The development of information and communication technology: An empirical study

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PREFACE

It was my strong intention to publish my thesis in a form of a book because there are not many empirical researches carried out about the effects of the Information Age in Hungary. As I could not find a reassuring mathematical and statistical method for studying the effect of the information communication technology on businesses in the literature, I proposed a new research and analysis method that I also used to study the Hungarian economic sectors.

The current age is often referred to as the Information Age. We live in a new type of society, often called the information society, which is a new, special variant of the existing societies. One of its main characterizing features is that producing, processing and distributing information have become a fundamental source in the economy.

The literature on the information society indicates that it is a still-developing field of research. It can be explained by the lack of consensus on basic definitions and research methods. There are also different judgements on the importance and the significance of the information society. Some social scientists write about a change of era, others emphasize parallelism with the past. There are some authors who expect that the information society will solve the problems of social inequalities, poverty and unemployment, while others blame it on the widening social gap between the information haves and have-nots. Various models of the information society have been developed so far and they are so different from country to country that it would be rather unwise to look for a single, all-encompassing definition.

Although the concept of the information society has its origins in the 1960s, it started to flourish in the 1990s. Its rapid development not only led to a series of publications and reports in Europe and elsewhere by the beginning of the 2002 but also to various information society policies and strategies.

Within the broad subject of the Information Age, I was especially interested in the question of what factors have an effect on the net income of enterprises. First, I studied the potential indicators related to economic sectors, and then I compared those indicators to the net income of the surveyed enterprises. The data resulting from the comparison showed that the growing penetration of electronic marketplaces contributed to the significant change of the net income of enterprises in various Hungarian economic sectors to the extent.

I also found that among all the potential indicators, only the indicator of electronic marketplaces had a direct influence on the net income of enterprises. However, the effect of electronic presence is also significant as it has a huge effect on the potential indicator of electronic marketplaces.

I hope that my dissertation will be a useful guide to those researchers and professionals who have a special interest in the details of the possible economic effects of information and communication technology and I also hope that students wishing to look into this matter more deeply would also find my dissertation a helpful assistance in their studies.

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Chapter 1 Introduction

The current age is often referred to as the **Information Age**. This concept was first introduced by **Manuel Castells**, the best-known theoretician of the **information society**. The information society is a new, special variant of the existing societies, in which producing, processing and distributing information have become a fundamental source in the economy.

According to the relating literature data, the Information Age began in the second half of the 1950s when, for the first time in history, the number of white-collar workers (engineers, administrative employees etc.) exceeded the number of blue-collar workers. It was the time when the first transatlantic cable was laid under the Atlantic Ocean between Europe and the United States, and the first satellite was put in orbit by the Soviet Union.

The literature on the information society indicates that it is a still-developing field of research. It can be explained by the lack of consensus on basic definitions and research methods. There are also different judgements on the importance and the significance of the information society. Some social scientists write about a change of era, others emphasize parallelism with the past. There are some authors who expect that the information society will solve the problems of social inequalities, poverty and unemployment, while others blame it on the widening social gap between the information haves and have-nots. Various models of the information society have been developed so far and they are so different from country to country that it would be rather unwise to look for a single, all-encompassing definition.

Although the concept of the information society has its origins in the 1960s, it started to flourish in the 1990s. Its rapid development not only led to a series of publications and reports in Europe and elsewhere by the beginning of the 2002 but also to various information society policies and strategies.

In our time a number of profound socio-economic changes are underway. Almost every field of our life is affected by the different phenomena of globalization, beside the growing role of the individual; another important characteristic of this process is the development of an organizing principle based on the free creation, distribution, access and use of knowledge and information. The 1990s and the 21st century is undoubtedly characterized by the world of the information society (as a form of the post-industrial society), which represents a different quality compared to the previous ones. These questions are further discussed in Chapter 2.

In the beginning, the driving force of information society initiatives was merely economic or rather industrial. However, in Europe the information society policy appeared in two waves: the first one focused on the liberalization of telecommunication and the development of the information society, while the second wave dealt with the social aspects of the information society instead, including the issues of social cohesion and the problem of bridging the **digital gap**.

Governments across the world started establishing economic and technology funds as a part of their social and political programmes. **The Organization for Economic Co-operation and Development** (**OECD**) declared that the knowledge economy had to be extended from the developed countries to developing ones. The OECD's report called on governments to deal with e-commerce and make the much-needed rules and regulations that are necessary for the development of the information society.

One of the main driving forces of the Information Age is the phenomenon called Information and Communication Revolution. Its significance often compared to the agricultural and industrial revolutions taken place in the history of mankind. In important fields of high-end technology (computer technology and telecommunication) not only the robust growth of quality, quantity and performance parameters can be observed but the approximation of these two fields along with the appearance of compound applications can also be detected. These phenomena of the information society cannot only be seen as one of the results of the development of technology but also a coherent system affecting the society as a whole. These issues are discussed in Chapter 3.

The research examining the national strategies on the information society in the **EU** countries almost unambiguously came to the conclusion that the emphasis was on technical and economic components everywhere while less attention east given to the social component. The common principle applying to the EU member states involves quality of life, legal protection, digital disadvantage, education and infrastructural development but we have a clear impression that the emphasis is being put on economic and technical components in many national strategies on the information society.

Neither the eEurope2002, nor the eEurope2005 action plan dealt with social concerns. Although the latter plan rephrased the observed imbalance between the components, it chose a technical method for introducing the European member states to the information society. In spite of the achieved results, finding an answer to the problems of poverty and a handicap situation still remains a challenge.

In terms of social concerns, a further delay was caused as one of the most important tasks in this period, was to raise the standard of living in the newly-admitted member states performing well below the EU-average. Governments stress their policies on the information society more actively on several forums, and express their willingness to consider the feedback of public opinion, which may be a promising sign as these feedbacks are in relation to broader social issues. However, it is also true that public opinion has a relatively small effect on choosing the indicators of current information society programmes in the EU.

Apart from the uncertainties about the very definition of its concept, similar problems are raised by the quantification of the various components of the information society. There is a wide range of variables that can be measured: a great number of explanatory variables can be listed from the perhaps more easily measurable infrastructural components to the more difficult components related to knowledge and willingness of using information. That is why most analyses use sets of variables and complex indices as there is no easily measurable (one-dimensional) index that would characterize the information society. The problems of quantification are presented in Chapter 4.

Nearly 80% of the value of today's manufactured goods is composed of the invested intellectual capital, while the raw materials used for production account for less than 20%. The case was quite the opposite a hundred years ago, then the products real value was given by the raw materials used for their production, the rate of the invested intellectual capital was negligible. This fact proves that the value of intellectual product has shown an extraordinary increase in recent decades.

The secondary information I collected gave a very reliable base at the beginning of the research. I managed to gain secondary data from outside sources. It is thought by many that the process of gathering secondary data is fast as they are easily accessible. However, it is a very long and

tiresome process in practice, mainly because of the information overflow. Besides collecting secondary data, the primary research also helped me in the problem definition. After gathering all available information, the quantification of problems followed. After finishing this step, I defined the approach and the factors influencing the research. Finally, with the help of the used examination methods, I determined whether the previously worked-out hypotheses proved to be true or false. The results of the research are presented in detail in Chapter 5.

1.1 The aim of the research

Several theories can be found in the literature on the definition of **the information society.**

The approach of civilization theory examines the whole social history, so the information society is the result of a thinking process in this context and not its actual subject.

In the evolution theory context, questions of the transformation of social subsystems, the new economic, social and community phenomena, the recognition of the new generation of the digital era, the peculiarities of the media environment, the power and communication patterns of the new world order and the rise of cyber science are dealt with in a highly abstract manner. The vast majority of studies on the information society were published by authors who examine small pieces of reality for practical reasons while they search for answers to the challenges in their own discipline.

Based on the neoclassical model of **economic growth**, it is understandable how the accumulation of capital and technological change affects the economy. The model has a fundamental role in understanding growth in the developed countries and it also can be used for the empirical study of resources of the current economic growth. The theory of economic growth examines those factors that generate the growth of potential output in the long term. Reviewing the temporal and spatial experiences of different countries show that this can be examined by four factors:

- the quantity and quality of labour force;
- the abundance of land and other natural resources;
- the accumulated capital;
- **technological change** and innovation.

In the case of examining growth as a process, researchers put an emphasis on the necessity of increasing capital intensity. This is supported by the computerization or the introduction of ICT devices in the banking sector.

Endogenous growth theory tries to focus on the sources of technological change in its studies on economic growth.

Technological determinism sees technology as the main motivating force in society, which decisively determines the values, the structure, the history and the changes of the society.

The theory of social construction of technology (it is also referred as **SCOT**), evolved in the 1980s argues that technology does not determine human action but human action shapes technology. It also argues that the ways in which a given technology is used cannot be understood without understanding how that technology is embedded in its social context.

Another important and more widely used theory is actor-network theory (**ANT**). It tries to explain how material-semiotic networks come together to act as a whole. As a part of this, it may look at explicit strategies for relating different elements together into a network so that they form an

apparently coherent whole. According to this theory, such actor-networks are potentially transient, existing in a constant making and re-making. This means that relations need to be repeatedly 'performed' or the network will dissolve. The elements of networks can be human and non-human as well: objects, techniques, institutions, organizational solutions or cognitive structures.

ICT can be regarded as a universal technological system, which is closely linked to all of the previous systems and creates new, more complex technological systems. ICT's characterizing function is to assure acquiring, storing, processing, delivering, distributing, handling, controlling, transforming, retrieving and using information.

Based on the considerations presented above, it is not the subject of my study to answer whether there is a need for ICT or creating the necessary conditions for the information society. The real subject is to measure what economic, social, cultural and environmental effects it has on the society. The rich literature of the information society discusses these aspects in detail. During my work, I take the information society as a normative future plan for Hungary, and I am looking for the answer of what progress has been made in building the information society in various economic sectors in Hungary. I examine the following issues:

- to what extent we can speak about the information society in Hungary nowadays,
- what is the development level of the information society in several economic branches and company sizes compared to each other and to the member states of the European Union,
- how this development level can be measured and calculated,
- how the development level of information and communication technology increases at certain company sizes,
- what trends can be observed in the development process in the individual economic branches and company sizes.

My research extends to the **static, momentary state** (1) of the development level of ICT devices used in the economic branches as well as to their **dynamic analysis**, (2) **expected pace of growth** (3) and their qualification. As far as I know, such comprehensive analytical study on the information society has not been written neither in Hungary, nor in the European Union.

I determined the priorities of my research while I was studying the literature about the subject, as I had to decide whether the theoretical components or the practical realization of my study based on that theoretical background should be more emphatic. In the end, the latter proved to be more important. On the one hand, the reason for this is because I was able to get a satisfactory starting point from the literature to connect the theoretical background with a practice-oriented problem handling. On the other hand, my subject choice also contributed to the practical side, as the question of the information society is raised from a very practical aspect in reality. It is supported by the vast amount of documents in the literature urging to create the information society.

When establishing the aims of the research, there is always the question of how to position the individual parts of the subject. Should they be positioned in a broader subject or should they be selected for further and deeper research? The former possibility means that we aim to make suggestions by putting the practical analysis into a broader structure. The aim of my research is exactly this, as the information society means a stage representing a new quality, and the changes of the information and communication technology can be observed in every part of our life nowadays. My study may give help to the structural reform as well.

The other cause of handling the problem in a comprehensive way is that I perform my research work in a framework provided by a university where there is an increased need for thinking in more complex structures. This approach may be helpful in handling the subject in a broader context. Such a comprehensive structure makes it possible to examine the problems of the development of the information society and analyse them from the desired aspects.

1.2 Applied methodology

The examination of the subject is **interdisciplinary** as it has social and scientific references, so a complex approach was needed when I started processing the literature. I needed to study literature on economics, law, sociology and technology connected to the information society.
In consideration of the complexity of the studied subject, I selected several analytical methods and approaches. During the data collection, I reclined upon the Hungarian and the international literature on the subject, thus I was able to process a large quantity of information (nearly 6000 figures). I also extended my literature research to printed and electronic publications on the Internet.
My primary research was conducted in the hope of testing and verifying the theses of my PhD study. As part of my research, I conducted an empirical survey among Hungarian companies and enterprises. The data were taken between 25th March and 25th June in 2007. The questionnaire was mainly answered by senior directors of the related companies (executive directors, Human Resources managers etc.), in the case of sole proprietorship, sole proprietors themselves as self-employed persons gave the answers to the questions. The questionnaire was filled in by 536 respondents altogether. The sampling unit was formed by Hungarian enterprises operating in several economic sectors while I used accidental sampling as a sampling method.
Applied methods: I used the functions, the cross tables and the chart wizard of Microsoft Excel as well as cluster analysis, correlation and regression calculation, multiple regression models, discrimination analysis and a customized indicator system in SPSS 16.0.

The chapters of the questionnaire

My primary research – which is actually a cross section survey – deals with the amount and the utilization of ICT devices of different enterprises in several economic sectors in 2006 and 2007.
The **aim of sampling** is to make it possible to conclude that the results coming from the measurement of a population representing the sampling frame but consisting less elements reflects the 'opinion' of the population. This conclusion, or rather estimation is based on the principles of probability, so in theory choosing the sample itself should be based on a randomized method.
In the **applied method of simple random sampling**, which can be used for examining various economic sectors and company sizes, each element of the frame has an equal probability of selection: the frame is not subdivided or partitioned. By using this sampling method in the case of the various categories of economic sectors and company sizes, it is not necessary to cover the cost of increasing the number of the elements of the heterogeneous population, because even a smaller sampling frame is enough to represent the population.

Table 1 - Sample size and population in several economic sectors

Economic sector	sample size (piece)	number of existing enterprises (piece)
(A) Agriculture, hunting and forestry	18	23 519
(C) Mining and quarrying	8	446
(D) Manufacturing	50	61 576
(E) Electricity, gas and water supply	17	690
(F) Construction	49	70 251
(G) Wholesale and retail trade; repair work	133	151 871
(H) Hotels and restaurants	22	31 997
(I) Transport, storage and communication	37	35 743
(J) Financial intermediation	16	24 863
(K) Real estate, renting and business activities	18	194 383
(L) Public administration and defence; compulsory social security	22	25 060
(M) Education	12	25 196
(N) Health and social work	29	52 551
Total	431	698 146

Source: Number of new, functioning and closed enterprises in several economic sectors, Hungarian Central Statistical Office, STADAT, individual research, 2006

In the case of the 'Real estate, renting and business activities' sector there were not enough questionnaires available. I made the correction of the resulting discrepancies later.

I analysed the rate of using ICT devices quantitatively, by using a questionnaire comprising 7 blocks [**Figure 1**]. Part of the questions were easily answerable, aiming at such qualititative indicators as utilization, the other part of them contains quantitative indicators linked to balance sheets.

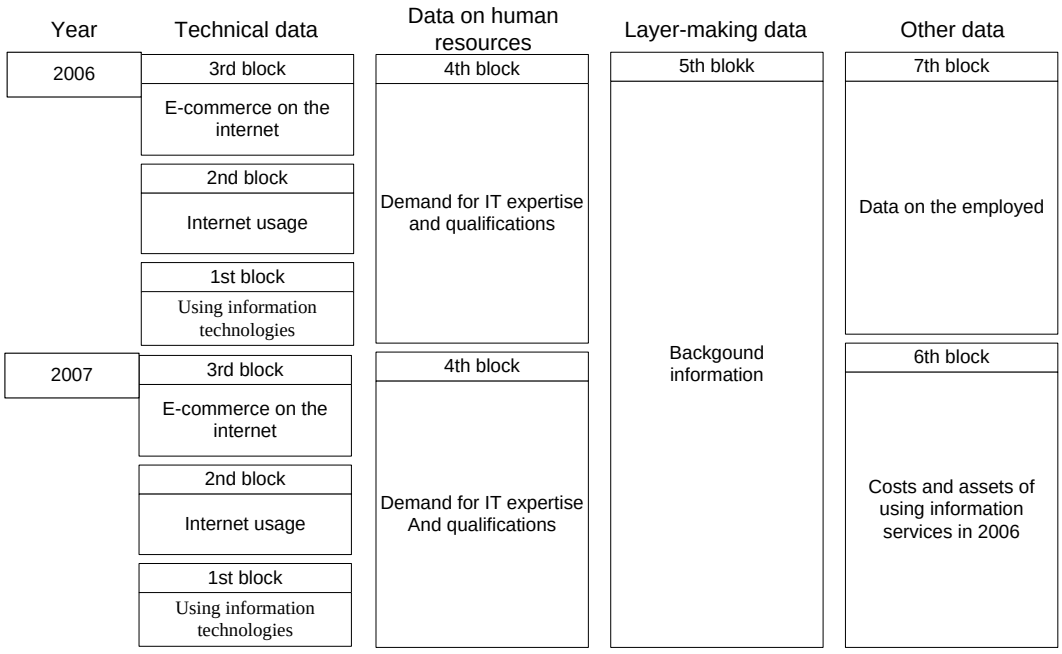


Figure 1 - The structural synthesis of the primary questionnaire used in the research

Source: Individual research

Single study model

I did not study the information and communication sector separately, although it gives the foundation of the information society, I examined its diffusional effects instead. I assumed that the adoptation of ICT devices was taking place in a different way in different economic sectors.
The literature on the development of ICT distinguishes five development stages [**Figure 3**]. These stages are built upon each other. With the help of the elaborated model, I measured the individual development stages. By averaging the data of the first three development stages, I examined the enterprises' willingness for adoptation. With the help of an own model, which comprises nine elements, I analysed the development and growth of the size categories and economic sectors. Its steps are as follows:

- Processing the data of the primary and secondary research,
- Assigning single indicators to individual development stages, calculating potential indicators,
- Calculating the values of potential indicators from single indicators,
- Studying potential indicators,
- Determining potential indicators at the individual development stages,
- Calculating the values of compound indicators by using potential indicators,
- Studying compound indicators,
- Defining the categories of adoptation,
- Conclusions on the pace of growth and the general state of an economic sector.

1.3 Hypotheses

During my research, I found out that the literature about the information society gave recommendations on how to **make** certain aspects (usage, opportunity, infrastructure) **measurable**.

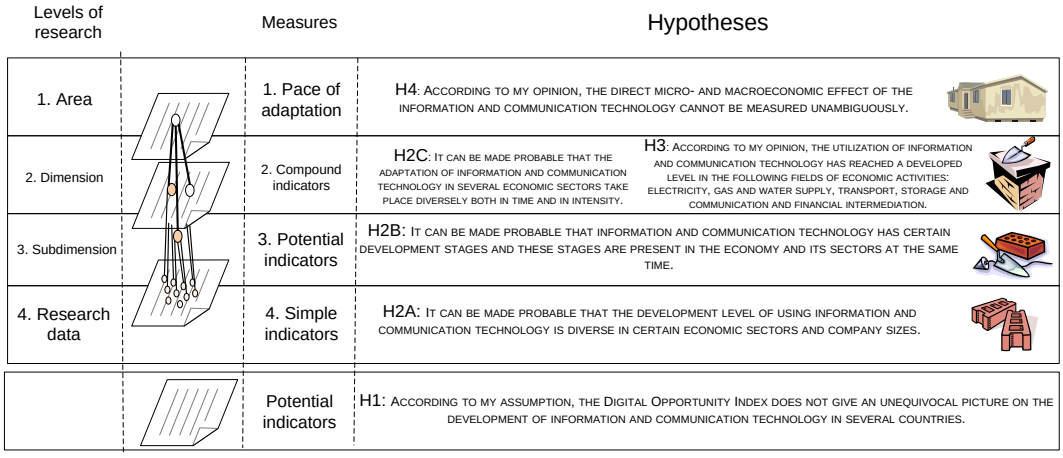


Figure 2 - Research levels and their connections with the hypotheses

Source: Individual research

With the help of these indicators, we are able to draw conclusions from which point a society may be characterized as „information society" – or to be more precise, what relative or absolute indicators are needed to be reached in the case of the information society.

The population is composed of households, individuals or companies. Household statistics are generally less reliable than government and business statistics as the latter ones are usually obliged to report.
The most widely known index among these is the Digital Opportunity Index (DOI).

H1: ACCORDING TO MY ASSUMPTION, THE DIGITAL OPPORTUNITY INDEX DOES NOT GIVE AN UNEQUIVOCAL PICTURE ON THE DEVELOPMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY IN SEVERAL COUNTRIES.

Originally, this indicator was created by the International Telecommunication Union with the purpose of getting an efficient tool for the surveying of ICT usage and accession.
This is the first e-index that is built upon internationally accepted indicators, comprising eleven separate indicators that are divided into three clusters: opportunities, infrastructure and utilization. When the DOI was created, the analysis of subjective factors was deliberately avoided because – according to the researchers – such qualitative factors would give too much room for interpretation, thus the overall image could be distorted.
The actual **DOI** index is based on household statistics.

