional and country levels alike, combines 11 indicators grouped into three subindices: ICT access, use and skills.
- Networked Readiness Index (NRI) is annually published by the World Economic Forum, is used to measure the propensity for countries to benefit from the opportunities offered by information and communication technology. It examines three major dimensions: the general business, regulatory and infrastructure environment for ICT, the readiness of the three key stakeholder groups in a society individuals, businesses and governments to use and benefit from ICT, and the actual usage of the latest information and communication technologies available (Davis & Olson, 1985).

3.2.1 The correlation between IDI and the added value

Correlation calculations are used to describe the direction and the strength of a linear relationship between variables. In our calculation, the correlation between two variables - the IDI index of a country and the average added value created by enterprises - was examined.

Depending on the individual countries the values of IDI were between 5 and 8.5, the added value per enterprise was between 50,000 and 800,000 Euros. The correlation coefficient is 0.791, which indicates a strong positive relationship. The linear correlation coefficient is the square of the determinant coefficient, which explains the added value with the IDI index by 61%. The standard error of the estimate (SEE) helps to determine the accuracy of the prediction. SEE shows the average standard deviation of the added value from the estimated values, which is a value of 1.39.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	817,842.426	1	817,842.426	41.911	.000
Residual	487,849.245	25	19,513.970		
Total	1,305,691.672	26			

Table. 3. 2 - ANOVA table for IDI regression analysis

The ANOVA table shows a similar division to variance analysis, based on the variance explained by each regression (817,842.426), and non-explained variance (487,849.245). Here, the significance of the f-test can also be read, which confirms the existence of the correlation (Sig. <.05).

In addition, it can also be observed by interpreting the t-test that the significance of the variable determining steepness is less than 5%, therefore IDI has a real effect on added value.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-1,010.976	205.450		-4.921	.000
IDI	196.450	30.345	.791	6.474	.000

Table 3.3 - Estimation of regression coefficient (IDI)

Based on the Unstandardized Coefficients, it is possible to read the formula of the regression line:

$$\text{Added value} = -1{,}010.976 + 196.45 * \text{IDI}$$

If we take a closer look at the figures, it becomes clear that the member states of the European Union can be divided into four distinct groups.

- Relatively high added value per enterprise with a comparably higher IT development level. This group of countries includes Austria, Germany, the United Kingdom and Ireland.
- Relatively high added value per enterprise with a comparably lower IT development level. Denmark, the Netherlands, Finland, Sweden and France belong to this group.
- Relatively low added value per enterprise with a comparably higher IT development level. Four countries can be found in this group, namely Slovakia, Cyprus, Romania and Bulgaria.

- Relatively low added value with a comparably low IT development level. This is the most populous group, comprising Lithuania, Latvia, Estonia, Malta, Spain, Italy, Slovenia, Poland, Greece, the Czech Republic, Portugal and Hungary.

Austria is situated above the regression line while Hungary can be found below it. This means that the average added value generated by the enterprises operating in Hungary is lower than they could achieve by benefiting from their actual IT development level. In contrast, the IT development level in Austria is lower than the average added value produced by the country.

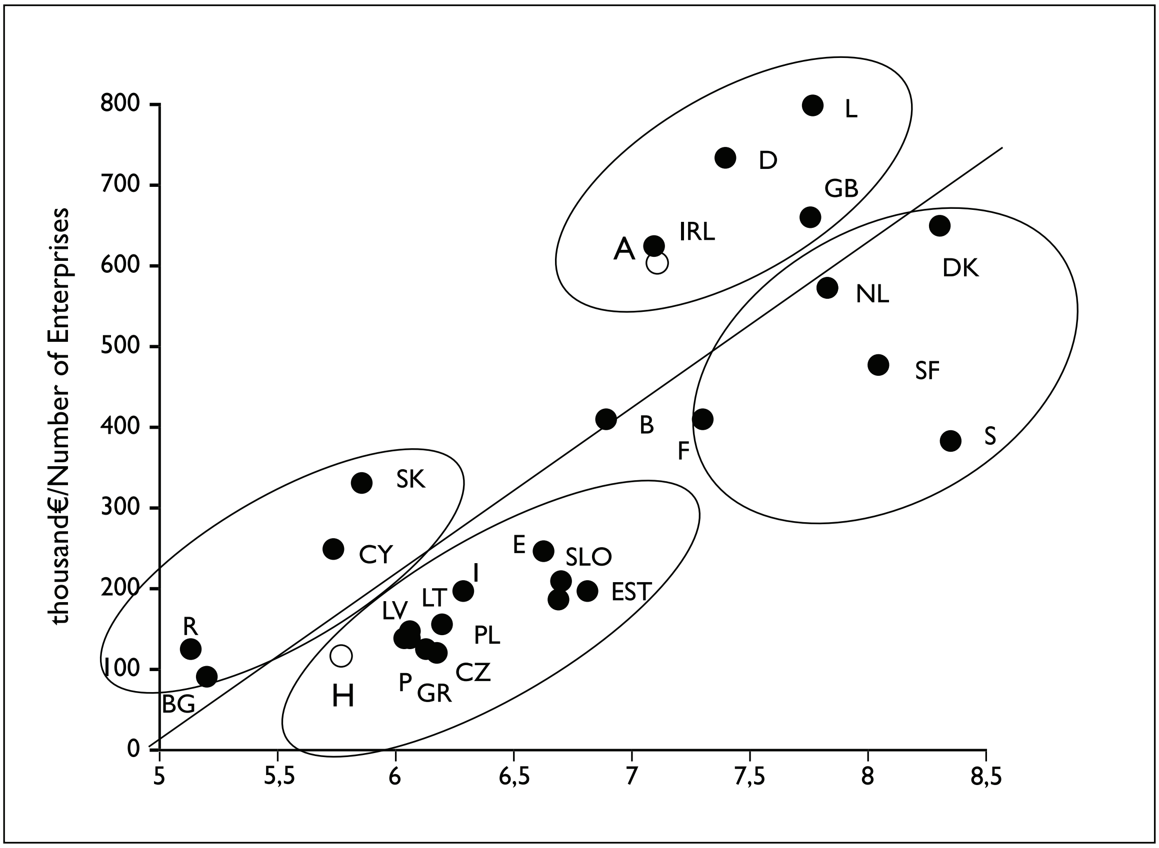

Figure 3. 1 - The correlation between the added value and the IDI development of the EU countries in 2012[3]

3.2.2 The correlation between NRI and the added value

In this calculation, the correlation between two variables - the NRI index of a country and the average added value created by enterprises - was examined. The value of NRI varied between 3.7 and 6.2 in 2012, depending on the individual countries.

3 Abbreviations: A=Austria, B=Belgium, BG=Bulgaria, CY=Cyprus, CZ=Czeh Republic, DK=Denmark, EST=Estonia, SF=Finland, F=France, D=Germany, GR=Greece, H=Hungary, IRL=Ireland, I=Italy, LV=Latvia, LT=Lithuania, L=Luxemburg, M=Malta, NL=Netherlands, PL=Poland, P=Portugal, R=Romania, SK=Slovakia, SLO=Slovenia, E=Spain, S=Sweden, GB=United Kingdom

In this case, the correlation coefficient indicates a very strong positive correlation (0.759). The linear correlation coefficient is the square of the determinant coefficient, which explains the added value with the NRI index by 58%. SEE shows the average standard deviation of the added value from the estimated values, which is a value of 1.48.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	751,272.926	1	751,272.926	33.877	.000
Residual	554,418.746	25	22,176.750		
Total	1,305,691.672	26			

Table 3.4 - ANOVA table for NRI regression analysis

The ANOVA table shows a similar division to variance analysis, based on the variance explained by each regression (751,272.926), and non-explained variance (554,418.746). Here, the significance of the f-test can also be read, which proves the existence of the correlation (Sig. <.05).

In addition, it can also be observed by interpreting the t-test that the significance of the variable determining steepness is less than 5%, therefore NRI has a real effect on added value.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-954.737	218.775		-4.364	.000
NRI	261.582	44.943	.759	5.820	.000

Table 3. 5 - Estimation of regression coefficient (NRI)

Based on the Unstandardized Coefficients, it is possible to read the formula of the regression line:

Added value = -954.737+261.582*NRI

It can also be observed following the data provided by the NRI index that Austria is located above whereas Hungary is below the regression line. The previously identified four groups can also be observed here; with the minimum difference that few countries can be found elsewhere in the diagram (for example Italy, Denmark and Belgium).

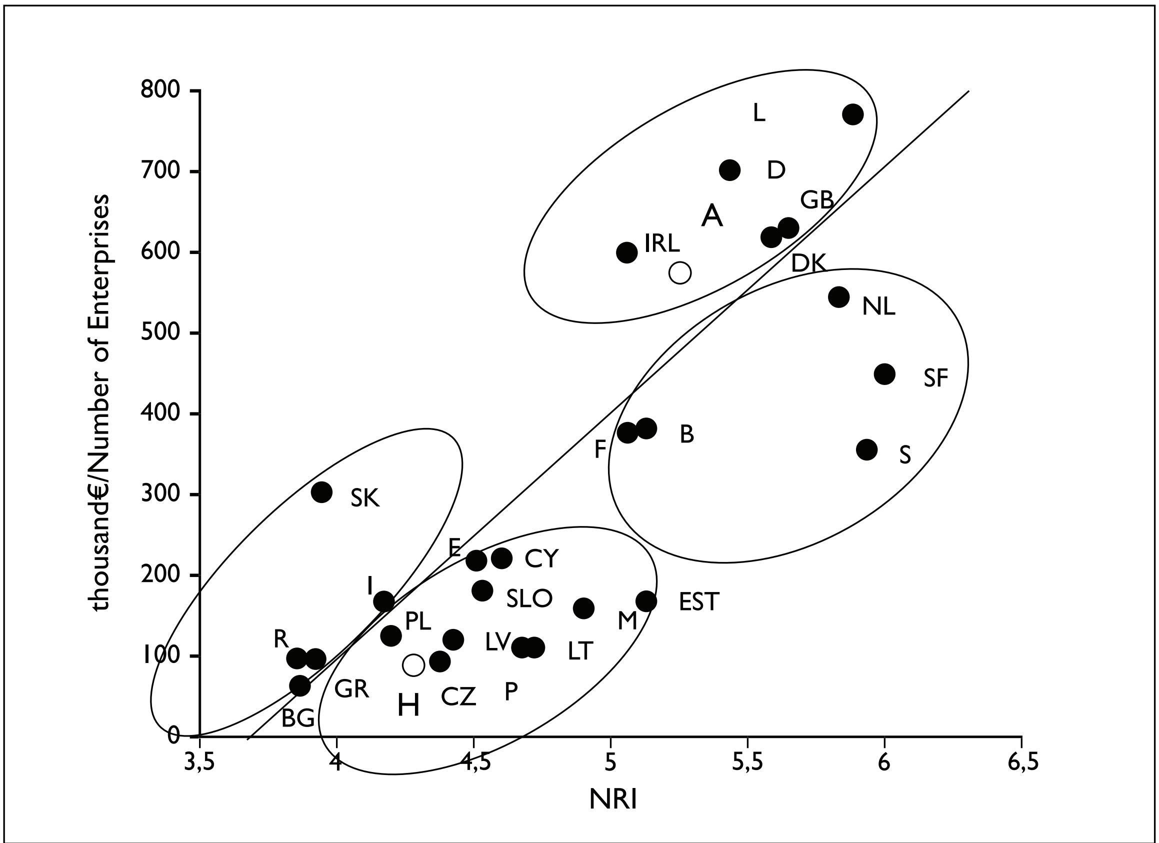

Figure 3. 2 - The correlation between the added value and the NRI development of the EU countries in 2012

The NRI value for Austria was 5.25, while in the case of Hungary it was 4.29. Austria falls into the group of countries where lower average added value belongs to the given IT development level. Hungary's NRI value is behind its average added value.