H2A: IT CAN BE MADE PROBABLE THAT THE DEVELOPMENT LEVEL OF USING INFORMATION AND COMMUNICATION TECHNOLOGY IS DIVERSE IN CERTAIN ECONOMIC SECTORS AND COMPANY SIZES.

The use of ICT has its own role in every economic sector and in every company regardless of their size, but it has a diverse influence in various sectors. That is why an application method is needed for the economy and its participants.
For example, the manufacturing industry is highly dependent on information on the procurement and sales side, so this economic sector is most likely to create values here with the help of ICT at the initial stage. ICT, however, can be used to create values in almost every part of the value chain for companies dealing with financial intermediation, since information flow is always present in the value chain.

H2B: IT CAN BE MADE PROBABLE THAT INFORMATION AND COMMUNICATION TECHNOLOGY HAS CERTAIN DEVELOPMENT STAGES AND THESE STAGES ARE PRESENT IN THE ECONOMY AND ITS SECTORS AT THE SAME TIME.

Electronic markets, trade links between business partners need a completely new way of thinking and organizations, while changing and putting the customary production, sales, ordering, purchasing, financial and administration processes on new grounds. The automatization of supply chain processes makes commerce cheaper, faster, simpler and more efficient. Using ICT solutions, savings can be achieved in transaction costs. Thus, the accumulation of capital and tangible assets can be avoided so companies are able to optimize their inventories and they can reduce the time needed for supplying the market. Taking everything into consideration, a new question may arise: what steps or stages are followed by companies to acquire more developed business models, electronic markets, for instance? In the table below, I present five development stages that can be observed in the relationship between the Internet and several enterprises.

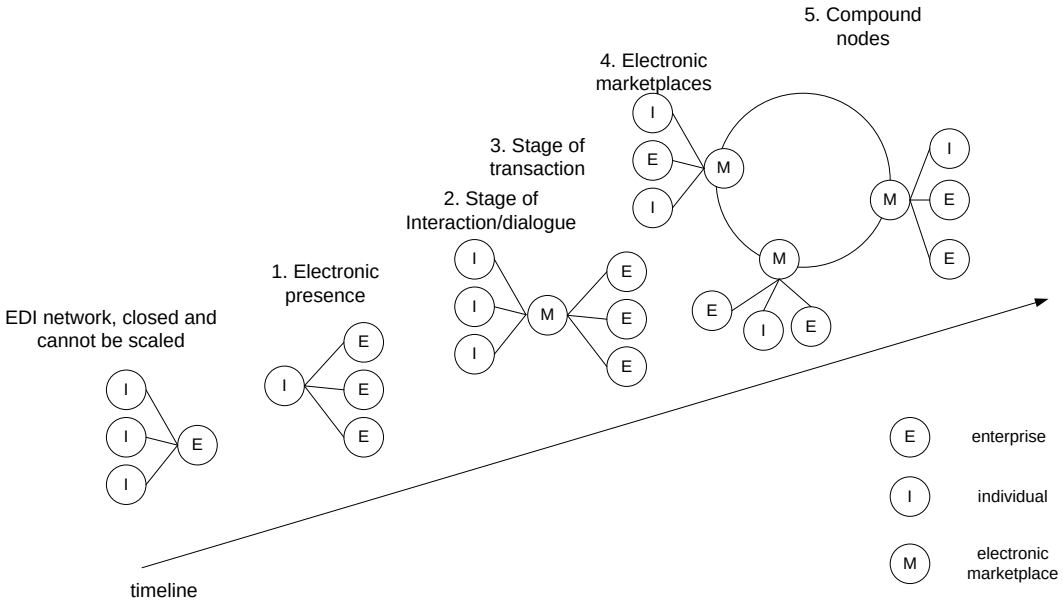


Figure 3 - The development stages of information and communication technology

*Source: **Kápolnai A. - Nemeslaki A. - Pataki R.**: E-business stratégia vállalati felsővezetőknek (E-business strategy for senior management), 2006*

The individual stages don't only show a development in the timeline but also the extent of exploiting the opportunities provided by the Internet.

H2C: IT CAN BE MADE PROBABLE THAT THE ADAPTATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN SEVERAL ECONOMIC SECTORS TAKE PLACE DIVERSELY BOTH IN TIME AND IN INTENSITY.

The **diffusion of innovations theory** defines the spread of innovations basically as a **communication process**, where the piece of information related to innovations spreads through certain **communication channels** in a given social network at a certain time.

The spread of innovations, just as the spread of new information and communication technologies, happens in the so-called 'diffusion networks'. The **willingness** of a company **to adapt** a new technology depends on the cohesion of the network – or the homogeneity of the network –, and the structural equivalence which shows what position is occupied by a company in the network, and, finally, it also depends on the threshold from where it is worth starting to use a new technology [**Figure 4**].

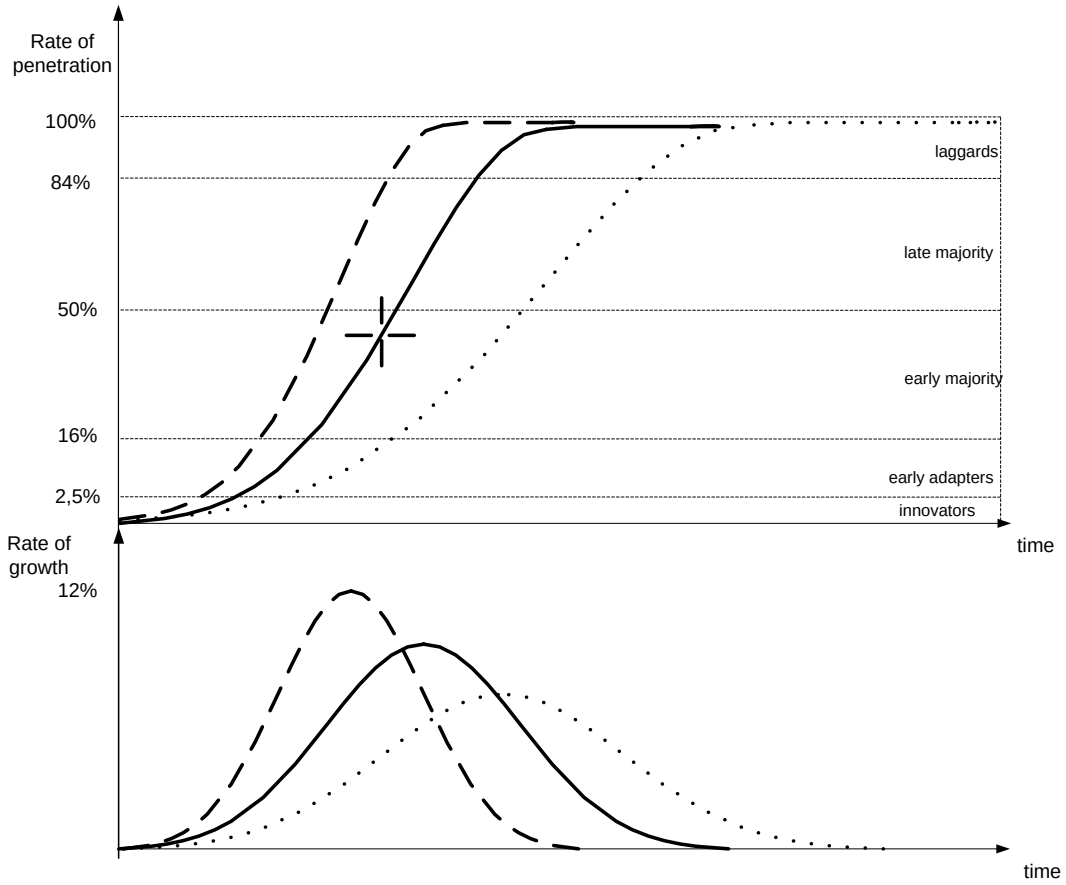


Figure 4 - Categories of willingness for adaptation

Source: ***Everett M. Rogers****: Diffusion of Innovations, The Free Press, 1995*

During the analysis of the diffusion of ICT devices, the category of **rejectors** should also be introduced because there are some companies that deliberately stand against using new technologies. This means that the spread of a certain new technology doesn't reach 100 percent in a given society, in order to reach that level, society and technology have to be transformed simultaneously.

H3: ACCORDING TO MY OPINION, THE UTILIZATION OF INFORMATION AND COMMUNICATION TECHNOLOGY HAS REACHED A DEVELOPED LEVEL IN THE FOLLOWING FIELDS OF ECONOMIC ACTIVITIES: ELECTRICITY, GAS AND WATER SUPPLY, TRANSPORT, STORAGE AND COMMUNICATION AND FINANCIAL INTERMEDIATION.

The larger number of corporations in the sectors 'Electricity, gas and water supply', 'Transport, storage and communication' and 'Financial intermediation' may help to accelerate modernization and improve the quality of services provided to other economic organizations, as these relatively powerful companies have all the conditions necessary to introduce cutting-edge information and communication technology. This unique resource, namely technology may provide stable protection to its holder, which can get competitive edge over its competitors, in extreme cases – as it is seen in the case of '*Electricity, gas and water supply'* – the companies may find themselves in a monopolistic state.

'Transport, storage and communication' and *'Financial intermediation'* are characterized by dynamically changing processes, the value created by ICT devices may evaporate quickly. Stable competitive edge can only be gained by the ability of continuous development and renewal.

H4: ACCORDING TO MY OPINION, THE DIRECT MICRO- AND MACROECONOMIC EFFECT OF THE INFORMATION AND COMMUNICATION TECHNOLOGY CANNOT BE MEASURED UNAMBIGUOUSLY.

The purchase and installation of **ICT** devices is an investment in financial terms, which means that the potential effects of the system, the range of the participants and the process planning must be assessed by the same methods as in any other investment. This is the reason why it is widespread to assess ICT investments using regular and traditional assessment procedures. In this case, significant difficulties may arise: assessing the „output" of any ICT system is questionable, and determining costs is not as easy a task as it seems at first sight.

During the assessment of ICT investments, it should be taken into consideration that the traditional analyses (Cost-Volume-Profit Analysis, for instance) have some very important limitations: they are not able to process the complex changes that an ICT system may bring to the company's operation. Although, on the one hand, a certain growth in profit can be detected for the enterprise, on the other hand, there is the opportunity (or a potential benefit) that allows the economic organization to renew its range of products and services, enter new markets and explore some previously unexploited strategic business opportunities with the help of ICT systems.

It is difficult to measure the situation, for instance when a company is being regarded as innovative by its partners because it uses the latest technology in a unique way. The positive aspects of this may be decrease in costs and increase in income (these can be measured quite well), or companies in some sectors (may) seek to co-operate with these kind of companies more willingly (but this effect cannot be measured easily and very incidental). Studying the negative aspects, it can be stated that using this strategy may cause an increase in certain costs and the risk of introducing a new technology may be higher.

Chapter 2 Information, Society, Information Society

Many theories can be found in the literature on the information society. The theories of the knowledge or information economy, postindustrial society, postmodern society, information society, network society, information capitalism, network capitalism etc. show that it is an important sociological issue to understand what role is played by technology and information in the society we live in. Both aspects - the form of society and the role of technology and information - belong to the central question of the theory of the information society.

2.1 The definition of information

In everyday use, the term "information" has meant a kind of guidance for a long time: when someone goes to the railway station to be informed on the content of the timetable or to the information desk to find out where a product or a counter can be found in the department store. Such information exchange works only if the right piece of information, the one that fits and makes sense for both parties of the communication is available.

Information as a term became more and more popular in the last 30-40 years; it has started to have an increasingly important role in everyday language while its strict meaning mentioned above has gradually faded away. At the same time, there has been a growing uncertainty about the true meaning of the term 'information'. All this doubtfulness is mainly caused by the so-called 'information-centered' world we are living in and by the widespread expansion of information and communication technology as almost everyone living in developed western societies can experience the phenomenon called the Information Revolution. All this suggests that information has become an essential part of our society and plays a centre role in our lives.

In **information studies**, rather complex definitions can be found on the nature of information.

Informatics or computer science is a discipline that deals with the storage, processing and distribution of information as well as planning computer networks and determining their operation principles.

Determining the exact subject of computer science is rather difficult because it is extremely hard to define what information is. According to the German physicist and philosopher, **Weizsacker** information should be regarded as the third universal elementary quantity beside matter and energy in science and technology.

According to the ninth volume of the Pallas Nagy Lexikon (Great Pallas Encyclopedia) information is a term with Latin origins meaning report, enlightment, inform, let somebody know; informant, instructor, messenger.

In the Dictionary of Foreign Words and Expressions the following meanings can be read:

1. enlightment, announcement, communication;
2. message, data, news, bulletin.

The fourth edition of American Heritage Dictionary of the English Language distinguishes seven meanings of the term 'information':

1. Knowledge derived from study, experience, or instruction,

2. Knowledge of specific events or situations that has been gathered or received by communication; intelligence or news,
3. A collection of facts or data: statistical information,
4. The act of informing or the condition of being informed; communication of knowledge,
5. Computer Science Processed, stored, or transmitted data,
6. A numerical measure of the uncertainty of an experimental outcome,
7. Law a formal accusation of a crime made by a public officer rather than by grand jury indictment.

The **theory of communication states** that information is the objective content of the communication between objects conversely affecting each other which is manifested in the change of the condition between these objects.

According to the **science of telecommunication** information is a series of signals structured in time and space, which is made up of a signal set having a specific statistical structure. The sender transmits data on the condition of an object or on the course of an event and the receiver perceives and interprets these signals. Everything can be regarded as information that is encoded and transmitted through a definite channel.

From the perspective of social science, information is the communication of useful knowledge that is created and transmitted in the intellectual communication system of the society. It is characteristic to the society as a whole, belonging to one of the global issues of world together with energy and environment protection.

According to the economic approach, information is partly a form of service, partly a product but, not as in the case of exchange of goods, both parties can keep their information. The content of material, energy and living labour is gradually decreasing in manufactured goods, while the amount of product information input is increasing at the same rate.

In summary, information is an expression related to enlightment, data, report, learning, communication and news. In certain cases, it can be identified with these items (knowledge, data, enlightment, news); in other cases it is the object of these listed items (conveyance of knowledge, learning, communication).

Despite the fact that it may still sound uncertain, the group of the terms 'data', 'knowledge' and 'communication' can be highlighted for giving an interpretation of information. According to the literature, the transformation of data into information needs knowledge. There are many definitions trying to find a link between information and communication, which also can have an importance when looking for a definition of the information society. **Communication** is a process of transferring information from one entity to another through a specific medium. If we link these two different approaches together, the picture we are given is a very complex one, where the four terms 'data', 'information', 'knowledge' and 'communication' must be interpreted in one compound definition. The same connection was made by **Michael Buckland** in his book on information systems.

Table 2 – Four aspects of information

	Intangible	**Tangible**
Entity	Information as knowledge	Information as thing
Knowledge	Information as process	Information process

Source: Michael Buckland: Information as thing. Journal of the American Society for Information Science, 1991

Information as knowledge is subjective in every case, it is linked to a given individual and it gains its exact meaning in a specific environment. It is intangible as an entity but it can be communicated, made to be known to others. Information as a thing exists similarly to knowledge, however, it is tangible. In this regard, **data** can be regarded as a kind of recorded knowledge because it is necessary to know the context of its creation (or the record structure), without having this context, the data cannot be interpreted.

2.2 Information and society

By definition, **society** refers to

1. human relations and relationships taken as a whole,
2. any community of human beings is able to perpetuate itself, more or less linked to a specific region or country, sharing a distinctive culture and institutions.

Whether a human community is regarded as a society depends on the extent to which its members are able to interact with each other, thus the capacity and extension of interaction is essential.

The most recent trends show that the definition of society has become less important in trying to understand the world surrounding us because if we examine only individual societies, we may not notice social (**multilateral** and **global**) phenomena between and over societies.

If we accept that the key feature of social existence is the development of relations, then the information society may bring a significant change in this very context: a lot more individuals have the opportunity to get in contact with other people in a simpler way and at a lower cost.

A question comes up here immediately: is it possible to call every human society an information society? Information is the essential condition of the functioning of every society, including their subsystems as well. It played an important role in every social formation in the agricultural and industrial societies of previous ages. Information flow is needed in every society but none of the previous societies were labelled "information society" by contemporary analysts and historians. The reason for this is that the communication, reception, processing, storage, interpretation and flow of information never determined earlier societies to such a high extent as today's. The activities relating to information have become more valuable in present day societies and that is what distinguishes them sharply from the societies of the past. This fundamental difference is convincingly described by theoretician of various interests, views and attitudes and orientation in the following five fields:

1. technology,
2. occupation structure,
3. the operation of economy,

4. spatial structure,
5. culture.

Frank Webster's book published in 1995 synthesizes the 1960s and 1970s information society theories in order to analyse the concept and its characteristics within the context of social science. These theories designate the potential directions of what might be a comprehensive research project, which can clarify the concept and exploit these theories as starting points for further exploration. Webster's typology is the following:

1. Technology

From the technological perspective we live in an information society since information and telecommunication technologies play a constantly expanding role in all fields of social existence, which has shaken the foundations of social structures and processes and resulted in profound changes in politics, economy, culture, and everyday life.

Most of the attempts made to define information society approach the idea from a technological point of view hence the central question of such explorations sounds like: What kind of new information and communication technology was constructed in recent decades that determined the infrastructure of information society?

2. Occupation structure and economy

Studies of occupational structure and economy show that we live in an information society because, when we have passed through the agricultural and industrial stages, the information sector and information oriented jobs dominate the economy. The main questions raised by this approach are: How have the proportions of employed workers changed in the industrial and service sectors in recent decades? How have their performance and the knowledge they use changed qualitatively? Have the so-called informational occupations begun to dominate production?

The question is similar to that which we posed by the technological approach: What is the point at which we can claim that the logic of capitalism, that is, its structure of production has qualitatively changed? Is the often cited "**new economy**" indeed so different from the old one? Where is the turning point? Is it possible to identify the point at which the former was replaced by the latter?

3. Spatial structure

As the spatial theorists see it we live in an information society because through the use of information technologies and globalisation physical space tends to lose its determining function. People are participating in networks that determine such social processes as production, division of labour, discussing politics for example.

The main theoretical questions are the following: Does the world follow the logic of networks? Does global society exist? Can it come to life? What is the inherent logic of global networks? Who belongs to them, and why do they wish to do so? What kind of social and economic capital is needed to gain access to a network and how can membership then be maintained? What are the innate social relations of the network, and what part do the new information and communication technologies play in those relations?

4. Culture

The cultural perspective also states that we live in an information society because our life is infiltrated by the globalised, extensively digitalized media culture that has become the primary means of providing sense and meaning for us and predominantly determines our lifestyle.
Theories attempting to explain the cultural aspects of information society describe such a global cultural context that may be adopted universally as a referential framework for the media. This approach also suggests that the media enjoy a unique status in the age of information and that they are the most prominent determining factors of social relations.
However, the question remains: whether life exists beyond media culture or not? Does the illusory game of signs have any connection to reality? The catchphrase of the information age is "virtual reality" which reality very often turns out to be more fundamental than the world that created it.

2.3 The information society

Many theories can be found in the literature on the information society. The theories of the knowledge or information economy, postindustrial society, postmodern society, information society, network society, information capitalism, network capitalism etc. show that it is an important sociological issue to understand what role is played by technology and information in the society we live in. Both aspects - the form of society and the role of technology and information - belong to the central question of the theory of the information society.
One of the first social scientist to develop the concept of the information society was the economist Fritz Machlup. In his breakthrough study, "The production and distribution of knowledge in the United States" (1962), he introduced the concept of the knowledge industry by distinguishing five sectors of the knowledge sector:

- education,
- research and development,
- mass media,
- information technologies,
- information services.

Peter Drucker has argued that there is a transition from an economy based on material goods to one based on knowledge.
Marc Porat distinguishes

- a primary sector (information goods and services that are directly used in the production, distribution or processing of information) and
- a secondary sector (information services produced for internal consumption by government and non-information firms) of the information economy.

Porat uses the total value added by the primary and secondary information sector to the GNP as an indicator for the information economy. The OECD has employed Porat's definition for calculating the share of the information economy in the total economy. Based on such indicators the information society has been defined as a society where more than half of the GNP is produced and more than half of the employees are active in the information economy.

For **Daniel Bell** the number of employees producing services and information is an indicator for the informational character of a society. A **post-industrial society** is based on services. What counts is not raw muscle power, or energy, but information. A post industrial society is one in which the majority of those employed are not involved in the production of tangible goods.