3.2.3 Results of ICT maturity and economic added value connections

The correlation between added value and the ICT development level of a country is close. Nevertheless, the use of ICT has some beneficial effects that are difficult to quantify.

The "Common List of Basic Public Services' is a recommendation for the performance of public services by the European Union which defines obligations for the member states regarding the range and levels of public services provided online.

If businesses and citizens have a higher frequency ICT usage in a country, it also means that they use the services of e-administration to a greater extent.

This an important message to strategy makers. Also a countries business enterprise ecosystem is a key stakeholder, element of the environment of its public service which determines the demands and very likely the supply sources of its innovation capability.

3.3 How does organizational use of ICT contribute to better organizational performance

This is a complex a widely researched question and this chapter intends to show and introduce the first fundamental element of the value creation process, that is how IS is configured.

We summarized in a rudimentary model the elements of ICT drivers and configurations which according to Resource Based Value theories contribute to enterprise value creation in Figure 3. 3. We will discuss these in the following sections as:

- Hardware and Network;
- Information Systems;
- Information Management or IS responsibility.

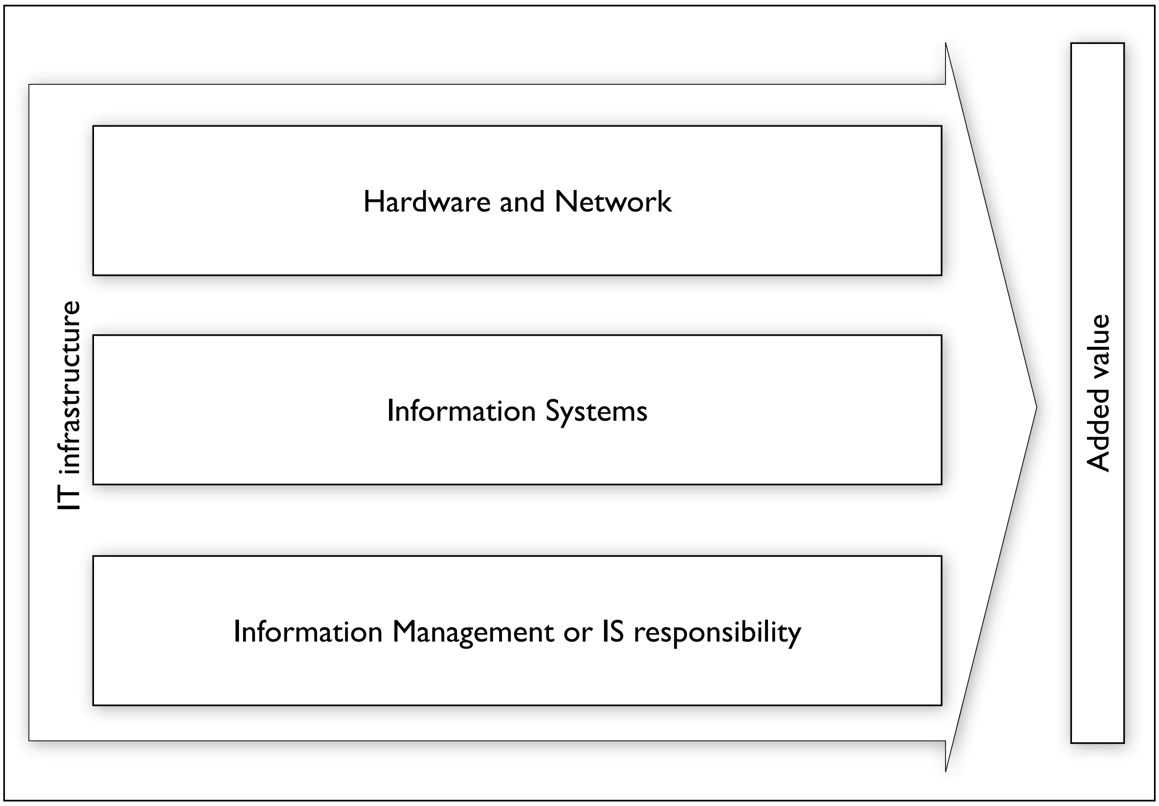

Figure 3. 3. – The logical framework of IT added value and the research model of the chapter.

We will show, that in all aspects we can observe noticeable difference between the high added value performer Austria and the catching up performer Hungary. We did this through sending out questionnaires to companies.

The questionnaire was divided into five blocks. The first part contained questions about the company background information, then issues related to the IT infrastructure. The third group of questions focused on the business issues related to Internet usage habits, while the fourth and longest section was aimed at assessing the usage patterns of IS. The fifth block of questions was investigating information management practices of the companies, while in the end of this section, we asked about some information on the human resources related to IT.

The primary research was based on a questionnaire that had already been filled out by Hungarian business enterprises. The same questionnaire was used among the Austrian enterprises, providing a good opportunity to compare and analyze the two countries. The questionnaires were sent out randomly, regardless of company size, business activity and regional location. The sample size for comparison was almost identical as 94 enterprises in Hungary and 99 enterprises in Austria completed and returned the questionnaire by the set deadline.

Based on the received questionnaires, an analysis by size categories could be performed because this grouping facilitates the creation of larger sample size in each defined size category. In order to explore the differences in business activities, a larger sample number would have been required in the individual categories of business activities. Therefore the sample of the responding enterprises is not representative, so the results of the survey can be interpreted only within the scope of the responding companies. The evaluation of the received data and the representation of the results were assisted by the application of Excel 2007 and SPSS 16.0 statistical software package. In order to make it easier to interpret the results of our research, diagrams and tables illustrating the course of our analysis as well as the revealed correlations were compiled. The sample of the respondent enterprises is not representative so the results of the survey can only be interpreted within the range of the responding enterprises. Based on the filled-in questionnaires, it can be observed that there is a sample containing at least 12 units only in the size categories of SMEs and corporations in each studied country.

Country	Micro-enterprise	Small-sized enterprise	Medium-sized enterprise	Corporation
Austria	43	28	16	12
Hungary	20	27	27	20

Table 3.6 - Number of surveyed enterprises by size categories

3.4 The role of IT infrastructure

IT infrastructure refers to the composite hardware, software, network resources and services required for the existence, operation and management of a business IT environment. It allows an organization to deliver IT solutions and services to its employees, partners and/or customers and is usual internal to an organization and deployed within owned facilities (Janssen, 2013). IT infrastructure consists of all components that somehow play a role in overall IT and IT-enabled operations. It can be used for internal business operations or developing customer IT or business solutions.

Typically, a standard IT infrastructure is distributed according to the following components:

- Network: Server-based network, Internet connectivity, firewall and security.
- Hardware: Servers, computers, data centers, switches, hubs and routers, etc.
- Software: IS, productivity applications and more.
- Meatware: Although conflicting, human users, such as network administrators (NA), developers, designers and generic end users with access to any IT appliance or service are also part of an IT Infrastructure, specifically with the advent of user-centric IT service development (Janssen, 2013).

In information technology, a server is a computer or software that facilitates the access to the data stored or generated on it for other computers or allows the utilization of its hardware resources (such as printers, mass storage devices, CPU).

3.4.1 The number of workstations used by enterprises

On average, 5.74 workstations were used by the Austrian microenterprises, 16.89 were used by small-sized enterprises, 153.86 were used by medium-sized enterprises, and corporations had 2,601 workstations on site.

In Hungary, these numbers are substantially smaller. The great differences can be seen in Table 3.7.

Country	Micro-enterprise	Small-sized enterprise	Medium-sized enterprise	Corporation
Austria	6	17	154	2,601
Hungary	3	7	55	1,105

Table 3.7. - The average number of workstations used by enterprises in 2012

Compared with Austria, the Hungarian enterprises are less developed in terms of the number of workstations in use. Austria belongs to the top countries in the European Union when it comes to the general supply and use of workstations, while Hungary's handicap is spectacular in this regard. Therefore, it is understandable that the situation is quite the same in the field of economic organizations. Similar to the penetration of server-based networks, a close relationship can be observed between company size and the use of workstations. This can be explained by the amount of information held and the number of employees as well. At a corporation, hundreds or thousands of employees do work that requires the everyday use of IT tools such as workstations. As the company size decreases, so does the number of employees and workstations together as well as the amount of data to be processed.

A significant correlation can be detected between company size and the penetration of server-based networks in both Austria and Hungary. It can be explained by the fact that the larger an organization is, the more data it has to store and share among users. The huge amount of a corporation's IT resources inevitably require the application of these networks but a microenterprise might be able to manage the available data and information and does not need the support of such networks.

3.4.2 The frequency of applying server-based networks

In order to draw a conclusion about the state of the IT infrastructure of the Austrian and Hungarian enterprises, it is necessary to know whether they operate servers on there.

More than half of the Austrian micro-enterprises (56%), and almost all of the small-sized businesses had a server-based network, and 100% of the medium-sized enterprises and corporations answered yes to this question. In Hungary, 30% of microenterprises, a little more than half of the small-sized enterprises and 93% of the medium-sized enterprises reported that they had a server-based network. All of the responding corporations in Hungary stated that they maintained a server-based network.

Country	Micro-enterprise	Small-sized enterprise	Medium-sized enterprise	Corporation
Austria	56	96	100	100
Hungary	30	52	93	100

Table 3. 8 - The frequency rate of server-based networks in percentage in 2012

Seeing these indicators, it can be said that Hungary's western neighbour is more advanced in this respect as microenterprises and medium-sized businesses there applied server-based networks in a much greater proportion. The percentage of these networks in the case of medium-sized enterprises and corporations were similarly high in the two countries. This is not surprising since the effective operation of larger organizations is almost unimaginable without the application of server-based networks.

3.5 Information Systems

In order to understand IS, we need to be aware of their general features, functions and key activities, together with their inter-relatedness to one another (Benjamin & Blunt, 1992).

There are several definitions offered on IS in the literature. According to Burt and Taylor's approach, "*IS can be regarded as an information source in any combination thereof, or any access to and any recovery of their use or manipulation. Any information system is designed to link the user to an appropriate source of information that the user actually needs, with the expectation that the user will be able to access the information satisfying their needs*" (Burt & Taylor, 2003). Davis and Olson define IS as "*an integrated user-machine system for providing information to support the operations, management, analysis, and decision-making functions in an organization. The system utilizes computer hardware* *and software, manual procedures, models for analysis, planning, control, and decision-making by using a database*". (Burt & Taylor, 1985)

In a broader sense, an information system is the collection of individuals, activities and equipment employed to collect, process and store information related to the company's environment, its internal activities, together with all transactions between the company and its environment. Beyond giving direct support to operations, its basic task is to provide decision-makers with the necessary information during the whole decision-making process. The system's main components are the following (Bocij, Greasley & Hickie, 2008):

- Individuals: the actual users of technical apparatus. Belong to this group both people who develop, maintain and operate the system and users of information, as top managers who receive information on the factors affecting business operations, and use IS to make decisions in relation to planning, implementation and monitoring business activities.
- Information (processed data on external and internal facts and communication) which – due to its systematized form – can be used directly in the decision-making process.
- Technical apparatus, nowadays usually a computer system (hardware and software) that supports and connects the subsystems applied to achieve corporate objectives.