1. economic sector,
2. resource,
3. strategic resource,
4. technology,
5. knowledge base,
6. methodology,
7. time perspective,
8. planning,
9. guiding principle.

Table 3 - Dimensions of the information society

	Preindustrial society	**Industrial society**	**Postindustrial society**
Mode of production	Extractive	Fabricating	Processing; Recycling
Economic sectors	Primary: agriculture, mining, fishing, timber	Secondary : manufacturing, processing	Tertiary: transportation, utilities, Quaternary: trade, finance, insurance, real estate, Quandary: health, education, research, government, recreation
Transforming resource	Natural power: wind, water, draft animals, human muscle power	Created energy: Electricity, oil, gas, coal, nuclear power	Information Computer and data transmission systems
Strategic resources	Raw materials	Financial capital	Knowledge
Technology	Craft	Machine technology	Intellectual technology
Key occupations	Farmer, miner, fisherman, unskilled worker	Semi-skilled worker, engineer	Professional and technical occupations, scientists
Key methods	Common sense, trial and error, practice	Empiricism, experimentation	Abstract theories, models, simulations, decision theory, system analysis
Time perspective	Orientation to the past	Ad hoc adaptiveness, experimentation	Future-oriented prediction and planning
Design	Game against nature	Game against fabricated future	Game between individuals
Guiding principle	Traditionalism	Economic growth	Codification of theoretical knowledge

Source: Daniel Bell: The Coming of Post-Industrial Society, 1979

Alain Touraine already spoke in 1971 of the post-industrial society. “The passage to postindustrial society takes place when investment results in the production of symbolic goods that modify values,

needs, representations, far more than in the production of material goods or even of 'services'. Industrial society had transformed the means of production: post-industrial society changes the ends of production, that is, culture. The decisive point here is that in postindustrial society all of the economic system is the object of intervention of society upon itself. That is why we can call it the programmed society, because this phrase captures its capacity to create models of management, production, organization, distribution, and consumption, so that such a society appears, at all its functional levels, as the product of an action exercised by the society itself, and not as the outcome of natural laws or cultural specificities".

In the programmed society also the area of cultural reproduction including aspects such as information, consumption, health, research, education would be industrialized. That modern society is increasing its capacity to act upon itself means for Touraine that society is reinvesting ever larger parts of production and so produces and transforms itself. This idea is an early formulation of the notion of capitalism as self-referential economy.

In **Yoneji Masuda**'s framework, industrial and information societies are compared to one another by 20 different indicators.

Table 4 - Comparison of the characteristics of the industrial and information society by Yoneji Masuda

		Industrial society	**Information society**
Innovational technology	Core	Steam engine (power)	Computer (memory, computation, control)
	Basic function	Replacement, amplification of physical labour	Replacement, amplification of mental labour
	Productive power	Material productive power (increase in per capita production)	Information productive power (increase in optimal action-selection capabilities)
Socioeconomic structure	Products	Useful goods and services	Information, technology, knowledge
	Production centre	Modern factory (machinery, equipment)	Information utility (information networks, data banks)
	Market	New world, colonies, consumer purchasing power	Increase in knowledge frontiers, information space
	Leading industries	Manufacturing industries (machinery industry, chemical industry)	Intellectual industries (information industry, knowledge industry)
	Industrial structure	Primary, secondary, tertiary industries	Matrix industrial structure (primary, secondary, tertiary, quaternary systems/industries)
	Economic structure	Commodity economy (division of labour, separation of production and consumption)	Synergetic economy (joint production and shared utilization)
	Socioeconomic principle	Law of price (equilibrium of supply and demand)	Law of goals (principle of synergetic feed forward)

	Socioeconomic subject	Enterprise (private enterprise, public enterprise, third sector)	Voluntary communities (local and informational communities)
	Socioeconomic system	Private ownership of capital, free competition, profit maximization	Infrastructure, principles of synergy, precedence of social benefit
	Form of society	Class society (centralized power, classes, control)	Functional society (multicentre, function, autonomy)
	National goal	GNW (gross national welfare)	GNS (gross national satisfaction)
	Form of government	Parliamentary democracy	Participatory democracy
	Force of social change	Labour movements, strikes	Citizens' movements, litigation
	Social problems	Unemployment, war, fascism	Future shock, terror, invasion of privacy
	Most advanced stage	High mass consumption	High mass knowledge creation
Values	Value standards	Material values (satisfaction of physiological needs)	Time-value (satisfaction of goal achievement needs)
	Ethical standards	Fundamental human rights, humanity	Self-discipline, social contribution
	Spirit of the times	Renaissance (human liberation)	Globalism (symbiosis of man and nature)

Source: Yoneji Masuda: Az információs társadalom (The Information Society) OMIKK, Budapest, 1988

Similarly to **Bell Peter Otto** and **Philipp Sonntag** assert that an **information society** is a society where the majority of employees work in information jobs, i.e. they have to deal more with information, signals, symbols, and images than with energy and matter.

Radovan Richta argues that society has been transformed into a scientific civilization based on services, education, and creative activities. This transformation would be the result of a scientific-technological transformation based on technological progress and the increasing importance of computer technology. Science and technology would become immediate forces of production.

Nico Stehr says that in the knowledge society a majority of jobs involves working with knowledge. "Contemporary society may be described as a knowledge society based on the extensive penetration of all its spheres of life and institutions by scientific and technological knowledge".

For Stehr knowledge is a capacity for social action. Science would become an immediate productive force, knowledge would no longer be primarily embodied in machines, but already appropriated nature that represents knowledge would be rearranged according to certain designs and programs. The economy of a knowledge society is largely driven not by material inputs, but by symbolic or knowledge-based inputs, there would be a large number of professions that involve working with knowledge, and a declining number of jobs that demand low cognitive skills as well as in manufacturing.

Also **Alvin Toffler** argues that knowledge is the central resource in the economy of the information society: “In a Third Wave economy, the central resource – a single word broadly encompassing data, information, images, symbols, culture, ideology, and values – is actionable knowledge".

In recent years the concept of the network society has gained importance in information society theory. For **Manuel Castells** network logic is besides information, pervasiveness, flexibility, and convergence a central feature of the information technology paradigm. “One of the key features of **informational society** is the networking logic of its basic structure, which explains the use of the concept of ’network society’” As a historical trend, dominant functions and processes in the Information Age are increasingly organized around networks. Networks constitute the new social morphology of our societies, and the diffusion of networking logic substantially modifies the operation and outcomes in processes of production, experience, power, and culture. For Castells the network society is the result of **informationalism**, a new technological paradigm.

Jan Van Dijk defines the network society as a “social formation with an infrastructure of social and media networks enabling its prime mode of organization at all levels (individual, group/organizational and societal). Increasingly, these networks link all units or parts of this formation (individuals, groups and organizations)”. According to Van Dijk networks have become the nervous system of society, whereas Castells links the concept of the network society to capitalist transformation, Van Dijk sees it as the logical result of the increasing widening and thickening of networks in nature and society.

The major critique of concepts such as information society, knowledge society, network society, postmodern society, postindustrial society, etc. that has mainly been voiced by critical scholars is that they create the impression that we have entered a completely new type of society. If there is just more information then it is hard to understand why anyone should suggest that we have before us something radically new.

Such **neomarxist critics** as **Frank Webster** argue that these approaches stress discontinuity, as if contemporary society had nothing in common with society as it was 100 or 150 years ago. Such assumptions would have ideological character because they would fit with the view that we can do nothing about change and have to adopt to existing political realities. These critics argue that contemporary society first of all is still a capitalist society oriented towards accumulating economic, political, and cultural capital. They acknowledge that information society theories stress some important new qualities of society (notably globalization and informatization), but charge that they fail to show that these are attributes of overall capitalist structures. If there were a discourse on continuity and discontinuity, capitalism would enter into a new development stage.

Concepts such as knowledge society, information society, network society, informational capitalism, postindustrial society, transnational network capitalism, postmodern society, etc. show that there is a vivid discussion in contemporary sociology on the character of contemporary society and the role that technologies, information, communication, and co-operation play in it. Information society theory discusses the role of information and information technology in society, the question which key concepts shall be used for characterizing contemporary society, and how to define such concepts. It has become a specific branch of contemporary sociology.

2.4 Narratives of the information society

2.4.1 The "great narrative" – the civilisation theory as context – macro level

Numerous well-known theories have emerged out of the intertwining of historical sociology, social philosophy and culture theory, operating with more and more daring categories as information society is advancing. The most comprehensive domain for exploration is designated the "civilisation theory" level.

The early literature written about information society by the Japanese **Tadao Umesao**, the Canadian **Marshall McLuhan** and the American **Alvin Toffler** took this approach when they studied information society in order to formulate a coherent system [**Figure 5**]. It is undoubtedly the information-based civilisation theory of the Japanese **Shumpei Kumon** that represents the most daring intellectual quest in the subject.

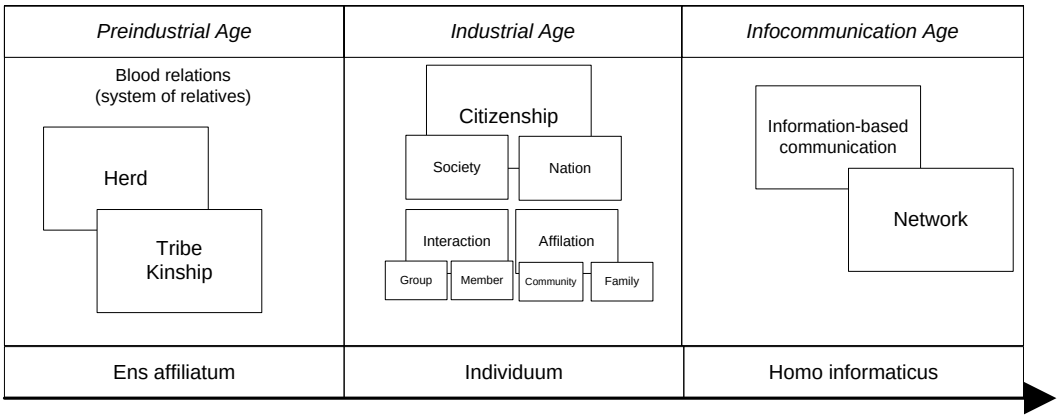


Figure 5 – Connection between civilization ages and the individual

*Source: **Balogh G.**: Az információs társadalom dimenziói (Dimensions of the Information Society), Gondolat-Infonia, 2006*

The **civilisation theory** approach takes the entire discipline of social history as its subject matter: presenting the information society in this context as fundamentally the end product of an intellectual process and not its actual subject. When the time came for the idea of "paradigm change" to be introduced into the public discourse, it was world history and analyses embracing periods of hundreds of years that provided the terminological toolkit to precisely and tangibly describe the depth, dimensions, scale, significance and evolutionary pattern of the ongoing processes. Since it has been accepted that this change is really taking place, the horizon and the time axis have become narrower but the questions posed by authors are those most socially comprehensive. For example, how do techniques of community organisation and co-ordination replace each other and change? How does the human psyche change? How are mechanisms of economic and political control transformed and what impact does this have on the environment and the relationship between man and nature?

2.4.2 The "small narrative" – development theory as context – the meso level

There is no doubt that **Manuel Castells**' applauded trilogy The Information Age is the high point in the use of that small narrative genre up to now. The strivings of leading economic researchers,

sociologists and political scientists to chart the most important structural principles and transformational logic since the 1960s reaches its zenith with this work. Castells manages to surpass traditional reasoning by offering a compact and multilayered foundation linking economic and political, as well as cultural theory. He has provided so far the most complete empirical embedding (with volumes of data queues) and at the same time created a unified terminological framework by the consistent application of the principle of the "network" for the study of the new set of social phenomena pertaining to the information society. After Castells, no matter how excellent they may be, "single-viewpoint" approaches seem jaded and lacking. Thus, there is a fount of exciting issues below the civilisation theory system level, too.

Dozens of new and fundamental phenomena can be found in the small narrative, their shared feature being that they all operate on a highly abstracted level when discussing issues of transformation in individual social subsystems; the network economy, new social and community phenomena, the generation of the digital era, characteristics of the new means and media environment, the power and communication pattern of the new world order, the rise of cyber science. These issues are related to various prominent "problem groups"; there are the issues pertaining to information inequalities, most often discussed in the form of analyses of the digital divide; there is the complex set of questions related to **information literacy**, which touches upon important disciplines ranging from pedagogy to psychology; there is the multidisciplinary interpretation of the information games between citizens and authority; as well as the legal and legal-philosophical problems generated by production and consumption of intellectual goods.

In addition to the above, the small narrative responds sensitively to the dynamics and structural transformations in already existing information societies. It addresses questions such as what stages, models and types exist within information society development and what rules it is governed by. What new information does the study of information society produce? How could the new and comprehensive individual "paradigms" be best captured? (For example, by introducing expressions such as **ambient intelligence** used to denote the universal environment of means and transactions, by a diverse analysis of the "virtual" dimensions of reality, or by exploring the internet phenomenon using a comprehensive and complex social science approach.)

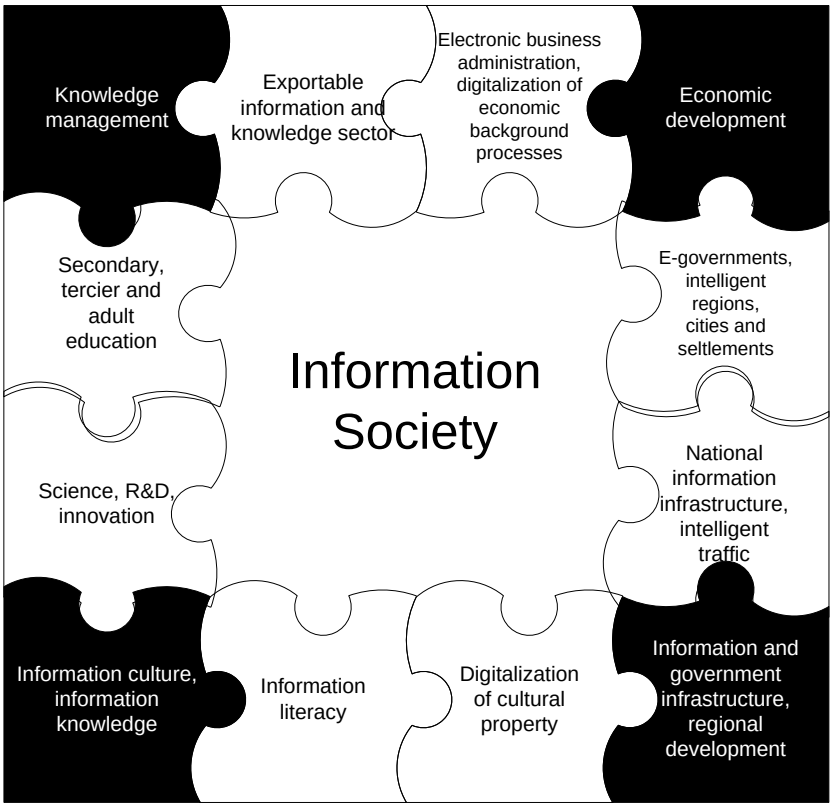


Figure 6 – The structure of the Information Society

Source: ***Élő G. - Z. Karvalics L.*** *:Beszéljünk közös nyelven az 'információs' és 'tudás' előtagú fogalomcsaládról! (Let's speak a common language about the expression and terms beginning with the prefixes "information" and "knowledge"), 2006*

2.4.3 The "mini narrative" – praxis and reflection – micro level

The vast majority of mini narrative texts are produced in workshops and by authors who explore certain smaller slices of reality that are significant for practical considerations, while typically looking for answers to challenges in their own discipline or having found a location for their discussions in the digital context.

As the means and institutions network built around information and communication technologies – from mobile telephones and internet service providers, information desks at railway stations to libraries and archives – interpenetrates every area as an "application", every "meeting point" becomes a theme giving rise to a whole range of tasks to be discussed and researched along the lines of fact finding, information proliferation and contextualisation.

The practical aspect of the mini narrative reveals itself in its purest form where direct intervention is a prerequisite for finding new information. In the case of economic players this means product development and innovation. In the public sphere it appears as information strategy, that is, information-conscious political planning as a new practice of social and economic control focusing on issues pertaining to information society. Information strategies or rather programmes aimed at building the information society, added a series of contextual sciences into their own arsenal, and as a result of this freedom of information and information privacy have gained greater importance than before.

2.4.4. Narratives interconnected to one another

The narratives and abstraction levels naturally are not clearly separate from one another. It is especially exciting to unravel how experiences on the micro level help in the formulation of more comprehensive theories, and the way a given "great narrative" starting point fundamentally determines the approach taken when analysing an everyday phenomenon. The interrelatedness between the narratives is always present and offers many challenging issues.

A possible matter of examination could be money. This fundamental element of the economy can be studied from the "bottom", too. The technological, criminal, banking industry and psychological issues related to credit card fraud are typically in the realm of the mini narrative. However, the examination of how the appearance of electronic money restructures the money and information flow in the economy takes the researcher to a higher level of complexity, that of the meso level. Moreover, a civilisational aspect opens up when exploring the issue of whether the historically emerged form of money, which is the information medium of measuring transactions between various economic players, will disappear due to the emergence of new, "more advanced" forms of mediation thus eliminating several harmful dysfunctions of the former [**Figure 7**]. Another question that can be raised at this level may be: will the shortening of the information value chain between the producer and consumer challenge the laws that have been strictly regulating the operation of the economy for thousands of years?

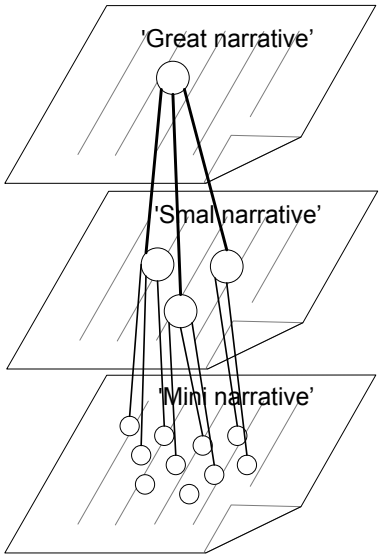


Figure 7 - Narratives interconnected to one another

Source: Individual research

2.5 Making the information society quantifiable

At the end of the overview of examination criteria comes a synthetic table which partly improves the previous models and partly specifies them. This table includes formulations to **make individual elements measurable** and thus answers the question of from which point and to what extent of deviation from absolute or relative indicators can a society be regarded as an information society. That is, where is the tipping point from one state to another in a sub-system or in regard to a characteristic, and through this, of all society? The same table will demonstrate that in many cases it is typical of metaphors found in book titles to focus only on particular limited areas. Returning to

the idea proposed in the introduction, we should restate that the term information society is not a "rival" of these terms but an umbrella term incorporating them all.

Table 5 - Synthetic basic categories of information society, their measurability and metaphors

Basic category	Measure and "tipping point"	Metaphor
Production (Manufacturing)	The proportion of businesses forming part of the information sector and producing information and knowledge products in relation to other sectors (relative dominance: when it is the largest sector; absolute dominance: when the sector alone produces over 50%, i.e. it is larger than all the others put together).	information industry, knowledge industry, information and knowledge industry, information economy, knowledge economy, knowledge-based economy
Employment	The number and proportion of those employed in the information and knowledge sectors in relation to other sectors (relative dominance: when it is the largest sector; absolute dominance: when the sector alone produces over 50%, i.e. it is larger than all the others put together).	white-collar workers, information and knowledge workers, immaterial workers, knowledge class intelligentsia
Work	How many people and to what degree are engaged in information activity "as a profession" according to the type of work done (threshold level: 50%).	symbol manipulators, intelligence, brainworker/mind worker
Resource and technology	Information and knowledge appear as resources and forms of capital in addition to traditional forms – the theory of growth and accounting strive to mathematise this but so far there are no accepted algorithms. (However, the contribution of information and knowledge technology to growth is already measured.)	intellectual capital, human capital, information capital, corporate information and knowledge assets
Income and wealth	GNP at a national level, monthly income on an individual level. There are no accepted measures in regard to the amounts; what is more, these amounts vary depending on the time of joining the information society. $5,000/person/month was the threshold level at the turn of the 1960s in the USA.	affluence, welfare state
Consumption	The proportion of purchased information and cultural goods, means and services in the consumer basket, especially in regard to media contents (threshold level: 33%).	consumer society, prosumers, mediatised society
Education (level of education)	Proportion of those with a qualification earned in higher education (degree holders) in society (threshold level: 50%).	learning society, meritocracy

Cognition	Results and scales in the measurable dimensions of cognition; microscopic dimensions, astronomical distances and scales, discovered genocombinations, sign processing, etc. The scale to measure this is still to be worked out.	life-long learning, scientific revolution, nano-scale, peta-scale
Conflict management method and power technique	Replacement of traditional forms of warfare, placing economic conflicts into an information context (business intelligence, innovation competition). The "state of democracy" of society, types and mediators of control. There are some methods used to measure the "degree" of democracy.	information warfare, cyber wars, business intelligence, bureaurocracy, control crisis- and revolution, risk society
Inter-connectedness	The degree of mutual connectedness (objective in the case of telephone networks: provision over 50%).	telematic society, "wired society"
Worldview and logical framework	Has the static and energy-centred worldview been replaced by an information-centred one? Have the global system level and the "space age" become a framework for analysis and interpretation? Is orientation to the future a characteristic feature?	global village, techno culture, information civilisation

*Source: **Z. Karvalics L.**: Információ, társadalom, történelem (Information, Society, History) 2003*

2.6 Evolutionarist approaches

Evolutionism's lineage can be traced back as far as to the 18th century in economic studies. The movement away from models built on balance and optimization has taken place gradually. Right from its appearance, evolutionist approaches focused on question neglected by neoclassic economics [**Figure 8**]. In the centre of its studies, the sources of the quantitative changes in historical time. According to this approach there is an ongoing competition and its trump-cards are new products, new organizational solutions and new resources. Entrepreneurs can fulfil their role of doing something new only in the information society. The combination is extended to every part and every detail of resources and production.