The computer system standardizes a significant part of the information and communication system, thus making it easier to produce and use information. According to one definition proposed (Csala, Csetényi & Tarlós, 2003) "*IS are systems that use information technology to collect information, transmit, store, retrieve, process, display and transform information in a business organization by using information technology.*"

3.5.1 Information systems and corporate decision levels

Depending on the organizational structure of enterprises, management activities are realized in different divisions of labour and at various levels. According to Robert N. Antony's comprehensive framework, there are three types of organizational controlling systems: strategic planning, management control, and operational control (Anthony, 1965).

Based on Antony's classification and in line with our assumptions, these systems can be transformed into decision-making and organizational levels of specific activities that are completed with a fourth one. These four levels are associated with the following tasks:

- Top-level management determines the business policy of an enterprise but they should provide guidance for the **strategy** to be implemented as well. In addition to the preparation of plans, they have to ensure their implementation and the correction or modification of their strategy if circumstances and conditions change.
- Middle-level management has to implement a policy specified by the top-level management, elaborating and implementing **tactical** tasks.

- The responsibility of the **operational** level of management is to directly control the implementation of real processes based on the strategy and tactics defined by the upper management levels.
- At the lowest **executive** level, the implementation of simple mass transactions is done. It can also be called the level of **tasks**.

If it is true that certain specific IS can closely be connected to certain decision-making levels, then it is worth examining how each information system is related to the other and exactly what levels of decision-making they are designed to support.

An executive information system (EIS) is a type of management information system (MIS) that facilitates and supports senior executive information and decision-making needs. It provides easy access to internal and external information relevant to organizational goals. It is commonly considered a specialized form of decision support system (DSS) (Power, 2002).

Management information systems (MIS) are distinct from other information systems because they are used to analyze and facilitate strategic and operational activities.

Originally, the term Management Information System „MIS" described applications providing managers with information about sales, inventories, and other data that would help in managing the enterprise. Over time, the term broadened to include: decision support systems, resource management and human resource management, enterprise resource planning (ERP), enterprise performance management (EPM), supply chain management (SCM), customer relationship management (CRM), project management and database retrieval applications (O'Brien 1999).

Transaction processing is a style of computing that divides work into individual, indivisible operations, called transactions. A transaction processing system (TPS) or transaction server is a software system, or software/hardware combination, that supports transaction processing (IBM Corporation, 2012)

According to the traditional structure, MIS, DSS and EIS are based on a TPS system (Rainer, and Cegielski, 2010).

CRM, SRM and SCM systems are basically designed to support decision-making at operational and tactical levels but it is inevitably necessary to have an underlying TPS system that addresses the daily tasks. ERP systems include some important functions of TPS, and be able to support the full operational level. Business Intelligence (BI) systems can include all sorts of decision-support systems used at middle and senior management levels that appear as BI applications. BI systems are always based on some lower-level support systems, mostly on ERP systems. ERP and BI systems can also be found in a complex package (Guo, Sun & Zhong, 2008).

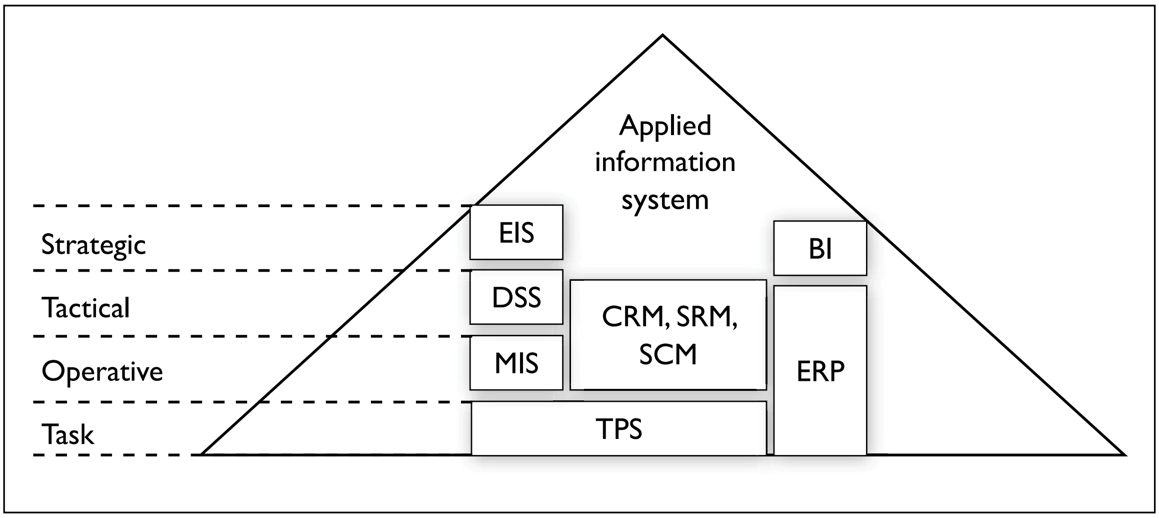

Figure 3.4 - Corporate decision-making levels with the supporting IS (Kacsukné Bruckner & Kiss, 2007)

It is needed to emphasize that this categorization should not be regarded as a rule, it describes only the current major trends. There are instances showing that some systems also extend to other levels of decision-making, and general shifts between these levels are also possible due to the continuous development (Sasvári, Rauch & Szabó, 2014).