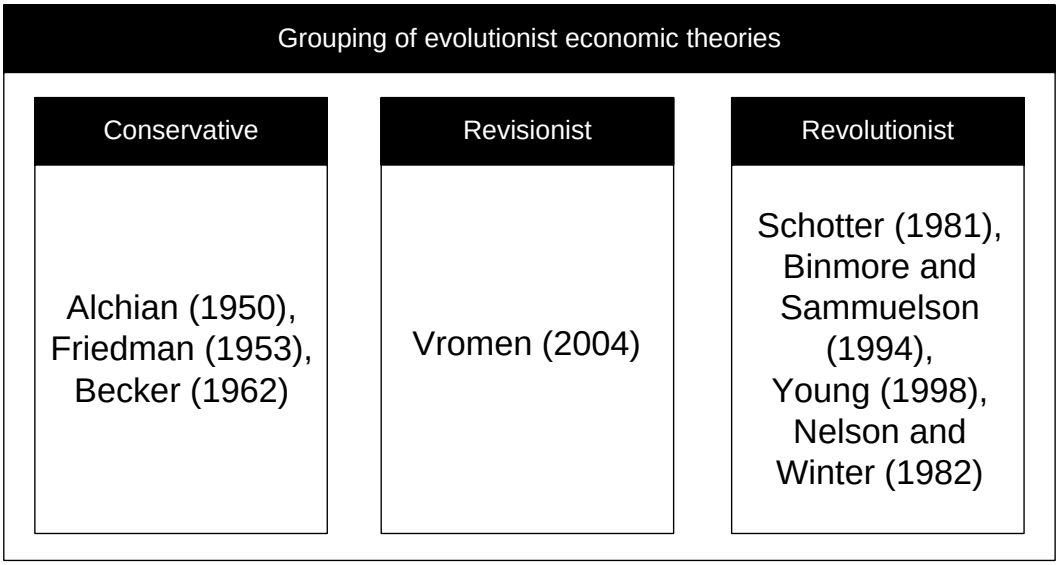


Figure 8 - Three main groups of evolutionary theories in economics

*Source: **Szabó K.** – **Hámori B.**: Információgazdaság (Information Economy), Akadémiai Könyvkiadó, 2006*

According to the **conservative approach**, the cornerstone of descriptive theories supported by the rational but not conscious behaviour of economic actors is that a continuous selection process is going on. Thus, from the economic perspective, it is enough to examine effective actors. This approach appeared in corporation theory well before the information age but it was more of an isolated thought experiment than a change of paradigm. Companies are not regarded as only optimization units but they are also organizations of processing and storing knowledge. In order to achieve this state, they need to use information and communication technologies.

The **revisionist theory** states that the process of evolution had already been completed. The behaviour of economic actors can be described automatically - in accordance with neoclassic raisings. Although it acknowledges the relevance of evolution, it shifts the attention from current economic processes to global issues. It assumes that current economic processes are determined and the use of available resources can firmly be defined. Among all resources, the role of information technology becomes more important.

According to **revolutionary evolutionism**, the behaviour of economic actors is characterized by limited rationality (their decisions are based on partial knowledge). They learn from their mistakes afterwards. Some questions can be raised here: how can they learn from their mistakes and how can the lack of knowledge be eliminated? In this case, the use of information and communication technologies can be helpful.

Evolutionary models put a stress on the heterogentity of individuals and companies. There can be great differences in performance, income and behaviour within an economic sector, between sectors as well as individuals. Heterogenity is manifested in company units, departments and teams as well as in the characteristics (size, technology etc.) of companies. The permanent heterogenity of conditions and circumstances is resulted in the permanent difference in performance and output. The organization is not able to control its teams and employees any more; it aims to co-ordinate them, instead. If all companies behaved in a similar way, there would be nothing for them to learn

from one another. In economic organizations, the shift between the diversity (private knowledge) and the communal feature of knowledge is connected to the shift between applying existing knowledge and research, that is, organizations are continuously confronted with two alternatives: they use their resources either for benefiting from existing knowledge or exploring new opportunities.

According to the evolutionist theory, companies are the collectors or "crystal cores" of knowledge. Companies and company groups co-ordinate their operations within a network [**Figure 9**]. This co-ordination can take place as follows. In fact, every company is an example of information organization able to multiply themselves according to certain rules. The challenge for economics is to identify and describe these rules. As it was stated before, companies are the collectors or "crystal cores" of knowledge and not simple data-processing machines. They perform various tasks by using several mechanism, while these mechanisms have compound effects on one another.

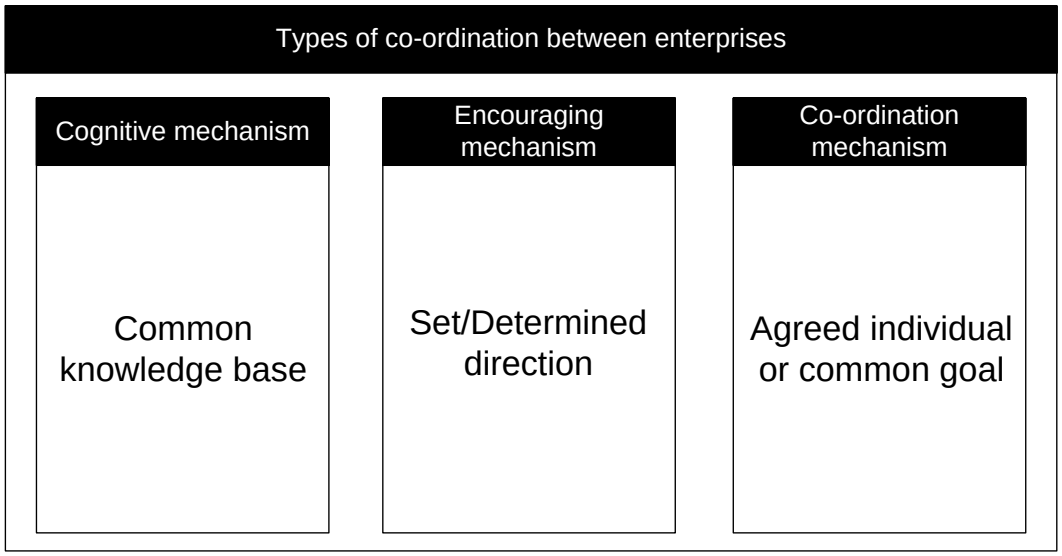


Figure 9 - Types of coordination

*Source: **Szabó K.** – **Hámori B.**: Információgazdaság (Information Economy), Akadémiai Könyvkiadó, 2006*

Cognitive mechanism put an emphasis on the importance of learning. Learning, by breaking daily routines and algorithms, has become more significant in the everyday operation of companies. In practice, knowledge, in its simplest form, can be described as technology processes. Technology is used all the time, although its operation is not comprehensible; it is used for acquiring the knowledge that the company does not have. In the information age, managers' training activities cannot be regarded as unique. Socialization for those who stand at the bottom of the ladder does not only mean acquiring the patterns and processes mediated by managers, it also means that individuals share their knowledge with each other for gaining experience and private knowledge. Sharing knowledge has a peculiar importance in the case of implicit knowledge, that is, common rules and technical skills.

The source of innovation is human creativity - but what motivates an individual to be innovative? One reason is the pleasure of discovery; the other is the discontent with the current situation. **Encouraging mechanism**s ensure that activities are aimed at a specific direction. These general motivations take a peculiar shape in the information society. Because of the winner-take-all

principle, crucial situations are caused more frequently even in robust companies. That is why there is a fierce rivalry between units, departments and individuals within a company.
Coordination mechanisms are responsible for harmonizing individual actions in order to achieve a common goal, by putting local and decentralized learning processes and actions as well as organizational changes into a given direction. For achieving such goals, companies use information and communication technologies to a greater extent and more intensively.
If a comprehensive description of the information society is required, we have to give upon one of the most essential economic principles, the principle of profit maximization. Rethinking and certain amendments are needed to the principle. Naturally, there are some who think that the principles of economics have not changed in the current technological transition. According to K. Szabó and B. Hámori, profit maximization has always been a paradigm and not a real practice. In the information society, however, where events happen so fast that a model framework can change radically even in the phase of elaborating it, the chance to make optimal and rational decisions at a company level is even smaller than in the slowly-changing, traditional economy. Thanks to computer science, large model calculations and simulations can be done within a short period. The trouble is not with the speed of these calculations but with the theoretical framework of the extremely complex problems. Instead of optimizing their activities by means of complex models, companies divide their activities into parts, projects and teams, and they try to solve the complicated problem of efficient operation by making work groups, projects virtual and real teams as substantive as possible.

2.7 Legal regulations of information society

The legal material concerning information society is interwoven into our legal system horizontally. The rules related to information society are enshrined to a greater or lesser extent in the several areas of law. As in any regulatory domain, the legal content concerning information society can be grouped according to the system of law. There are two distinct groups: the laws organising legal relations between the state and its citizens, and between the various state or public organisations (called public law), and the laws organising legal relations between citizens and partnerships, and between members of civil society (civil law). Differentiation is based on the relationship between those involved. While in the first case we can speak of an unequal legal relation based on subordination and superiority, in civil law the typical legal relation is one of equality and coordination.
In the continental legal system, we can distinguish between four main categories:

1. civil law,
2. criminal law
3. administrative law,
4. constitutional law.

Civil law regulates the property personal and family relations of natural and legal persons in cases where the partners are equal and state intervention, except for legislation, occurs only in the event of a legal dispute. The most important areas affecting information society are as follows:

- e-commerce,
- digital signature,
- content regulation,

- protection of copyright and industrial property rights,
- media law,
- competition law.

Criminal law regulates acts that are a danger to society. We can group all those acts committed with or against IT technology which are dangerous for society and for which the law orders the sanction of punishment. Legal regulation of information society is primarily concerned with the following categories of crime:

- misuse of personal data,
- content-related crimes (e.g. distribution of child pornography, hate speech, etc.),
- crimes against computer systems and data,
- infringement of copyright.

Administrative law is the regulatory system of state functions. State administration extends beyond central government and local government to larger systems; for example the operation of transport, security, military and information systems. The following functions essential to information society belong to this group:

- electronic administration,
- electronic register of companies,
- administrative procedure,
- electronic public procurement.

The fourth field is **constitutional law**, which arose out of continental legal development. The object of regulation is to structure relations between the citizens and the state and the organisational structure of the state. The constitution is the document describing basic rights, responsibilities and procedures thus creating the basis for the process governing political, economic and social life. Areas of constitutional law related to the information society are as follows:

- electronic freedom of information,
- personal data protection,
- freedom of the press and freedom of expression.

2.8 The effects of technology and innovation on society

Technique can be defined as the application of some devices or knowledge in order to accomplish a specific task or fulfil a purpose. These purposes may range from industrial use to social needs, improving working conditions or raising the standard of living. For humans, technique is an acquired way of using the surrounding environment for satisfying their own instinctive goals and cultural desires. It is the knowledge to create something new.

Under the term '**technology**' I mean all the procedures and knowledge of procedures that are needed to perform a specific task.

Studies considering science and technology as an inseparable and organic part of society, like information society studies, do not have a unified conceptional and methodological apparatus, nor a comprehensive and prevailing scientific paradigm. We can talk about a variety of multidisciplinary and interdisciplinary studies, schools, theories and approaches interacting with each other and comprising works of scholars from various traditional sciences like history, economics, sociology or

anthropology. The great number of diverse approaches makes it impossible to review them completely, so we have to forget about introducing schools like the technology theories of evolutionary economics in detail. On the whole, the goal of this chapter can be nothing more than to provide an ”intellectual crutch” for discussing and interpreting information communication technologies by reviewing the most relevant and important theories, concepts, models and notions of the topic.

Technological determinism argues that technology is the principal driving force of society determining its mode of operation, development, course of history, structure and values in a decisive manner. Converse effects are taken into account to a limited extent, fully disregarded or disclaimed. Technological development is thought to be propelled by the logic of science alone.

Most scientific concepts explicitly reject technological determinism; yet they assist its survival by studying only technology’s influence on society. This is more symptomatic of ICT related researches.

The beginning of **Science, Technology and Society studies** dates back to the early 1970s, when the first studies were published. The novelty in the pioneering works, which lends them their special character even today, was that they stressed –contrary to technological determinism – society’s crucial role in the development of science and technology, framing the three intermingling domains in complex theoretical systems. The works of philosophers, historians and sociologists were collected in two books in the mid-eighties, which have become the most cited publications of this school. Some of these approaches have developed into theories, generating further discourses and STS has been crystallised into an interdisciplinary field of research with both common research areas and methodology.

The STS school is far from being the dominant scientific paradigm of this area of knowledge, but has several advantages that make it indispensable when examining information society and ICT. These are its strong empirical basis and complex approach to analysing interaction between technology and society, their manifold co-dependence, and complex co-development. Within the several concepts of STS, many schools exist criticising and complementing each other.

2.8.1 Studies of the interactions between science, technology and society

The foundations of STS were laid down in the 1980s by the “**Social Construction of Technology**” school, which focuses on the development phase of technologies at the micro level, and pinpoints that technology (and natural scientific developments) are basically shaped by social processes [**Figure 10**].

Any given technology stabilizes when debates are settled. This is the phase of ‘closure and stabilization’. Closure, however, does not mean finalizing: newly joined user groups can reopen the debates which can lead to new modifications to or variations of the existing technology.

Using the terminology of evolutionary approaches, we can say variations, mutations and hybrids are brought to life during the diffusion of a certain technology, which is chiefly true for ICT. Take the different variations of computers (desktop PC, portable notebook, PDA, etc.) or the convergence of mobile phones with other electronic devices (such as PDAs, digital cameras, mp3-players, game consoles, or GPS devices) which are typical hybrids.

Bijker and Pinch emphasize that the meanings assigned to technologies are determined by the norms and values of social groups which draw the “wider context” of socio-cultural and political environment into the set of determining factors. Drawing on the wider context concept, **Laudan R.** argues that changing social values can bring new technological constructs or their complete generation to life. The heterogeneous and hierarchical community of technological development functions as a mediator of social values and forces value orientation in society to change.

Capital mobility has increased incredibly, the economy has shifted to the service sector, innovation has become the primary source of productivity growth in relation to engineering, organizations, institutions as well as individual workers. The "technical construction of society" has become a major issue, that is social processes are mainly mediated by technological development. The society's level of being informed, with exploiting the opportunities provided by information and communication technology, has been increased dramatically. This new technology, together with biotechnology opens new perspectives in the fields of industry, trade and education.

The nature of economic competition has been undergoing huge changes, as more and more people think that there has been profound changes in the relation between economy and society and innovation requirements. The continuous and self-accelerating innovation processes characterized by the intense competition has brought about some changes in time relations. People start moving on a different time scale, time has been speeded up.

Space has become globalized, by turning into more unified and more complex at the same time. Socio-economic processes create new virtual spaces or even real spaces are modified: the processes are arranged in new ways in the interacting local, regional, national and supranational spaces. While integration processes are considered to be a general tendency, clear attempts for isolation also appear repeatedly. Knowledge has become the main economic source, and learning abilities and skills have become a criterion of adaptation at the levels of individuals, companies, local communities, nations, supranational organizations and the world taken as a global system.

Actor-Network-Theory is another school of STS studies, which is more and more widely used. It is a new branch of the sociology of science and technology, the basis of which was elaborated by **Michel Callon**, **Bruno Latour** and **John Law** in the 1980s. They – along with other scholars – developed their concepts into a theory.

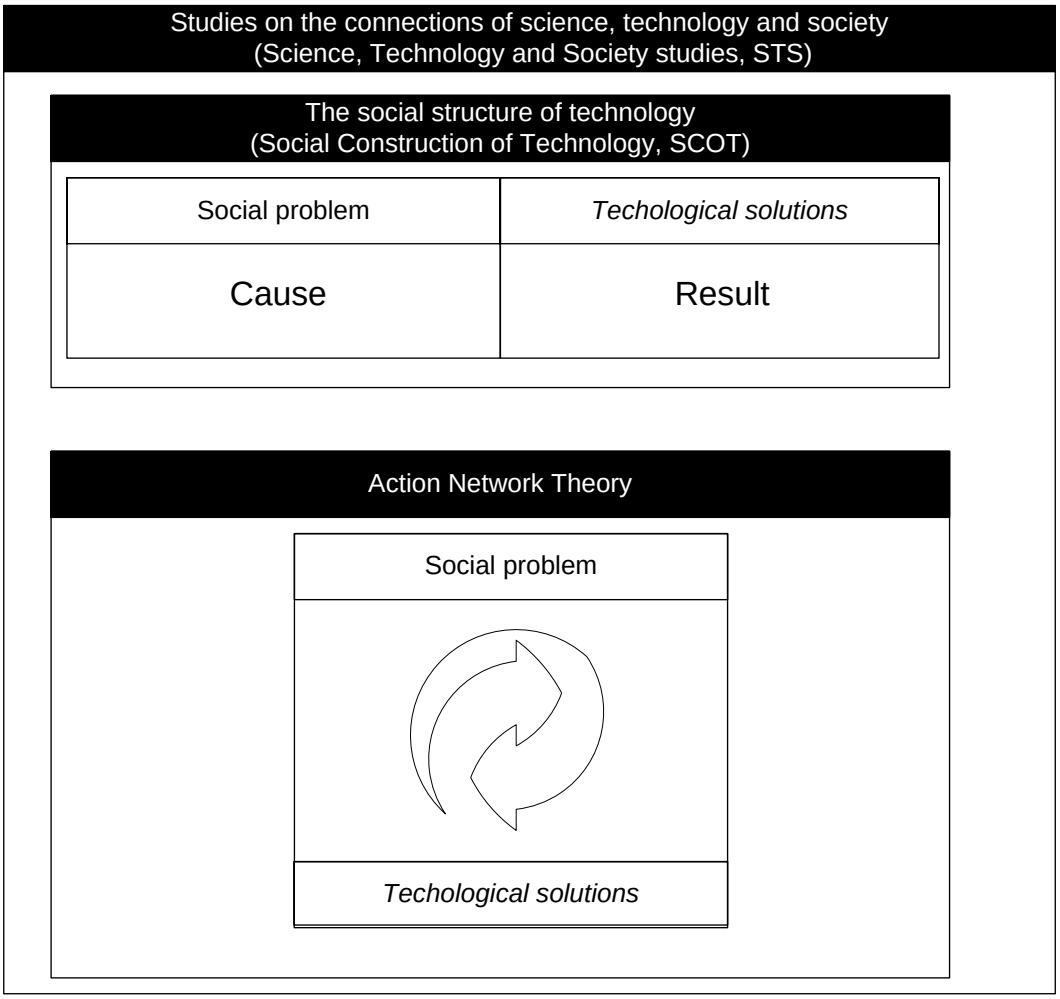


Figure 10 - Grouping of studies focusing on the interactions of science, technology and society

Source: Individual research

A basic statement of **ANT** is that technological objects along with their socio-political context co-develop and shape each other mutually into socio-technical entities through constant interactions. The objects and their context form heterogeneous networks made up of human and non-human components which are connected to each other dynamically. These heterogeneous components can be objects, techniques, institutions, organisational solutions, human abilities or cognitive structures.

Human components as network builders are constantly formed and constituted by the networks they are part of. Actors in this network are connected by intermediaries, which in many cases, have social meanings. Texts, technical artefacts, currencies or human skills can function as intermediaries.

One of ANT's – much debated – theorems is that the natural state of society is disorder. Order is achieved through the constant and endless efforts made by the actors to build networks.

Callon argues that an actor-network cannot be derived either from the actor or the network. The actions and the will of actors are inseparable from the network, and their effect runs through the whole network.

This leads us to one of ANT's radical novelties: the boundaries between the actors disappear and even actions cannot be interpreted in the traditional way.

In the literature, the constant shifting of power between technology and society is called translation: as a result of this process, networks are formed progressively, in which certain entities gain control over other entities.

2.8.2 Diffusion of innovations

Innovation has become a key activity of information societies. It is the cornerstone of economic competitiveness. National and regional (such as European) administrations develop high level strategies to promote innovative activities in the economy.

Innovation can be defined as basically novel inventions or concepts – arising from either professional research or ideas by amateurs – translated into practice. An innovation can be a technological object, a new organisational solution or an idea. Innovations become market goods through product development and/or technology transfer. The product cycle consists of the following stages: introduction (to the market), growth, maturity and stabilization, and decline. The life cycle of common goods (e.g. road infrastructure) and public goods (e.g. public safety) go through the same stages. Rogers' theory applies to the life cycle of innovations as far as the maturity phase and at the level of communities and societies.

Rogers explains the diffusion of innovations as basically communicative: diffusion is the process by which an innovation is communicated through certain **channels** over time among the members of a social system. Diffusion is determined by the above mentioned four factors (innovation, communication channels, time and social systems). It is a process of decision making, in the stages of which different types of information and knowledge transferring mechanisms play crucial roles.

The diffusion of innovations – thus, of technologies too – takes place within social networks, so called diffusion networks [**Figure 11**]. The ability of individuals to adapt depends on the cohesion of these networks, in other words, to the extent of its homophily (similar socio-economic status, qualifications, attitudes); on structural equivalence (on the individual's position in the network); and on the threshold of other users which makes it worthwhile for a group member to adopt the given technology.

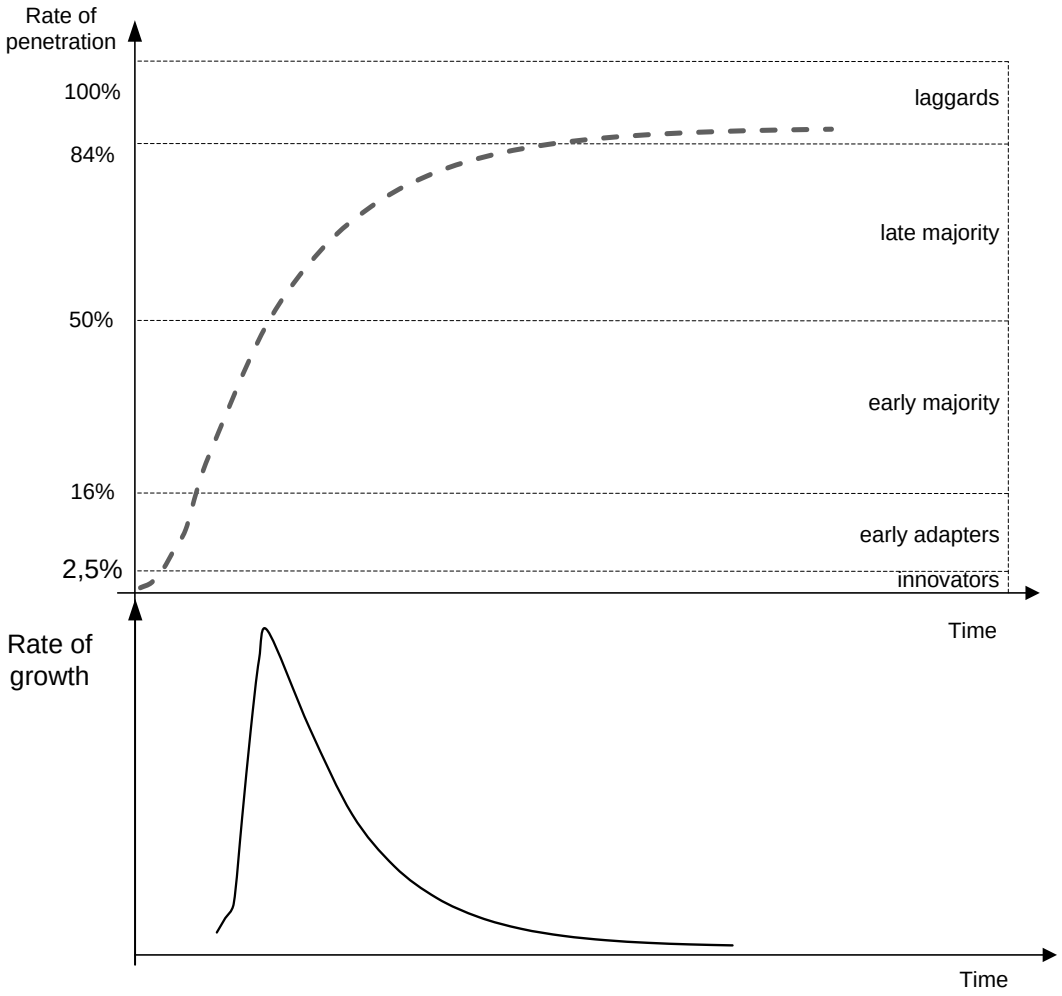


Figure 11 - Categories of willingness to adaptation

*Source: **Everett M. Rogers**: Diffusion of Innovations, individual research, 1995*

Innovators play a crucial role in diffusing an innovation between homophile diffusion networks. They tend to use the technology first, and usually possess heterophile social relations (they maintain regular relationships with several social groups and through them, several networks of diffusion). Chronologically, the second group to adopt an innovation are called the **early adopters**; these are followed by the **early majority**, then the **late majority**, and lastly, the **laggards**. Each of these ideal-typical groups is characterized by specific socioeconomic factors, personality values and communication behaviour. For example laggards are the most disadvantaged group along the socio-economic scale.

When studying the diffusion of ICT, at least one more category must be added: the **refusers**, who consciously resist usage throughout their lives (also known as **diehards**). The existence of this group indicates that no technology ever penetrates a society fully. To reach 100% diffusion both society and technology need to change as compared to their initial status when the innovation was introduced.

The process of diffusion is broken down into different stages from the individual user's point of view. First, one typically acquires information regarding innovation through mass media channels (or cosmopolitan communication channels). The following three phases are dominated by **interpersonal channels** (or **local channels**). In the second phase, persuasion and opinion forming

take place, followed by deciding on the adaptation, finally evaluation and confirmation of the usage. Of course, refusing the implementation (even several times) is an option too, but it can be followed by acceptance, and vice versa, the evaluation of implementation can lead to discontinuing usage.
Rogers analyses the characteristics of an innovation affecting its own diffusion (such as relative advantage, compatibility, complexity, trial ability and observability), but gives little attention to their socially constructed nature.
The main advantage of Rogers' theory is that a key role is ascribed to communicative processes. This momentum makes the theory a close relative to other approaches such as **SCOT** and **ANT**. Rogers' theory can be drawn upon in the analyses of such information society related issues as the **digital divide** or **e-inclusion**.

2.8.3 Methodology problems in applying STS studies

The application of these theories and schools on ICT is problematic in many respects. First, as we stated above, there is not a single, widely used paradigm which has synthesised the various schools and theories dealing with technology and society. Second, these fragmented approaches do not have a fully-fledged mode of application to the relationship of Information Control Technology (ICT) and (information) society.
Third, SCOT, ANT, the evolutionary- or the systems approach to the history of technology – when dealing with information society – does not take into account the results of approaches (such as information science or information systems literature or social informatics, information management and knowledge management, communication and media studies) studying the very essence of the information age: information, communication and knowledge. The list of unnoticed or partially incorporated sciences, which focuses on the role of ICT in human information processing and other cognitive activities, is much longer.
These, though, miss the approach of STS and evolutionary schools, particularly the concept of technology and society as a seamless web. Merging the two modes of understanding information society is in its infancy, though studying ICT systems cannot be complete without them both.

Chapter 3 The effects and characteristics of information and communication technology systems

Information and communication technology can be regarded as a universal technological system, which is closely linked to all of the previous systems and creates new, more complex technological systems. **ICT**'s main characterizing function is to assure acquiring, storing, processing, delivering, distributing, handling, controlling, transforming, retrieving and using information.

Let me start the characterization of ICT with the ever growing pace of its development. Two million years passed between the invention of flintstones and chopping tools. Only a couple of hundred thousand years were needed to the first appearance of the first flake tools. In terms of communication technologies, tens of thousands of years passed between the appearance of speaking and writing. Mankind had to wait only about 5.000 years for the European introduction of printing. Slightly more than four hundred years. A hundred and fifty years after Morse's first message, the first commercial internet services became available. In the age of information, the time between the introduction of new technological systems brought to existence by radical innovations becomes shorter and shorter.

New hybrids, variations and mutations appear in the individual systems in countless amounts at an astonishing speed (and disappear very quickly in most cases).

Another very important and equally general trait of information and communication devices is their continuously **growing capacity**. Its driving force is primarily the increasing need for storing, processing, publishing and distributing information along with the growing volume of information-related activities.

The **phenomenon of convergence** has been characteristic to information and communication systems from the very beginning, both at the level of **physical products** (communication devices and networks, for instance) and **non-physical formations** (data bases, communication channels, content distributing systems etc.). As a compound expression, ICT refers to the convergence taken place between **information technology** (**IT**) and telecommunication systems. The merger of these two systems resulted in the birth of a new, standardized system at a higher level. The standardization between ICT systems and television broadcasting together with other home electronic systems is currently evolving in front of our eyes: by their nature, these devices have been seen before as parts of information and communication technology but in a less integrated way.

With no exception, ICT infiltrates into those technological systems that are not considered primarily to be closely connected to information and communication technology [**Figure 12**]. The same phenomenon is taking place with the dominant technological systems of all economic sectors: agriculture, manufacturing, traditional service sectors (financial intermediation, transportation and storage, for example), education, public health and public administration.

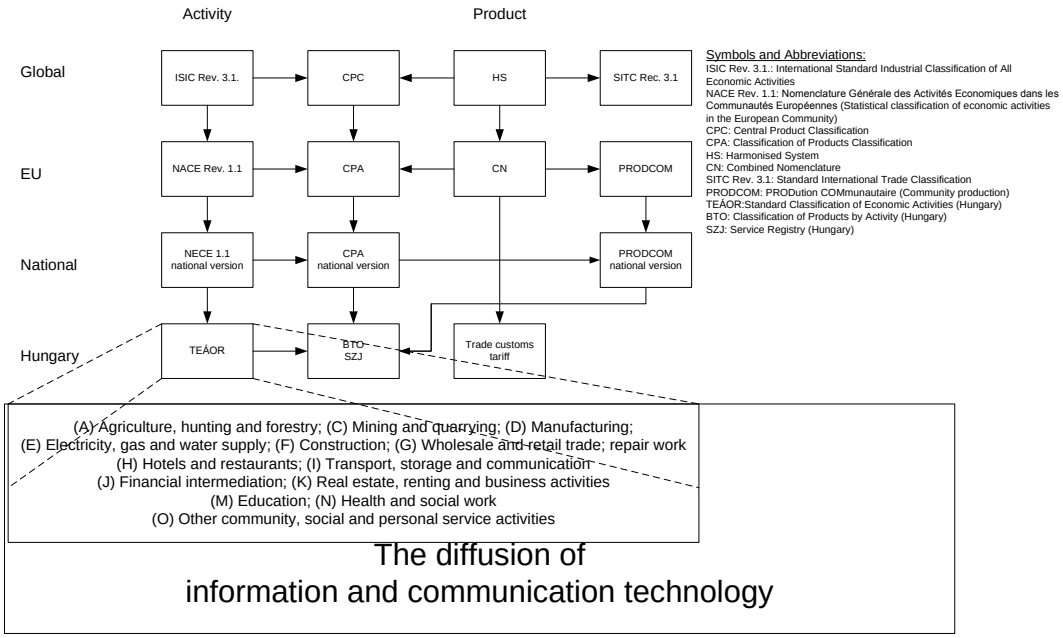


Figure 12 - The diffusion of information and communication technology into economic sectors (by NACE codes)

Source: Individual research, Hungarian Statistical Office, 2008

Quite naturally, our everyday life cannot avoid being affected by these radical changes, either. As information and communication systems are gradually becoming part of our traditional activities happening in the 'real world', these activities are eventually extended into a virtual dimension characterized by purchases on the Internet, electronic communication, online financial transactions etc. This infiltration can be described by the terms '**pervasive computing**', '**ubiquitous computing**' and '**ambient intelligence**'.

3.1 The effect of information and communication technology on the actors of the economy

ICT has a different effect on the actors of the economy, including companies, employees and consumers.

Nowadays we witness a change of paradigm in the operation of enterprises. They have become a rapidly changing system of independent work groups and projects. Enterprises characterized by flexible operation demand flexible labour force. In this new situation, employees have to leave the traditional patterns and develop a new kind of mentality. If they want to stay afloat in the labour market, they have to as enterprises are no longer strongly interested in developing the professional knowledge of their employees.

Beside the changes experienced in the attitude of enterprises and employees, consumers' behaviour has been also changed essentially by the effect of ICT. As consumers are freed from their isolation by the Internet, they become active and conscious actors in the economy. The relationship between buyers and sellers has changed, it has become harder for sellers to recognize and influence the trends in demand and consumers are better informed than ever before.

3.1.1 Employees

The fundamental factors of production in enterprises using ICT are intellectual and organizational capital. The operation of enterprises has to be adjusted to the growing importance of these two factors of production. The management of companies have to rethink the forms and characteristics of work organization and they have to replace the previous strict processes with new, flexible and easily adaptable ones.

Beside the change in the importance of factors of production, enterprises are also inclined to be flexible because of the consumers' more definite demand for customized products and services. With the flexibility gained by using ICT, enterprises are able to react to the changing market needs, and ICT also helps them in downsizing, job enrichment and outsourcing.

Fundamental changes has been seen in work organization with the spread of flexible production systems. Initially, flexible production systems were introduced to eliminate efficiency-related problems in mass production, later it was used to mass production. Flexible production lines do not require a large number of workforce; instead, there is a growing need for employees with strong problem-solving skills.

In the rapidly changing market environment, companies are forced to authorize their employees to solve any occurring problem in their jobs because even the most sophisticated procedures wouldn't be enough to cover every possible situation. The group of the authorized employees primarily ranges from managers to workers with strong professional skills. Jobs related to ICT are almost impossible to perform without a certain degree of authorization. Authorization has greater effect on employees' performance when it is accompanied by adequate rewards, communication and professional trainings.

Companies can keep pace with the speed of the development of **ICT** only by introducing job enrichment. The requirement of versatility can be met only by **employees with high-level general education**.

The decrease of the number of strict positions along with the changing requirements of the remaining ones allows employees to acquire new skills but it also stretches their responsibility. Cross-trainings are also organized for the group of employees in order to enable them to perform various tasks.

Team-based companies have better problem-solving skills, higher productivity, more efficient use of human resources, more creativity and more innovations when compared to traditional non-team based organizations. Nowadays, when digital information is regarded as the chief mean of production, the efficiency of production is highly dependent upon obtaining and processing information. Based on the achievements of ICT, companies have shaped up the infrastructure of obtaining and processing information, and help their employees to co-operate by compressing time and space.

The intention of raising efficiency gave room to **virtual teams**. By being part of a virtual team, employees do not have to work under the same roof and other employees from outside the company can take part in the work of them.

Telework represents the **flexibility of working** conditions in the most expressive way as it is strongly connected to **ICT**. Its fast spread around the world was partly caused by global market

trends. The majority of employees are not involved in production processes any more, instead, they are usually employed in the preparation of production, these latter kinds of jobs can be outsourced.

ICT has an extremely great effect on common knowledge. Common knowledge is the part of knowledge that is not specific to a given company; it can be obtained and used by anyone. Having a common knowledge of their employees does not mean a competitive edge for companies; it is more of an indispensable condition for them to remain competitive. However, employees working for the same company for a longer period surely finds it harder to follow the changes in common knowledge than those who change their jobs more often. ICT has an essential role in the accumulation and distribution of common knowledge. By embracing the whole economy, it creates a common language for lots of various applications (the simplification, standardization and digitalisation of processes). Because of the more and more intense competition, companies can hardly afford not to hire atypical work force in order to keep their common knowledge up-to-date. The characteristics of atypical work are the following: fixed-term employment contracts, casual work, part-time employment, systems of flexible working hours, self-employment (being economically dependent on a single buyer), labour force hire and recruitment and telecommuting. Generally speaking, companies tend to use **atypical labour force** out of the sphere of the essential competitive advantages. Common knowledge changes very slowly at companies operating in a stable environment or being in a monopolistic state. The ICT sector, which is characterized by standardized processes, extreme dynamism and rapidly changing common knowledge, does not work that way. This is the reason why employing atypical labour force is so widespread among the companies operating in the ICT sector. As an effect of ICT, companies are gradually forced to switch from constant employment to hiring atypical labour force. The cause of the high rate and the quick expansion of atypical work force is the decrease of the average degree of capital specific skills along with the reduction of transition costs.

Companies primarily employ atypical labour force out of the essential fields of competitive advantages. A competitive advantage means a specific knowledge or skill that distinguishes companies from their competitors, putting them into a favourable position. This is called **company-specific knowledge**. However, material processes are no longer part of competitive advantages today. Multinational companies outsource their easily copiable production processes to companies operating in the developing world, and they work on developing a specific knowledge capital instead. The number of employees enjoying high social security is decreasing and they are gradually replaced by atypical labour force. All these changes have a dramatic effect on employees as their secure standard of living is closely connected to the position they hold in the world of labour.

Regarding the availability of ICT, significant geographic, national, ethnic and cultural differences have started to appear. According to Negroponte, the real cultural barrier is between generations. When the younger generation enters the labour market, they bring a new culture and a completely different view on authority with them.

3.1.2 Consumers

Information and communication technology has brought a deep change in the opportunities for consumers compared to the opportunities provided by industrial capitalism. This change was as profound as the one caused by the Industrial Revolution earlier. The new generation of consumers is, first and foremost, well informed, collecting and using other consumers' existing experiences. Companies (especially corporations previously focused on products and markets, nowadays they concentrate on consumers. It is not enough to recognize consumers' problems, identifying the problems in order to solve them is also needed. The opportunities provided by ICT identify actual consumers, based on actual problems occurring during the use of a product.

Well-informed consumers, being used to companies trying to find solutions to their problems, have greater expectations towards companies and contribute less and less importance to the growing standards of the material ingredients of goods and services (comfort surplus). The demand for comfort is connected to a kind of consumer impatience. Consumers expect companies to provide products or services to them when it is the most convenient for the customers.

Consumers also hold on to the freedom of choice but they do not like being overwhelmed with to many alternatives. Mobile devices are especially suited for handling consumer impatience.

Today's consumers can hardly be dazzled by only material goods. They wish to have experiences instead. In this process of dematerialization, value is less and less dependent upon the material characteristics of a given product or upon consumers' needs. It is even better when the provided product is virtually an experience or an entertainment.

The desire for experiences and intellectual challenges is interconnected with the shift of consumer behaviour from material values toward ethical and intellectual ones. We talk about such values as beauty, health, friendship, self-realization, tolerance, eco-consciousness and so on. These values have come to the front as a kind of reaction to the extreme materialism of the consumer society. **Value-oriented** (or postmaterialist) consumption requires the existence of a high standard of material consumption. Whole economic sectors have been built on postmaterialist values from organic food and sportswear producers to travel agencies offering exotic tours.

The abundance of products offered by manufacturers, the shorter product life cycles and the trends in consumption all make consumers and customers more and more unpredictable. As the technological development and the exchange of goods are becoming faster, there are less and less products that can confirm consumer preferences. The traditional decision models predicting consumer behaviour are hardly suited for understanding consumers' interests in new products. Companies can raise consumers' interests in a new product mostly by growing consumers' understanding and sympathy toward a newly-introduced product or service. However, emotions are considerably more unpredictable than rational consumer choices. This problem is further deeped by the capriciousness of consumers, they are vulnerable not only to their emotional dispositions but also to their momentary feelings. The chances of impulse buying are far higher when using ICT than in the case of traditional shopping. It must be admitted that basic needs cannot be ignored, they have to be fulfilled under all circumstances.

It can be clearly seen from the above summary that ICT has distracted consumers from their traditionally passive role. Companies react to this new kind of attitude by involving consumers in

the promotion and the development of their products and services. By directly influencing the making of products, consumer demand pull decides the fate of them even before putting them on the market.
Beside active consumers, the global consumer has also appeared. Global corporations benefit from both the disappearance of national borders and the availability of customization, as these trends are related to one another. ICT has given a new opportunity for consumers to break away from geographic barriers.