3.2.5 The use of IS in Austria and Hungary

Nearly two-thirds of the Austrian microenterprises used TPS systems. The proportion of ERP systems (both used and planned to use) was up to 27% in 2012. Using MIS systems reached 23%, their planned use was 3%. Less than one-tenth of the Austrian microenterprises reported using SCM and SRM systems. The proportion of the intended use of CRM systems reached 17%, although the rate of their actual use was only 5%. Using DSS did not exceed 1% in Austria. The use of such strategic systems as BI and EIS affected only one-tenth of the microenterprises in Austria in 2012.

A quarter of the Hungarian microenterprises were using or planning to use TPS systems. The intended use of ERP systems did not exceed 10% in this size category. The planned use of MIS and SRM reached 15%, it was the second highest rate following the intended use of CRM which was 35 %. The use of strategic systems was less than 5%. The use of SCM systems did not exceed 5%, either, their intended use was around 15% in 2012. It can be stated that none of the Hungarian microenterprises used IS at a higher frequency rate of 5%.

Small-sized enterprises in Austria used TPS systems in the largest proportion, their usage rate was 75%, respectively. ERP systems were used by 46% of them. At operational level, MIS systems were used by nearly a quarter of the Austrian enterprises in 2012. The use of different tactical IS in the case of CRM and SRM affected the fifth of small-sized enterprises. Using DSS and SCM systems was not typical of Austrian enterprises.

Small-sized enterprises in Hungary most commonly used TPS systems (30%) followed by ERP (15%) and CRM (15 %) systems. 15% of them reported using SRM systems. Based on the responses, none of the small-sized enterprises in Hungary used any kind of decision support systems. 7% of them used BI and only 4% of them reported using EIS systems.

Country		Austria			Hungary		
Levels	**IS**	**Used**	**Not used, intro-duction is planned**	**Not used, introduction is not planned, either**	**Used**	**Not used, intro-duction is planned**	**Not used, introduction is not planned, either**
Micro-enterprise							
Strategic	BI	8%	8%	84%	0%	5%	95%
	EIS	2%	0%	98%	0%	5%	95%
Tactical	DSS	0%	5%	95%	0%	5%	95%
	SCM	0%	8%	92%	5%	10%	85%
	SRM	7%	10%	83%	5%	15%	80%
	CRM	5%	17%	78%	5%	35%	60%
Operative	MIS	23%	3%	74%	0%	15%	85%
Task	ERP	20%	7%	73%	0%	10%	90%
	TPS	60%	2%	38%	5%	20%	75%
Small-sized enterprise							
Strategic	BI	29%	4%	67%	7%	11%	82%
	EIS	4%	7%	89%	4%	11%	85%
Tactical	DSS	0%	4%	96%	0%	30%	70%
	SCM	4%	11%	85%	11%	19%	70%
	SRM	22%	4%	74%	15%	15%	70%
	CRM	22%	4%	74%	15%	19%	66%
Operative	MIS	43%	4%	53%	7%	26%	67%
Task	ERP	46%	4%	50%	15%	22%	63%
	TPS	75%	7%	28%	30%	19%	51%

Table 3.9. - The penetration rate of IS among micro-enterprises and small-sized enterprises in Austria and Hungary in 2012[4]

Nearly 90 % of the Austrian medium-sized enterprises used TPS systems. The proportion of using ERP reached 80% in 2012. The use of MIS systems approached 70%, and their planned use was 6%. Over a fifth of the medium-sized enterprises reported using SCM and SRM systems in Austria. The rate of using CRM exceeded 37 %, being the highest frequency rate among the IS used at a tactical level. The use of DSS was not typical in this size category. The use of strategic systems, including the use of B, affected more than a third of the Austrian medium-sized enterprises.

4 I=Task; II=Operative; III=Tactical, IV=Strategic

More than half of the Hungarian medium-sized enterprises used or planned to use the TPS systems. Using ERP systems was more than 40% in this size category. The intended use of MIS and SRM was nearly 40%, and 44% in the case of CRM systems which was the highest rate in the group of IS used at a tactical level. The use of EIS systems was used by nearly a quarter of the medium-sized enterprises. Although, the use of SCM systems affected a quarter of medium-sized enterprises, their intended use was up to 26% in 2012.

Country		Austria			Hungary		
Levels	**IS**	**Used**	**Not used, intro-duction is planned**	**Not used, introduction is not planned, either**	**Used**	**Not used, intro-duction is planned**	**Not used, introduction is not planned, either**
Medium-sized enterprises							
Strategic	BI	38%	6%	56%	7%	19%	74%
	EIS	7%	7%	86%	26%	4%	70%
Tactical	DSS	0%	14%	86%	19%	18%	63%
	SCM	19%	0%	81%	26%	26%	48%
	SRM	25%	0%	75%	37%	19%	44%
	CRM	37%	12%	51%	44%	15%	41%
Operative	MIS	69%	6%	25%	41%	15%	44%
Task	ERP	81%	0%	19%	41%	7%	52%
	TPS	88%	6%	6%	52%	7%	41%
Corporation							
Strategic	BI	92%	8%	0.00%	20%	15%	65%
	EIS	67%	8%	25%	45%	10%	45%
Tactical	DSS	33%	17%	50%	35%	20%	45%
	SCM	55%	18%	27%	40%	0%	60%
	SRM	64%	18%	18%	60%	5%	35%
	CRM	75%	17%	8%	50%	10%	40%
Operative	MIS	92%	8%	0%	60%	5%	35%
Task	ERP	92%	8%	0%	60%	10%	30%
	TPS	100%	0%	0%	75%	10%	15%

Table 3. 10. - The penetration rate of IS among medium-sized enterprises and corporations in Austria and Hungary in 2012

Every responding corporation in Austria reported using TPS systems. The use of ERP by corporations was almost 90%. Nine out of ten corporations used MIS systems at the operational level. In the case of CRM, the use of various IS at a tactical level affected three-fourths of the Austrian corporations. With a usage rate of more than 60%, the use of SRM was the second most commonly used tactical system in Austria. The use of SCM systems was typical of every second, the use of DSS was typical of every third corporation in Austria. The use of BI systems reached an impressive 90%

and the use of EIS was also high, affecting more than two-thirds of the enterprises belonging to this size category.