3.1.3. Employers

Nowadays, the majority of changes in work organization, decision mechanisms and corporate organization structures requires enhanced flexibility. **Flexibility** means quick reaction, the removal of strict limits and the frequently mentioned job enrichment as well as openness for innovations and unconventional answers to the newer and newer challenges. The environmental impulses do not affect the operators of the assembly lines or the workers of call centers through a long chain. Companies were operated centrally from a single headquarters earlier, nowadays managers and workers try to find answers to the current challenges in many local corporate decision nodes. The coordination of numerous independent units is generated by the company as a self-organizing system, and the company's philosophy is determined by the self-organization of independently operating units based on market principles.
In the case of immaterial and material goods, countless product versions are made with the help of **ICT** mainly in the phase of planning, using computer or other simulation techniques. In the theory of **adaptive systems**, genetic algorithms simulate the conditions of evolution and natural selection. The best solutions are selected by using the simulations generated by these algorithms.
Genetic algorithms are widely used to solve various engineering and economic problems.
Mutation or natural selection is an alternative for conscious optimalization. Optimalization assumes that economic actors are rational and well-informed. Contrary to this, they do not necessarily recognize relative advantages during natural selection. Optimalization is a direct and conscious choice of economic actors while natural selection is a spontaneous process. and results in a random mechanism. In the latter case, actors supposedly intend to make the best decision but their intention eventually fails because of the lack of information and finally results in random mechanisms.
The fact that innovations contradict optimalization is also proven by their high mortality rate. Only few products or methods become successful after many years of introducing them.
Instead of or beside centrally made plans, companies heavily rely on the principle of natural selection within the organization. Innovation is not a temporary sway from equilibrium, but quite on the contrary, equilibrium means a temporary stillness between the high and stormy waves of innovations.
In the information society, the nature of companies is fundamentally transformed by the ever more intense need for knowledge and adaptation. The six main characteristics of the adaptive nonlinear networks are the following:

- dispersed actions of heterogeneous actors,

- lack of comprehensive supervision,
- irregular hierarchical order,
- continuous adaptation,
- constant novelties,
- dynamic, out-of-equilibrium processes.

3.1.3.1. The development stages of using ICT

Electronic marketplaces are a complex combination of the basic business and operation models of the network economy. According to **Kápolnai**, **Nemeslaki** and **Pataki**, five development stages can be distinguished in the relationship between companies and the use of ICT. The individual stages do not represent only a time series but they also point at various strategic approaches interpreted in the present time and the depth of the opportunities provided by ICT.

The first stage, which can be mostly regarded as the first connection between companies and ICT, is called **electronic presence** when companies use information and communication technology solely for marketing purposes (publishing corporate information, information on products and services, product brochures, publishing list of services and prices, online product marketing and job advertisements.)

In the second stage, companies use ICT for **bidirectional communication**. They realize bidirectional communication and commercial cooperation with their buyers, suppliers and business partners.

Companies start advertising and applying information and communication technology as a sales or **distribution channel** in the third stage. ICT manufacturers and suppliers have been the first to use information and communication technology for this purpose among the traditional economic actors. The first part of this third stage is when the transaction takes place in a traditional off-line way with the exception of placing orders, while in the second part of this stage; this channel is also used for payment transactions. With the expansion of online payment systems, the whole transaction can be performed through the network. In the case of products that can be distributed electronically, their delivery also happens by using information and communication technology.

In the fourth development stage there is an intermediary between business partners: they are connected and organized into a community by **electronic marketplaces**. E-marketplaces eliminate the majority of traditional intermediaries. Their great advantage is that they integrate a great number of partners by linking many buyers and sellers.

The fifth stage is the interconnection of electronic marketplaces when these virtual marketplaces are organized into networks. This stage allows a sudden increase in the number of commercial partners.

3.2 The macroeconomic context

Despite its fast expansion and more widespread usage, the effect of information and communication technology on productivity was negligible in the 1980s and in the beginning of the 1990s. Later, more and more studies were published arguing that information and communication technology contribute to the growth of productivity.

The effects of **ICT** on economic growth got into the centre of interest due to the technological revolution taking place in the US in the second half of the 1990s. The previous international productivity trends were altered in the period 1996-2000. The pace of productivity growth, which is defined by production per worker or rather production per labour hour, accelerated in the US and, in contrast to the previous decades, exceeded the growth dynamism of the European Union including its economic and monetary union. With the bursting of the dotcom bubble (the dramatic decrease in the value of blue chip stocks), the analysis of the macro- and microeconomic effects of ICT was overshadowed. Part of the reason of this moderate attention was that considerable excess capacity had become available in the blue chip sector and the real economy needed some time to make use of it. In the period of the recession, or rather of the low growth of GDP, following the bursting of the technological bubble, companies were forced to cut back on their investments in information and communication technology. The acceleration of the growth of productivity made the pace of GDP growth more dynamic as well.

According to the **European Committee**'s report, the macroeconomic effects of information and communication technology predominate in four channels, having an influence on economic growth and productivity.

1. The **production of information and communication technologies** is inseparable from rapid technological development,
2. The **investment channel**, that is, the growth of production potential by accumulating information and communication technology capital,
3. The possible **production externalities** (network externalities, network of external economic effects) connected to information and communication technology,
4. The increased demand for information and communication technology may intensify the demand for other types of labour force and capital. However, it must be taken into consideration that ICT is a substitution for other outputs, and the application of new technologies with the necessary restructuralization leads to tensions in the labour and capital markets.

This is the reason why negative growth effects should be taken into account in the case of the fourth channel, at least in the short and medium term. In many cases, information technology may soften the demand for human resources because ICT products themselves can substitute the living work or embodied human capital used to produce them. The substitution of human resources with information and communication technologies will probably increase in the future as technologies and delivery systems become more mature.

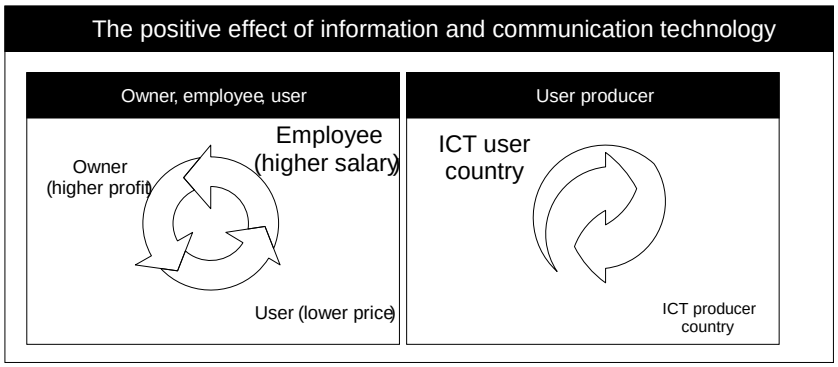


Figure 13 - Groups benefiting from the profit created by information and communication technology

Source: Individual research

In theory, the **owners** of information and communication technologies can benefit from the information revolution by gaining higher profits, **employees** can achieve higher salaries or wages, and **users** can also feel the beneficial effects in the form of lower prices [**Figure 13**]. Based on empirical experiences, profits and salaries showed a modest increase but these changes were slight in comparison to the drop in the relative price of ICT products. This allows us to conclude that the countries employing information technologies benefited slightly more from the information technology revolution than **ICT-producing countries** as part of their profits were lost due to the unfavourable changes in purchasing power parity. It must be noted that salaries and wages paid in the ICT sector are higher in a great number of developing countries manufacturing information technologies than elsewhere.

For the time being, the effect of information technologies is not unambiguous on the geographical location of production in the relation between **centre** and **periphery**. On the one hand, as transaction and communication costs become lower, the flexibility of production comes to the front against economy of scale opportunities, a robust increase in the expansion of economic activities; a kind of deconcentration can be expected. On the other hand, the more precise information available on the changes of consumer preferences, the growing weight of intermediate goods used as inputs in the production of other products, and the **opportunity of outsourcing** certain economic activities to suppliers all make it advantageous for companies to produce close to markets. If outsourcing results in a growing number of new intermediaries providing various partly customized services (accounting, marketing, purchasing etc.), being close to markets is also essential as concerned companies are able to save up more time.

The use of information technology products continues to expand rapidly in the **developed countries** but productivity advantages appear more slowly than in the case of developing countries. Similar to developed nations, the reducing price of information technology products is likely to be the main driving force in the developing world. The use of information technology can be detected in the growth of productivity only if the additional human capital is available, the deregulation of telecommunication infrastructure and information flow takes place and it is possible to eliminate organizational inflexibilities that prevent companies from exploiting the advantages of new technologies and ideas. Although information technologies contribute to raising the standard of

productivity in the developing world, the productivity gap may widen between the developed and developing countries.

The high standard of human capital shows a strong correlation with the adaptation of information technologies. As new technologies usually appear in the form of new equipment, high investment rates accelerate their adaptation.

Finally, a strong connection could be observed between the expansion of information technologies and economic policy. The probability of the expansion of new technologies is higher when economic policies are open to imports and the inflow of foreign working capital.

The rate of Internet users and the number of mobile phones is not necessarily lower in some of the poorest countries than in the countries representing a higher economic development level. This allows us to conclude that there is a strong intention to have access to information technologies and international knowledge networks even in the poorer countries. The real question is whether these technologies can be used for accelerating economic growth in those nations.

Information technologies provide attractive opportunities to "by-pass" and exceed out-of-date technologies.

Modern technologies also bring education much faster to a considerably larger number of people than before. With having better access to information and lower transaction costs, people living in the periphery of domestic and international markets can join the mainstream by using up-to-date information technologies. The opportunities of applying information technologies are outstanding in raising productivity, including plants, banks, ports and even governments. These trends are strengthened by continuous innovations and cost reductions.

The effect of information technologies on productivity is not perceptible in the whole developing world. In many cases, the main reasons for this are the lack of adequate complementary human capital, the low responsiveness of the telecommunication sector and a fair amount of inflexibility. Regarding human capital, information technologies may moderate the demand for human resources as IT products themselves substitute the living labour needed to manufacture them. At the same time, the need for complementary human capital in information technologies can be significant, especially in the field of business and government applications.

3.3 The microeconomic context

The growing effects of information and communication technology should have to appear most dynamically at the level of microeconomy. These microeconomic effects are the following:

1. Companies using Information and communication technology efficiently increase their market share at those company’s expenses that increase their productivity more slowly.
2. ICT make companies able to **extend their supply**, meet with users' demands regarding offered services and in general faster and more efficient conformation to demand.
3. Information and communication technologies **moderate the efficiency problems** of capital and labour, e.g. through decreasing stocks.
4. ICT diminishes **transaction cost**s considerably in the production and the distribution of goods and services, especially where transaction costs are high both in absolute terms and total costs. Diminishing transaction costs allows companies to take steps or pursue new kinds of activities that they would not do or would have to do, for example outsourcing. Due

to this, supply and demand can meet in a more efficient way. Therefore it is possible to penetrate into markets, where there was no chance for it earlier. Furthermore, it lessens communication costs, allowing enterprises to take part in the supply chain, satisfy users' demands and increase internal efficiency.

5. Information and communication technology influences not only the structure of workplaces but also the process of supply and choosing a regional site. By lessening ICT costs, sometimes posing serious difficulties for transactions between countries, it is possible to increase **international trade** potentially, moderate the importance of domestic markets, stimulate international financial transactions and make technology transfer easier.
6. ICT has a disproportionate influence on business performance by giving the opportunity for **innovation**s *(*new processes and structures). In summary, using information and communication technology results in cutting costs and improving the quality of products.

Some of the above mentioned effects are deepened by network impacts. Network impacts appear both in and between certain companies and make possible for new type of cooperating forms to come. Network impacts are much more evident at a sectorial level and not at the level of individual companies. Some of the above mentioned impacts are network impact as well, e.g. cutting transaction costs. Stocking costs can be cut by using ICT, and help better integration between companies in the supply chain.

Lately from investing in **ICT** important corporate-level advantages have been taken, especially for companies wanted to maximize connected adaptations and innovative benefits in their organizations.

Economic advantages derived from investing in information and communication technology (capital deepening) are the sum of all the benefits of better productivity at a corporate level and network benefits make innovation faster and costs lower. Reviewed studies show that it is more complicated to determine the industrial effects of ICT in numbers, than its national effects. It might really not reveal different network impacts at certain corporate-level directly, but indirectly. Impacts of ICT at a company level can hardly be measured, while at the level of the national economy many a little makes a mickle, in other words it can be considerable.

The number of studies examining the microeconomic effects of ICT in international comparison is not significant. It is because information makes it possible are not really available, even at the level of certain countries effects were examined by studies based on empirical data bases. This situation has changed recently, an international database is going to be available thanks to the statistical collaboration in OECD.

Results of empirical researchers examined how ICT influence productivity of a corporation were quite controversial. Especially in the nineties, a lot of corporation research could not demonstrate any connection between the growing use of ICT and the rising rate of corporational productivity. This was called **productivity paradox**. One of its explanation is that the advantages of ICT (more precisely its quality-mark and impacts) were not appeared in productivity statistics, especially not in the service sector.

The other explanation is that the **diffusion of key technologies** and hereby the development of network impacts is relatively slow. Development needs more time than it was expected before, because for using them necessary changes has to be made in the organization system of a

corporation and in the qualification of labour, etc. So it is suggested that more time is needed to explore and make use of the effective business processes facilitated by ICT.

Other impacts were established by researches, for example a lot of companies using ICT pay higher wages. On the other hand, using ICT doesn't mean any guarantee for success at all. The performance of companies using information and communication technology in a more extensive way was already more favourable than the average earlier.

Taking advantage of the potentials offered by ICT is only possible for companies that can change their products and production process at the same time. On the other hand, the advantages of ICT depend on sector-specified impacts and are not enforced equally in every economic sector.

The conclusion of the reviewed literature is that relative labour productivity grew in the fastest way where ICT was integrated and combined in different stages of the production process.

The **role of network impacts** and network cooperation in the course of making capital of possibilities made by investing in ICT has a great importance. The expansion of using the Internet makes it even faster. The Internet helped many services to join the trade in a larger scale than before.

The **network externalities** characterizing communication networks make it probable that the bigger the impact of ICT, the faster it is spreading through the economy and the society.

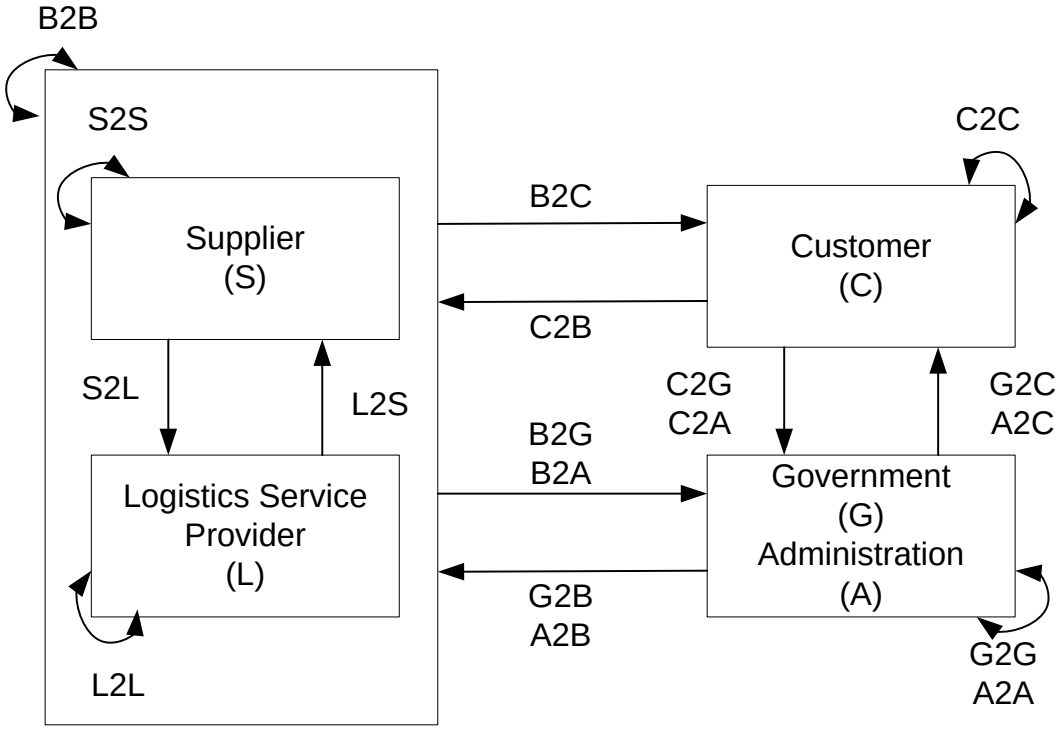


Figure 14 - Communication networks and electronic trade channels between several economic actors

Source: Individual research

The impacts of networks were examined on **B2B** (**business to business**) in Germany. The more companies use B2B in a sector, the more companies left out are forced to join the network. Not so the e-sales as e-supply made company competitiveness better.

The most important elements determining investments in ICT are the following:

1. direct costs of information and communication technology,

2. the costs and limits of the environmental factors determining the spreading potential of **ICT** (human resources, necessary changes in organization and other elements),
3. risk and uncertainty – elements regarding the safe and secure ways of online payment, transport and guarantees,
4. field of activity of a company – some sectors has more, some has less capability of integrating information and communication technology,
5. intensity of competition in a certain sector – in a competitive sector enterprises invest ICT sooner; while the more intense competition within the ICT sector cuts costs and helps it to spread as well,
6. ICT and organization capital (new work methods, the modernization of company processes) are necessary supplementary elements for each other, they cannot be separated.

Especially bigger EU companies use **ERP** (**Enterprise Resource Planning**) and e-supply.
E-business services are used more often by sectors having higher knowledge or higher intensity of ICT. Integrating them definitely needs further investments in softwares and trainings. Additional organizational changes influence the whole organization/system; organization plan, job description, responsibilities, liability questions and last but not least organizational culture.
Quantitative analyses showed that ERP or e-supply were in positive correlation with rising productivity. On the other hand, it was not possible to find a stable correlation between growing productivity of certain sectors and other e-economic applications (**SCM**, **Supply Chain Management** and **CRM**, **Customer Service Executive**). Essays about those enterprises using ERP found out some reasons which lead to the failure of projects: because of missing reforms, weak project management, inadequate training and underplanning of the time needed.

3.3.1. Adaptable techniques for preparing IT and ICT investment decisions

ICT became an inseparable part in the life of enterprises, so this kind of integration is going to be more tense in the future and to operate it is necessary to consider several aspects:

- ICT is becoming more and more important, actually its services have become indispensable,
- Costs of ICT are higher and higher,
- As the expansion of ICT knowledge is very fast, the demands of users became more sophisticated as well,
- The connection between information providers and users turns into a seller-buyer relationship, in which the most important thing is quality.

There can be several solutions for everyday problems, which are the following, based on the summary written by **Szabó Z.**:

1. Buying more equipment, in this way problems can be solved by extensive growth. However, it is wasteful and it is not sure whether it leads to success,
2. Revising troubles precipitately (fire-fighting) - although in the long run it does not bring adequate results,
3. Observing what is happening and hammer out a formal solution as soon as possible, it means to work out an organized management approach. Of course it is crucial to build a new ICT system or to change and update the one that has already been installed.

The above-mentioned approaches show clearly that investments in ICT became an indispensable part of business life. It doesn't matter if it is a system for supporting a company's business processes or an operation system of a non-profit company because every organization needs information.

As all investments, it is also for a long run and has a deep impact for the present activities of an enterprise and for its future possibilities as well. An integrated corporate management system sets the confine of a company's business processes for even 8 to 10 years. But a simple investment seems to be as simple as buying new computers or office system also raise several questions to think of.

The way of creating an information system and the system-planning/organizing itself are qualified as an investment in financial sense. It means that examining the possible impacts of the system, considering all concerned, planning processes are needed to be done in the same way as in the case of any other investment. Accordingly, it is so frequent to appraise ICT investments with the method used in case of other investments. In this case significant difficulties might be rising: to measure the „outgoing side" of an ICT system is methodologically pending and also to estimate costs is not as easy as it seems at first sight.

3.3.1.1 Calculation of Return of Investment (ROI)

ROI methods are used in case of classical investments (buildings, machineries) to analyze capital investments. The simplest explanation is that net profit is expressed in percent of invested capital. If it is a planned investment, quotient is used for comparing variations. In the case of a more complex investment, various similar schemes can be made, where every part appearing in the system as a surplus capacity should be taken into consideration [**Figure 15**].

The cost analysis scheme of ICT investments

Development costs	Continuous costs
Development efforts New hardware New, purchased software New hardwar Other	Maintenance and development of user softwares Cost of additional data storage Additional demand for communication User training and education Additional services Other

Figure 15 - The cost analysis scheme of ICT investments

Source: ***Dobay P.****: Vállalati információmenedzsment (Corporate information management), 1997*

Not only costs but benefits need to be indicated: plus incomes and decrease of operational costs as well. Based on these, yearly net cash flow can be counted and to correlate it with investment costs we get ROI.

This relatively simple method of correlating costs and profits is good for expressing aims, relation of budget and business efficiency in numbers and show to the owners what is happening with their money.
The biggest disadvantage of this method is not to consider the directly or indirectly facts turn out in IT investing in force. Besides this, it can be hardly used in the case of projects, where impact of investing primarily effects the whole or some part of the organization not only the certain division.

3.3.1.2 Cost-benefits analysis (CBA)

By means of it more detailed cost analysis can be made, as it makes possible to consider certain elements that cannot be quantified. These elements can be: rate of speed, accuracy, safety, solidity, better information supply.
CBA's has gained upon from the 60's (in case of several IT investments as well), as it made possible to consider certain not quantifiable factors and uncertain elements too, so meant great help for choosing among different alternatives. Discounted cash flow calculation has to be made regarding life-span of the proposed system, considering expected inflation and rate of interest. We can consider several indexes in financial calculations: net present value, internal rate of return, refund period.
At the same time regular **CBA** cannot be used efficiently in several cases:

- there is not „investment" made, but there are a lot of small „acquisitions",
- impacts of established systems cannot be realized in an observable division or specific activity but in the operation of enterprise,
- operated parts of the system are integrated in a process, so impacts can't be isolated from each other,
- Increasing range of factors cannot be quantified (advantages and disadvantages).

To evaluate ICT investments we have to consider that CBA's has a very important restriction: they are not able to process/consider those complex changes take place in the enterprise and influenced by the information system. Though demonstrable profit-increasing comes off for the corporation under the system, but appreciated possibilities can be the followings as well: enterprise renews its supply by the system, enters into new markets, discovers strategic chances have not used before.

3.3.1.3 Total Cost of Ownership (TCO)

TCO-model was created by GartnerGroup in the beginning of the 90's, which is an excellent method for monitoring ICT infrastructure and for analysing direct and indirect costs of possessed and used softwares and hardwares. TCO considers all the emerging costs during the lifetime of the system, so the enterprise can define easier all the costs of the investment.
Of course **GartnerGroup** did not create a model that can be used for every case, but it made a scheme that can be used for analysing certain ICT fields by the enterprise.
A research – made by several of hundreds of financial and IT managers – showed that one of twenty-five financial decision-makers considers that the bigger part of ICT investment's costs arise after initation. Against this most of them focus on controlling ICT investment's costs instead of costs arisen after initation.
According to researches of GartnerGroup distribution of emerging costs during the lifetime of a system was basically changed by growing networks, intranet and extranet systems. Acquisition

costs of hardware for data centers or single desktops make about 50% of the total cost, service costs are only 28% of them. The service costs of client-server systems reach 77% of the total costs. In the case of network workstations, acquisition of hardwares and servers make only 20% of the emerging costs during appliance's lifetime. To define and follow up exactly the costs of ICT is a challenge because it means that a lot of costs can be different in several TCO-models, different divisions can pay the same cost and presence of some of the costs is not really obvious. Furthermore, accounting-mechanisms used by enterprises usually are able to record identifiable and hidden costs. Any of these make difficult for enterprises thinking of introducing TCO to choose the applicable model and define costs to be followed as well. Actually every TCO-model has references worthy of considering and developing such model practically to meet requirements of IT environment and supported processes. Introducing and using TCO consistently, we can achieve such basic information as the following:

- present and future costs and resources need to establish, maintain and support computer environment (to meet users and business requirements by this),
- to make established decisions on behalf of maximal operational efficiency in the field of labour policy, network supporting and training,
- to appraise alternatives for purchasing, maintaining and supporting these fields,
- to make achievable plans and calculations which help to introduce chosen alternative.

Regular updating of basic information means a help for the management to measure continuously the efficiency of computer environment. TCO-model by GartnerGroup makes possible to compartmentalize costs that becomes able to simulate and analyse in a reliable and particular way. It is not possible to compare and make conclusions without consistent cost-categories in the course of compartmentalizing costs in different groups. Cost calculation of **ICT** includes analysis of regular costs (e.g. investment, labour, expenses of consultancy, activities, subcontractors) and hardly definable and measureable indirect costs (supporting collaborator and themselves, downtime) as well.

TCO model uses two main categories for systematizing costs:

- **Direct cost**s: investment costs, fees and labour payments spend by computer division or those business unit provide information services or solutions for the enterprise and users. Costs include costs of the hardwares and softwares and costs of information financing and labours and also management and supporting fees arisen by subcontractors.
- **Indirect cost**s: it measures the efficiency as information provider provide expected services for end users. If information services solutions are efficient, user does not need to be supported by fellow worker or itself and downtime decreases. But if it is not, of course it increases. At most of enterprises these costs remain hidden, they are not measured and followed. Because of it, if the enterprise starts to cut their direct costs, end users would be charged unconsciously by it.

The following main categories can be separated in the TCO model by GartnerGroup:

- **Direct cost**s: measures direct payments of ICT (capital, labour, fees)

- **Hardware and software**: hardware and software investments and renting fees of hardwares, if they connect to the shared computer assets of enterprise (including servers, client machines – mobile and desktops – periphery and network)
- **Actuation**: direct labour expenses, costs of activities, subcontractor's fees used by information provider at the level of division, business unit or enterprise to give technical support and make infrastructural procedure for user.
- **Administration**: direct labour costs, costs of activities, subcontractor's fees arisen by supporting informational service operations (supervising management, financing, purchasing and training)

– **Indirect cost**: rating the efficiency of informational service's capital and labour payments through having effect on the users. Measuring it happens through efficiency loss of users' activities and downtimes.
  - **Users' activities**: it is a cost of users' supporting each other and themselves instead of letting official information support them. It includes support the collaborator and themselves, official training of users, non-official training, self-development and modification of applications, local file maintenance and the use of the computer in a non-officially way (e.g. to play, use internet) .
  - **Downtime**: lost productivity comes from the planned or not planned unavailability of a network, system and application. Its measurement happens by the wage for the lost time.

GartnerGroup defined the method to be followed needs for cutting TCO costs. Necessary elements were compartmentalized in three groups: innovation of technology, process and qualification. Enterprises using it can decrease costs arisen during the lifetime of information services efficiently if they make investments complement each other: train their workers, update processes and introduce technology, which can be managed, amended and supported easily. Based on some studies using this skill costs can be increased with 30-40%, let alone greater operability and satisfaction of users.

In the practise of TCO all the innovations can be realized at three wider level (basic, intermediate and advanced) and defines those cost-categories are influenced by innovations.

So we can state about TCO-models, that they mean a very important step forward compared to regular investment-return analysises, as all of those elements are considered during making decisions can cause payment in the lifetime of certain application. Within the confines of it, costs of several factors (especially indirect costs) can be used as a decision criteria has been described with a sort of quality category so far.

This method is exceedingly suitable for finding those hidden costs by comparing alternatives or analysing operating system, which presence is not necessary, so to abolish them the result of the enterprise can be increased.

At the same time it needs to be noted that this method has a lot of disadvantages. The first and the most important that it counts only with costs but not the result made by the application. It means difficulty that most of the cases it is very hard to find out who made the certain cost, so this way it is not perfectly suitable for managing the enterprise. The most important parameters of TCO are the following [**Figure 16**]:

Advantages of TCO	Disadvantages of TCO
Primarily used for purchase decisions It accounts for the whole life-cycle of a(n ICT) device It applies whole life-cycle costing Simple data collection and administration It uses categories based on resources Widely-used (especially abroad)	Cannot be used for controlling and management There are no added productivity units There are no added cost drivers Not flexible, cannot be changed It has various interpretations It needs additional administration

Figure 16 - Summarizing evaluation of the TCO model

*Source: **Very Z.**: Az informatikai controlling (IT-Control), 2001*

It is a very important viewpoint that TCO has several explanations, because after GartnerGroup a lot of enterprises made their own TCO-models and connected analysis application. The point all of these that it examines emerging costs during lifetime of investment (or in some cases the profit of it). After this, the manager should be almost omniscient if he is going to be able to choose the most suitable model.

Furthermore, I would like to draw your attention to another limitation of this method. The method itself is not capable of being the one and only base for a decision in case of an investment or innovation. The cause of it is that it does not really care for the strategy of the enterprise and its business procedure and demands, thus it does not define a potential or operating application to be accepted or denied. It's worth mentioning that before setting up ICT (especially if the motivation for investing is not the result of an elemental development but it is ad hoc connected to a tender or a financial subsidy), most of the customers do not know exactly what kind of operational costs they should calculate with.

To analyse ICT investment alternatives, a complex method need to be used by all, which includes examination of costs as well of course.

3.3.1.4 Rapid Economic Justification (REJ) and the Business Environmental/Economic Impact Statement (BEIS)

REJ is an attempt made by **Microsoft** and **Intellectual Arbitrage** to develop a better balanced approach for examining and developing ICT projects as it was before. REJ offers the possibility of assessment's balance against those cost-models (eg. TCO) dealing with only the cost side of a project. Opposing to only cost-oriented models, REJ examines costs and profits at the same time in context of the whole enterprise. REJ focuses the datas and procedures of economic analyses in a chain of steps considerably executable quickly and offers a well-defined output and recommended implementation technique for or to each of them.

BEIS and **REJ** developed side by side. This method contains more detailed methodological datas and techniques. BEIS includes several ways of solutions, methods and techniques regarding the methodology and against it; REJ is a potential solution itself. BEIS makes possible to analyse in a more radical way and to analyze the connection between statistical correlations and business

strategies. To use different application but REJ needs more time and effort and not recommended for enterprises has no expert in working out IT feasibility studies.

Basic parts of REJ

The aim of the **REJ framework** is to help the quantification and the evaluation of planned ICT investments. With the help of this method, evaluating IT investments can be assured in the scope of limits defined by very important business exercises for the enterprise. REJ refers to these business exercises as critical success factor (**Critical Success Factor**, **CSF**).
The method is suitable for evaluating investments one by one, including specific technologies and products as well. The framework can be used with other analysing methods, eg. IT-portfolio management, **Balanced Scorecard** and with different methods analyzing emerging costs during lifetimes.
To make a REJ study has three steps:

- To define the roles and responsibilities in a team: the most important part of making a team is having a group of stakeholders from several different specialties to make the best ICT investment decision. This approach gathers economic, IT and financial specialists, so investment decision can be examined from different point of views.
- Preparations for making the business study. (to define a policy to follow and based on it study can be demonstrated for IT and financial management) The aim of REJ is making a study helps for the management to understand better the value of investment in dispute. It is specially important as investments are competitors of other projects of the enterprise. The final aim of the study is to assign observations of the team and to show how the sketched solution meets the business requirements and to determine the expected financing profit of the solution.
- The process of making the study (techniques and aids for examination): REJ helps IT managers to connect information regarding technological decisions with the business procedures important for the enterprise. The method combines parts of strategies used for evaluating popular IT investments with the parts of Microsoft Solution Framework (MSF) to make a quick and efficient process for evaluating IT and investment decisions.

Model of a REJ project

The process consists of 5 well separated steps:

1. **Assessment of the business situation**: the REJ team starts work with defining the fields important for stakeholders. Like this the team is going to be able to harmonize decisions with the critical fields of the enterprise. This harmonizing activity ensures to work out REJ study quickly as the team focuses only on those factors that are really significant to reach their appointed aims.
2. To **define the solution**: having finished the examination of the business situation the team defines those activities connecting the most to the CSF of the enterprise. It makes possible for the team to define the solution based on how it helps to develop critical business activities.

3. **Estimation of p&l**: having defined solution to be made, the next step is to estimate potential profits such as emerging costs during the procedure of realizing it. These factors are defined based on the regular cash-flow planning.
4. To **define risks**: as all the factors cannot be realized in the beginning of the project, so none of the investments can avoid risk. In this period the team tries to identify and quantify the obscure fields of the project.
5. **Calculation of financing key performance indicators**: based on cash-flow calculations were modified by risks and timefactor results is going to be expressed with the financial indicators as well used by the enterprise. After collecting and analysing all the information the team is making the study, which features the technological investment that meets business demands.

The first step: to define business situation

The first step of REJ is to explore the important fields of the business. The aim is that the ICT investment decision has to be in line with the general aim of the enterprise. In the course of it the team reviews business plans, strategic plans, supply-chain calculations and makes interview with the stakeholders.

The team identifies:

- CSF of the enterprise,
- Strategies of the enterprise to reach CSF hopefully,
- Those key performance indicators (KPI) with the enterprise measures success.

Conclusion are fixed in a so called „alignment-chart". In this chart it is shown that what kind of critical success factors are elemental for stakeholders and for achieving it what kind of strategy they follow and what kind of indicators are used for examining its fulfilment.

Second step: define an ICT solution

The team determines how every single activity assessed in the first period can be developed by ICT. Then required enable (RE) is going to be defined for every activity can make profit of IT and ICT support. RE is a technological possibility or capability ensures the execution of expected activity. If it meets the capability of the solution, the solution gives value to the activity. The team makes a „value-report" in every single case like this. The team can use cause and effect analysis to determine factors can be connected to certain activities.

Summing up the results an activity chart comes off, in which every single activity is defined. These are the followings: present status and status to reach, necessary technological conditions and connected value report and the actual technological capability of planned solution.

The end of this period value-reports can be conciliated with stakeholders if these are acceptable for them. They can choose the most important values for the enterprise.

Third step: estimation of profit and costs

The investment decision bases on how the solution meets the needs of the enterprise. In case of a profit-oriented enterprise the base of the decision is how much cash or asset will be earned by the solution and they usually examine how much money will be saved by introducing the new solution. In this period the team calculate profit and loss reached by introduction and make a cash-flow report for the top management to define relative value of investment by it.

The easier task for IT managers how to follow and measure costs (eg. with the help of models like TCO). Against it to measure IT profit can cause serious problems. Traditionally it means labour cost savings by introducing the solution. This way of approach does not give exact picture in case of certain group of users e.g. knowledge workers, so severe further indicators are worthy to consider:

- the time knowledge workers can use for production is increasing,
- cycle time is decreasing,
- used active capital is decreasing,
- supporting and infrastructural costs are decreasing,
- uncertainty and risk is decreasing regarding the final aim.

The team reviews all of the value-reports and examines how can it be modified for measurable profit for the enterprise. There are a lot of possibility to estimate IT and CT costs. Eg. PCM-model of MetaGroup or TCO Analyst or TCO Manager Systems of GartnerGroup. This step of the analysis ensures the calculation of the investment and continuous operating cash flows (expenses) in useful lifetime of the solution. The advantage of these applications is also that makes possible to compare the cost of the enterprise with the cost rate of certain industries.

After the team identified costs and profits, they make a previous cash-flow report of the project, which is going to be the base of investment analysis. In the end of the procedure they finalize the alignment-chart of the planned solution (from the first step), value-reports and cash-flow reports.

Fourth step: identification of the risks

Risk-management is the part of the life, as in the beginning of the project we are not able to realize every factors. In this period the team identifies those important fields where we can count uncertainty with.

The following risk categories can be separated:

- **Risk of alignment**: the better is the alignment, the lower is the risk. However in case of certain developments it is hard to measure conformity (eg. development of infrastructure), but it is necessary, because without it future conformity is not possible.
- **Risk of realization**: the chance of the costs of realization are diverging from the planned cost.
- **Operating risk**: the chance of the operating costs are diverging from the planned ones.
- **Risk of solution**: the more we learn about the solution and its impacts, the lower is the risk. At the same time low-risk projects do not always give the chance for great profit. Risks connect to the technology can be handled as a part of the risk of the solution.

- **Risk of the profit**: the chance of not estimating appropriately prospective profits or an unexpected financial situation happens/comes. E.g. If the enterprise has to pay bigger capital cost as it was planned or any other fields need for more attention by the enterprise, planned incomes can not be achieved.

The risk-management of REJ was developed to focus on those fields, where the risk seems to be high. The team uses risk-management chart to identify potential risks. It describes all of the categories with points 1-5, besides the team makes risk report for every high-risk factors, estimates its chances and the impacts of its having effect on the solution.
After measuring risks, it is necessary to decide how to report them: one of the possible solution is modifying cash-flow report or putting risk factors and its estimated importance in a chart.

Fifth step: composing financial indicators

The closing step of REJ is compiling the study. The study has to contain all the information that helps management to make an investment decision. After calculating all indicators, the study is going to be appear in two forms (demonstration and text document).
The capability of profitability and return (ROI) can be described with useful indicators used by the enterprise. These popular indicators are NPV, IRR and beside them, a lot of other indicators can be used (Economic Value Add – EVA, payback period, Earnings Per Share – EPS). Before the study is made, the indicators we want to use has to be in compliance with the management. As risks can cut revenues and increases costs, the actual NPS and IRR-values can be lowered accordingly. Many of the enterprises count with costs that raise threshold value has to be reached by IRR.

3.3.2 Examination of techniques can be used for preparing ICT investment decisions

In the view of these methods it can be said that no method was found that would help to make investment decisions 'routinelike'. The use of traditional financial indicators – which would be suitable for so called regular investments - has a lot of obstruction and it would be dangerous to base decisions only on them.
TCO-model provided a lot better view for managers of impacts, ICT appealed to the enterprise. With these, the method has severe failures: eg. profits made by IT cannot be defined; it has a lot of contradictory interpretation in severe meanings and does not reflect the appropriation of the enterprise's processes.
The framework of REJ by Microsoft tries to quantify the **impacts of ICT investments** in the way that examines its effects on the enterprise's critical factors. After disclosing the factors leading to business success, a prospective ICT solution needs to be examined in order to see if it is sufficient for the purpose, then estimates costs and profits were made by this. Then risks are going to be quantified and finally the value of a potential solution is going to be expressed in the system of financial indicators used by the enterprise.
This kind of REJ analysis gives proper picture of the relation between the enterprise and the potential ICT solution definitely, but the success of the solution depends on the knowledge of experts taking part in the analyst group. The method (and all similar methods) provides only the support with the help of hopefully all potential factors can be realized, but only in that case if they

learnt newly and specific way of thinking can be found in the methods and they are really looking for the best solution for the enterprise and do not represent some external interest.

Chapter 4 The quantification of ICT development

In the beginning of the 20th century, the measure of economical and social changes were defined by quantity-indicators of produced materials, in which quantity of tons of coal or steel production were prevailed. Around in the middle of the turn of the century energy consumption, produced kwh of electricity, quantity of used fuels and numbers of kilometres are done by aviation and train service became significant. Nowadays, economy and society in the age of information base on results of production chain (information-knowledge-acquaintance), the motor of processes is handling structured knowledge and communication.

Quantifying and measuring of differences of the information society's different parts raise similar problems like the question of the concept's definition itself. Our main problem is defining information society in any other way, then we also have to measure in a different way maybe with different variables and methods. It follows that the topic contains wide range of measurable variables: several explaining variables can be listed from infrastructural parts measured in the most easiest way through knowledge-part can be measured a bit harder till hardly tangible willingness for using information. That is why most of the studies work with groups of variables and complex indexes as there is no one-dimension indicator can be measured simply and could be considered as an own one by any of the information societies.

At the same time we cannot consider the measurement of the information society's part as a complex, multi-variables measure development task. The quantification of some of a local social components raises measurement issues. Factors should be measured regarding information society and economy can be divided into two parts: we have to examine measurement opportunity of certain parts and we also have to discover the differences of information technology's development we can get with the help of forming complex variables and using similar complex examination techniques.

Measurement probes are partly helped by using principally and previously-used indicators regarding the economy and the information society as well. But with the appearance of new symptoms in the information society, variables or rather measure factors appeared that had never been used before. Some of them can be easily quantified followed by former measure techniques and samples, but others – these mean the real challange – do not show any commonality with former variables by their nature, so need new kind of measure techniques. Not only the newly appeared phenomena in the economy and the information society can be defined as new issues and challanges but also to define and measure certain special parts within. In case of new and transforming local inequality factors measurement questions are raised by the fact that most of the informant system is able to follow changing of factors only with some delay. This kind of following cannot be considered in every case as a disadvantage. For choosing the appropriate unit and technique needs time: needs time to get known the dissimilar touch of the existing new or transforming factor and to form our new technique deferring to it. In that case if this monitoring period would be too short (we would have almost present, continuously adaptable and varying data publication) we could give a hardly comparable timeline based on our continuously measured datas. As technique of measuring changing factors has already been settled and only small changes need

to be done, in case of new factors we cannot rely on bases like these. In some cases measure problems were not experienced before might be arisen due to the variegation of newly appeared factors and new techniques need to be provided (see also **measurement of content providing**).