The most frequently used information system was TPS among the Hungarian corporations, reaching 75%. It was followed by the use of ERP (60%) and MIS (60%) systems. CRM systems were used by 50% of them. Based on the responses, six Hungarian corporations out of ten used SRM systems. It was also remarkable that only a fifth of the Hungarian corporations used any kind of BI systems and nearly half of them used EIS systems during their daily operations.

3.6 Information Systems management – responsibility for ICT

Among the Hungarian **microenterprises**, IT functions were performed by the owners or by the appointed senior management at almost half of the businesses. It is very similar to the Austrian microenterprises where a third of them also appointed the owner or a member of the senior management to perform this task.

Based on the results of our survey, in the group of the Hungarian **small-sized enterprises**, their executive director or external service providers were responsible for executing the operation of IT functions in the largest proportion. Operating IT functions by an employee at a lower, departmental position was the least significant in Hungary. Contrary to this, the most frequently appointed person in this size category was an employee at a lower position in the case of the Austrian small-sized enterprises.

	Micro-enterprise		Small-sized enterprise		Medium-sized enterprise		Corporation	
Country	**Austria**	**Hungary**	**Austria**	**Hungary**	**Austria**	**Hungary**	**Austria**	**Hungary**
Chief Information Officer	3%	5%	0%	15%	19%	48%	84%	80%
Chief Executive Officer	33%	45%	14%	30%	0%	11%	8%	0%
An appointed employee working at a departmental level	28%	20%	71%	10%	81%	19%	8%	10%
An external service provider	15%	5%	11%	30%	0%	22%	0%	10%
Other	21%	25%	4%	15%	0%	0%	0%	0%

Table 3. 11 – Persons responsible for operating IT functions in Austria and Hungary in 2012

In terms of the **medium-sized enterprises**, IT functions were operated by IT managers in Hungary in the largest proportion. It was also significant to entrust an external service provider in this size category. More than 80% of the Austrian medium-sized enterprises appointed IT managers to perform this task.

In the category of **corporations**, IT managers were responsible for operating IT function in the highest proportion in each of the studied countries.

3.7 Conclusions

As it is increasingly visible, the information society creates a new type of state, a digital state that becomes, at least partially, a network state following the model of network economy and network society. This is no longer a single or multi-centered, not a centralized or decentralized state. Therefore, regional and local government administrations become more and more equal players to the central government, which is the traditional holder of the highest executive power. Their primary task is to create an atmosphere for citizens and business enterprises to participate rather than being subjects or subordinates. In parallel, the next step is when local societies also gain their, at least partial, equal rights to take part in the processes of e-administration. In order to achieve this, the stakeholders (such as citizens, private sector and state) must have adequate technical infrastructure and personnel. This chapter demonstrated what levels of development enterprises operating in Austria and Hungary were able to reach in the fields of hardware, network, software and meatware.

The greatest handicap was measured in the size category of the Hungarian microenterprises and small-sized enterprises since only half of them reported using server-based networks, compared to their Austrian counterparts in the same size categories. In contrast, in the groups of medium-sized enterprises and corporations the difference in frequency rates could hardly be observed. In terms of the number of workstations, the Hungarian enterprises used half as many workstations as their Austrian peers in every size category.

The frequency rate of using IS by microenterprises in Austria exceeded the same rate in Hungary. In fact, the same result was found in the case of using IS both at operational and strategic levels. In the case of the surveyed 9 IS it was found that the Hungarian microenterprises hardly used or did not use any of them at all. It can be explained by the complexity of the products and services offered by those enterprises, which, in turn, might affect the added value created by them. There was a more than seven-times difference between Austria and Hungary in this respect in 2012.

The use of IS among the Austrian small-sized enterprises was twice as high at the level of performing tasks and six times as high at the operational level as it was found in the case of their Hungarian peers. A 30% handicap could be observed only at the tactical level while the Hungarian added value was barely a third of the Austrian one.

The use of IS by medium-sized enterprises at the tactical level was very similar both in Austria and Hungary. It was remarkable, however, that the Hungarian data showed a 30% decrease at the level of tasks and at the operational level while the added value was still only about a third compared to the Austrian figures.

The average added value generated by the Hungarian corporations was nearly half of their Austrian counterparts while there was a narrow gap in terms of operational and tactical levels and a more robust difference could be found at the strategic level.

Both in Austria and Hungary, the same persons were appointed to be responsible for operating IT functions in the size category of microenterprises and corporations. In the case of microenterprises, usually the owner or another member of the senior management was in charge while IT managers were entrusted with this task in the group of corporations. The persons in charge of operating IT functions varied in the group of small and medium-sized enterprises, they could be managed by owners, employees in a lower position, external service providers or IT managers alike.

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3.9 References

[1] 10 Emerging Technologies 2011. (2011). Download: 30.09.2011.,Technology Review MIT: http://www.technologyreview.com/tr10/

[2] Anthony, R., Planning and Control Systems: A Framework for Analysis. Harvard Business Review, 1965

[3] Bannister, F., & Remenyi, D. (2003). The Societal Value of ICT - First Steps Towards an Evaluation Framework. Electronic Journal of Information Systems Evaluation, 6 (2), 197-206.

[4] Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital Business Strategy: Toward a Next Generation of Insights. MIS Quarterly, 37 (2), 471-482.

[5] Benjamin, R. I. and Blunt, J. Critical issues: the next ten years. Sloan Management Review, 33(4) 1992

[6] Bilbao-Osorio, B., Dutta, S., Geier, T. and Lanvin, B., The Global Information Technology Report 2013, The Networked Readiness Index 2013: Benchmarking ICT Uptake and Support for Growth and Jobs in a Hyperconnected World, 2013 World Economic Forum 2013.

[7] Bocij, P., Greasley, A. & Hickie, S., Business Information Systems: Technology, Development and Management. Fourth Edition. Harlow: Pearson Education 2008.

[8] Botos, Sz., IKT fejlettségi indexek és regionális alkalmazhatóságuk, Acta Agraria Kaposváriensis Vol 14 No 3, 147-155, Kaposvár University, Faculty of Animal Science, Kaposvár 2010.
[9] Burt, E. and Taylor, J. A., Information and Communication Technologies: Reshaping Voluntary Organizations?, Nonprofit Management and Leadership, 11(2), 131–143 2003.
[10] Carr, N. G., IT Doesn't Matter. Harvard Business Review, Vol. 81. No. 3, May. 2003.
[11] Cohen, S. S., Delong, J. B. and Zysman, J., Tools for Thought: What Is New and Important About the "E-conomy"? BRIE Working Paper, No. 138. February 22. http://e-conomy.berkeley.edu/publications/wp/wp138.pdf 2000.
[12] Csala, P., Csetényi, A. and Tarlós, B., Informatika alapjai (Basis of informatics). Budapest: ComputerBooks 2003.
[13] David, P., The Dynamo and the Computer: a Historical Perspective on the Modern Productivity Paradox. The American Economic Review, Papers and Proceedings, Vol. 80. No. 2. May, pp. 355-361. 1990.
[14] Davis, G. B. & Olson M. H., Management information systems: Conceptual foundations, structure, and development. New York: McGraw-Hill. 1985.
[15] Deák, I., Bodnár, P. & Gyurkó, G., A gazdasági informatika alapjai (Basis of economic informatics). Budapest: Perfekt Kiadó 2008.
[16] Electric Paper GmbH, Evasys, System for Survey-based Evaluation in Education, Draft Version 10/2004, Version 2.1 2004.
[17] Enterprise and Industry, SBA Fact Sheet, Austria, Belgium, Bulgaria, Cyprus, the Czeh Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom from http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/#h2-2 2012.
[18] Guo, J., Sun, L., & Zhong, L., Research on Firm IT Capability and Competitive Advantages. International Journal of Business and Management, 3(6), 89-92 2008.
[19] Lips, M. (2012). E-Government is dead: Long live Public Administration 2.0. Information Polity, 17 (3-4), 239–250.
[20] H Jr, H. C., Agarwal, R., Clemons, E. K., El Sawy, O. A., & Weber, B. (2013). Impactful Research on Transformational Information Technology: An Opportunity to Inform New Audiences. MIS Quarterly, 37 (2), 371-382.
[21] IBM Corporation. CICS Transaction Server for z/OS, Version 3.2 Transaction processing. Retrieved Nov 12, 2012.
[22] Janssen, C., IT Infrastructure, Technopedia, Janalta Interactive Inc., http://www.techopedia.com/definition/29199/it-infrastructure 2013.
[23] Kacsukné Bruckner, L. & Kiss, T., Bevezetés az üzleti informatikába (Introduction into business informatics). Budapest: Akadémiai Kiadó 2007.
[24] Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Information technology and organizational performance: An integrative model of IT business value. MIS Quarterly , Vol. 28., pp.: 283-322.

[25] Nemeslaki, A., Vállalati internetstratégia, Budapest, Akadémiai Kiadó 2012.
[26] Power, D. J., Decision Support Systems: Concepts and Resources for Managers, Greenwood/Quorum 2002.
[27] Raffai, M., Információrendszerek fejlesztése és menedzselése (Development and management of information systems). Novadat Kiadó 2003.
[28] Rainer, R. K. & Cegielski, C., Introduction to Information Systems: Enabling and Transforming Business. 3rd Edition. John Wiley&Sons, USA. 2010.
[29] OECD National Accounts of OECD Countries 2009, -Volume I, Main Aggregates, OECD Publishing, http://www.oecd-ilibrary.org/sites/9789264067981-en/04/01/index.html;jsessionid=drn783erb9he.delta?contentType=&itemId=/content/chapter/9789264075108-16-en&containerItemId=/content/book/9789264067981-en&accessItemIds=/content/book/9789264067981-en&mimeType=text/html or http://dx.doi.org/10.1787/na_vol_1-2009-en-fr.) 2009.
[30] OECD. (2010). Information Technology Outlook
[31] O'Brien, J., Management Information Systems – Managing Information Technology in the Internetworked Enterprise. Boston: Irwin McGraw-Hill 1999.
[32] Sanou, B., Measuring the Information Society 2012, International Telecommunication Union 2012.
[33] Sasvári, P., Rauch, W. and Szabó, J., Diverse Reasons For Implementing Business Information Systems – The Example Of Typical Usage Patterns Business Information Systems Among Austrian and Hungarian Business Enterprises, Saarbrücken, LAP LAMBERT Academic Publishing, 2014.
[34] Szabó, K. & Hámori, B., Információgazdaság, Budapest, Akadémiai Kiadó 2006.
[35] Wymenga, P., Spanikova, V., Barker, A., Konings, J. and Canton, E., EU SMEs in 2012: at the crossroads, Annual report on small and medium-sized enterprises in the EU, 2011/12, ECORYS Nederland BV, from http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/supporting-documents/2012/annual-report_en.pdf 2012.

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