In some other cases, though the factor is new to measure, it can be equal to measure factors existing for a long time. Beside this, field researchers need factors to be disassembled into parts, namely for measuring area units. We can realize in case of several factors that surveys do not take this demand into consideration, although there are available information about broader nationwide trends. In case of new factor's measurement the main problem is picking apart areas is too difficult even though the factor itself can be measured easily.

Among the new indicators of the 1990's, the indicator of **PC-supply** is a good example of the case mentioned above. Most of data are not published in area classification or if they are, it happens at a level of extensive aggregation or maybe in an estimated form. In case of this indicator the result of measure technique is difficult area explanation, precisely less reliable area results can be conducted from survey, because of the nature of the technique. Measurement of PC-supply mostly happens in household-statistics survey, which are more irresponsible than a survey of sphere has duty of registration like corporations (market) or state. We have to separate the survey of hardly measured home PCs and PCs for education, trade, government might be measured easier in the indicator of PC-supply. In the case of the aforementioned household-statistics survey techniques and representative ones, in the case of the latter one file-register forms (inventory, accounting) can be used.

There are further factors as well, where household-statistics can be used. Measurement of **mobile-phone availability** follows by the technique of phone, fax, radio or tv substance, but to pick apart local is not really clear. Area level measurement of number of mobile phone subscriptions is absolutely unsolved against measurement of owning television. Hungarian mobile service providers handle the number of subscribers as a trade secret and sometimes publicize only estimated or nationwide datas. If mobile subscriptions become public (like a directory), area identification of subscribers is going to be possible, so to compile territorial data. We have to pay our attention to the fact that one subscriber can have more phones or more person has one (partnercard system) and mostly the real user of the phone is not the subscriber (company phones).

If we can solve these problems, we still have the difficulty of how to define area mobil communication.

Infrastructural factors seem to be more measured ones as society factors. Measurement of **number of computers in network means** less problem as **measurement of them in net-communication**, but it is still not simply to count these PCs. The easiest way of counting the PCs having network connection - as in lot of other cases, in this as well – can be done by compiling a list at institutions (enterprises). Area information can be defined as an information in the headquarters of the institute or enterprise (a more detailed information is possibly insolvable). Network connection of home computers can be got to know by a household survey. To count the number of users is easier. The indicator of **numbers of internet subscribers** can be defined or registered locally easier. We can get the residential and institutional datas from database of internet provider companies.

Following international tendencies, we can find several factors within new ones, which do not act on foregoing measurement exercise. Most of the new factors arising by the increasingly expanding

information society need new monitoring techniques in several elements. Content-service used as an indirect indicator of informational activity and the quantity indicator of **e-commerce** can be counted difficulty. Measurement techniques of these kind of activities have not been worked out yet, so far I have only information from indirect sources and I have estimated data about their measure. Until the concepts themselves like e-commerce, network content, information service is not clearly defined (professionally), their reliable measurement can not be solved either. Initial viable might be the direct measurement of this factors or representative survey or cooperate datacollection which do not offend business secrets.

Sometime in the turn of the millennium within new factors were arisen with information society we can find ones that can have a financial-statistical approach. A long-standing technique is the autonomous evaluation of budget heading, supposing that these are in appropriate dissociation, appropriate contents in the examined budget. In case of incomes and also expenses, new factors can be found, which provide direct or indirect picture of the new ones. By this technique we can get information about hardware and software costs, network costs or incomes of launching ICT products. The functional implementation of it in the public administration and business sphere can be found out from yearly budgets

The practical realization of the survey can be identified from the data of annual budgets in the administrative and business sphere, in the case of the populace it can be deducted by using surveys on expenditure (or consumption) structure. Since the majority of these population-related surveys are representative, that is, not based on the responses of the whole population, the classification of territorial units and the evaluation of survey results should be analysed with certain caution.

It is important to note that the clarification of the measurability of a transforming or newly-appeared factor together with finding answers to the arising methodological questions can only be performed in a separated way.

The measurement of factors generally raises different problems that can only be solved in different ways, therefore unified schemes or scenarios cannot be used for measuring a new factor. It is also important to note that it is not necessary to include all factors in everyday statistical surveys.

4.1 Households and the nation

The primary sources of the official statistics presenting on the development of the information society in the EU are those regularly repeated surveys (sometimes including tens of thousands of respondents that are extended into all member states and, in numerous cases, into the countries waiting for accession). The subject of these surveys is the demand side of the market for infocommunication products and services. Their population consists of households, individuals and business organizations; their methodology is occasionally harmonized by **Eurostat**. In the case of household surveys, one way of harmonization is to publish recommendations on sampling strategies, the content of questionnaires and the definitions of terms and indices included in questionnaires.

Large-sample surveys are complemented by projects in which questionnaires are sent to the governments of the member states in order to get a full review on the expansion of information and communication technologies in institutions such as central government organizations, local governments, education and health institutions. These surveys are carried out by independent

consulting agencies. The review of the development of e-government services in the member states of the EU is based on such surveys.

In Hungary, data on households and the information society are mainly provided by casual surveys that are conducted by several independent organizations serving business, government or scientific needs. The orders for such projects generally come from government institutions or telecommunication companies, while the actual surveys are conducted by universities, consulting, market and polling companies.

Surveys on the population's demand for and attitudes towards information technologies are generally based on a limited number (1000 to 3000) of responding households or individuals.

The topics of the questionnaires included in such surveys are as follows:

1. ICT-availability in households,
2. habits of computer use,
3. habits of Internet use,
4. measurement of the penetration of e-commerce,
5. knowledge needed for using computers and the Internet,
6. yearly household expenses on ICT.

The questionnaires are based on Eurostat's recommendations. The results are published in the following autumn. The results are also used for composing individual indices. With the help of these indices each country is ranked and evaluated.

Numerous surveys are conducted on e-readiness and competitiveness across the globe year after year, comparing as many as 60-180 countries. The strength of e-readiness rankings is given by the fact that its makers are able to evaluate the development of the surveyed countries by using few, well-chosen indices. In most cases, these rankings are made up of complex indices that are composed of subindices. Despite this multidimensional analysis, these rankings are not aimed at giving a detailed analysis of the individual countries.

Mostly predetermined - quantitative and measurable - indices give the basis for the rankings. A part of the analyses almost exclusively puts an emphasis on economic indices by reviewing the development level of infrastructure in the fields relevant for the information economy. In the case of other lists, much more attention is payed to social indices, which means that the social effects of economic and technological changes are also part of the international comparisons and evaluations between countries.

The methods and the international rankings designed for measuring the e-readiness level of a country have lost their popularity recently but they have not disappeared for good. The results of the traditional and longitudinal researcher were available even in 2007 (for instance, **IDC-World Times**: **Information Society Index** (**IDC**); **International Telecommunication Union**: **Digital Access Index** and **Digital Opportunity Index** (**ITU**); **Economist Intelligence Unit** (**EIU**)).

If someone would like to get a more general picture about the e-readiness levels of the countries around the world, it is enough to take a closer look at these three well-known and comprehensive indices mentioned above. However, case studies may be needed to get a more detailed picture.

4.1.1 INFORMATION SOCIETY INDEX (ISI)

From the middle of the 1990's when **ISI** appeared, a lot of changes were taken place. Followed by these changes (especially the technological ones), the original methodology was modified in 2003, so since then several new factors, such as the rate of households having broadband internet access, users of mobile internet, development of softwares and the number of wireless phone subscribers have been calculated in the rank. For calculating the index, computers, telecommunication, WEB and development of social factors are considered.
About the index we can tell that the place in the information society rank mostly correlate with the society and not with computer or internet factors: the higher the score from social factors the more possible for a country to be in a favourable place in the rank.

4.1.2 Digital Access Index

The oldest operating professional union of the world, the **International Telecommunication Union** was founded in 1865, Paris. This union scores the **Digital Access Index**, **DAI**. The first issue of Digital Access was made for the conference of **World Summit on the Information Society** (**WSIS**) in 2003. The list contained 178 countries, but in 2005 there were only 40 countries to be ranked. The index was made for being effective help of comparative international examination for **ICT** access and use. One of the important aims of DAI is helping to eliminate the digital divide. This is the first index based on internationally accepted ICT indicators.
Makers of DAI, in case of its measurement considered not only infrastructural factors but e.g. the level of education or the issue of affordability and these factors were aggregated in between 0 and 1 in order to make a rank.
Four quality categories were made:

- excellent,
- top,
- middle,
- low.

In the course of analysis five components are examined (infrastructure, business environment, consumption and economical adaptation of e-trade, society and cultural environment, legal regulation) and certain aspects are weighted differently at making the final rank.

4.1.3 Digital Opportunity Index

Digital Opportunity Index (**DOI**) was introduced at the World Summit on the Information Society (WSIS) closed in 2005. An action plan accepted in an earlier part of the meeting expressed the need of a comparative methodology that can help to evaluate the performance of certain countries. Consistent examination of the declared aims, the use of compiled indicator-system give opportunity to make comparisons beside evaluation.

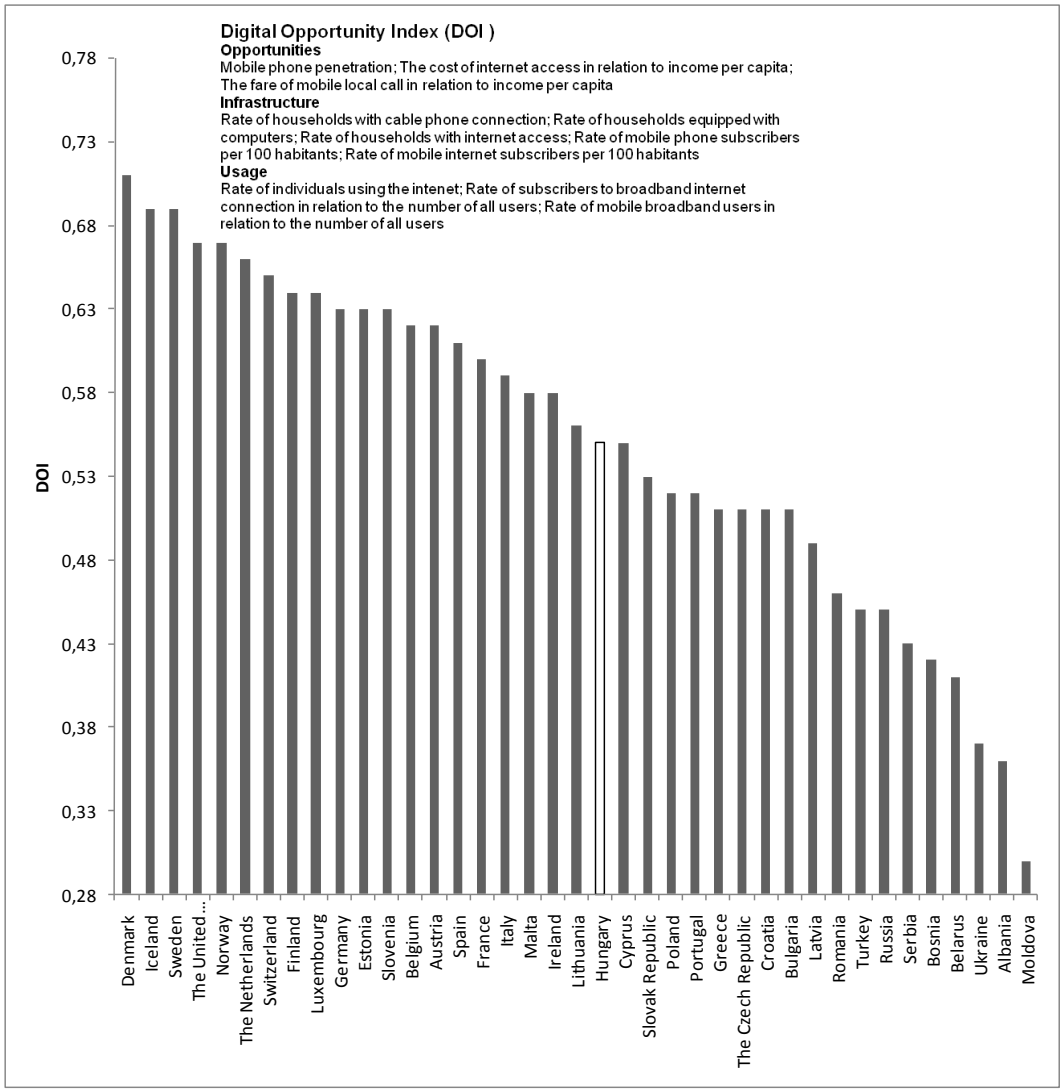


Figure 17 - Country ranking according to the DOI index in Europe in 2005

Source: ITU/KADO Digital Opportunity Platform, 2005

The index contains 11 indicators; as a consequence it can be ranked among less complex indices. Components can be ordered into 3 bigger classes, they examine the use and opportunities beside infrastructure. Comparing the complex indicators and examining the use of opportunities of **ICT** applications, it turns out that DOI is one of the most complex survey, at present data of 180 countries are available.

4.1.4 Economist Intelligence Unit

EIU is the biggest not investment bank like economic forecasting institute of the world. EIU and Pyramid Research analysed the situation and the readiness of 60 countries together at the first time in 2000 for the information age. Countries are compared in 6 categories since the methodological modification in 2001 (connection, economical environment, e-commerce, legal regulation, support of e-services) based on 100 different indicators.

EIU divided the countries into four groups in 2004:

- use ICT daily,
- ICT is developed (quick adaptation of e-services),

- ICT is developing,
- ICT is not developed.

4.1.5 ORBICOM/ITU ICT possibility index

ICT possibility index (**ICT-OI**) alloys economical aspect, rate of labour in the field of ICT-production and social approach, mainly use and share of information and further human factors are involved. Dimension of information density as defined by base network and human factors, while use of information focuses on ICT infrastructure and human factors. A canadian civil organization helped in working out the methodology is called ORBICOM and ITU. Among indices focusing on ICT this one is the most appropriate for drafting long run trends.
The ICT Possibility Index basically came from digitally division's discourses; results of certain countries are compared with the average of 180 countries, the imagined state of Hypothetical, taking part in the survey. Four big groups were created in it, having the most developed, developed, medium and low value of ICT-OI index.

4.1.6 The use of indices

It is important to emphasize that comparing lists can be done very carefully, mainly in case of declaring winners-losers: because of different methods, the primary use of different time frames, different factors and importance the same country can be a winner on one list and loser on the other. It does not really mean error-because list of certain parts of ISI show different ranks, so even among one rank can be differences in the field of certain country's judgement – but it is a proof that the way of measurement is more determinative than the performance of countries.
The determining critics regarding prepare examinations is an insensibility for alternative development. This mainly comes from universal, global methodology, in every county the same technology platforms are examined, though the information society can be based on different infrastructural bases in certain countries. For these factors – can be traced back to cultural ones – the big international comparative examinations are less sensible.

4.1.7 INEXSK examination technique

The name of the international wide technique is an acronym (**INfrastructure, EXperience, Skills, Knowledge**), which refers to the complexity of this technique. It is used for examining the common effect of infrastructure experience, skills and knowledge in the comparative studies on the information society. The process does not yield a one dimensional index, as formerly known or a kind of index but a structural picture can be done in every square-units in the same order.
The aim of the technique is to point to the way that level of infrastructure, experience and skills contribute to knowledge based economical growth and development. The technique aims to give answer the question by specially representing graphic factors can be considered, so the given diagrams are going to be the outgoing results of INEXSK-technique.
The following diagram shows that the technique summarizes the examined factors in a logical system based on each other. The base is the level of infrastructural availability, a factor that shows

how wide or narrow a base can be for the development of skills and experiences. Production and consumption experiences - which are showed up in an indicator brought in the next step –, represent the phase of increase of accumulated knowledge (experts concordantly say that significant part of attained knowledge is built up during production and consumption).

In the third step, indicators of production and consumption skills come up, which are accompanied with firm empirical parts. The last step on the upper part of the diagram is called ideal knowledge indicator is emblematical only and sign the use of knowledge and its development of intensifying on behalf of social and economical development.

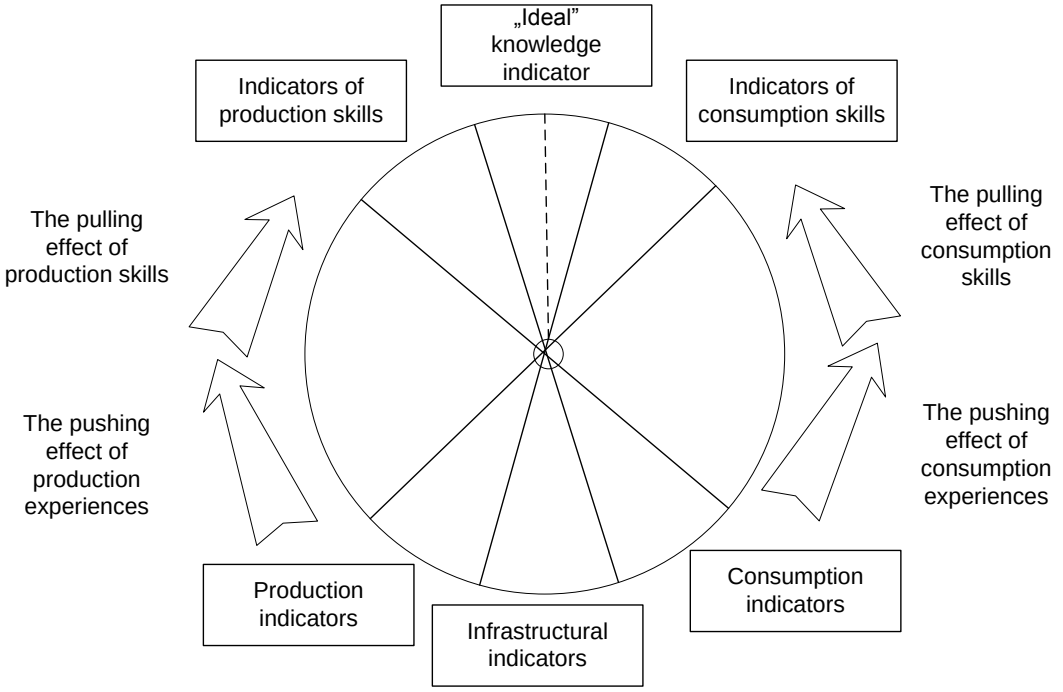


Figure 18 – The dynamic scheme of the structure INEXSK

Source: Mansell R. – Wehn U.: Knowledge Societies: Information Technology for Sustainable Development, http://geogr.elte.hu, 1998

Indicators on the bottom part of the diagram enhance and generally make possible efficient use of factors are on the upper part of the diagram. Its interaction shows that attained production and consumption experiences by new technological application effect on the direction of increasing the attained knowledge (see arrows on the upper part of diagram).

Neither production nor consumption alone, however, will bring infrastructure assets and experience into productive use in the creation of knowledge. This requires `pull' influences from the production or consumption skills, represented by a second set of arrows leading to the skills level. Finally, the diagram has a relatively larger gap between experience and skills indicators than between infrastructure and experience, or skills and knowledge. This gap reflects the difficulty in coordinating the `push' of experience and the `pull' of skills to achieve an effective outcome.

For infrastructure, the traditional measure is the size and growth of the telecommunication network. Telephone networks provide a broad base for building other types of infrastructure, such as data communication networks, but cannot serve as the only indicator of development. Unfortunately, few other indicators are as comprehensive as those associated with telecommunications. Where more detailed information is available, telecommunication indicators can be shown to be reasonably

good proxies for other variables. (For example, where it can be examined, the extent of data networking appears to be consistent with high levels of telephone access.)

To understand the contribution of experience, electronics industry production and demand can be examined. These are indicators of the ICT production capacities of various countries, and of the domestic use and export or import of electronic products. Although production and use of electronics products are only partial measures of the ICT revolution, they do provide insight into the vigour of the social and economic changes that are associated with the process of moving toward greater knowledge use in societies throughout the world.

In examining skills, it is vital to develop measures that indicate the state of readiness to enlarge the use of information to develop knowledge. A principal indicator of such readiness is the literacy level. It is also important to develop measures of the skills that may be harnessed in producing or adapting ICTs. The stock of graduates with technical degrees in engineering, mathematics, and computer science is relevant here.

The chart introduced by Mansell and Wehn brings together indicators from each of the categories, that is, infrastructure, experience, and skills, in a charting technique called the `**ICT footprint**'. The `footprint' technique is developed from the **INEXSK** framework. It can be used to make inter-country comparisons and to benchmark the performance of different regions in preparing for, and participating in, the ICT revolution. It is also a means of organising the thinking about how other measures might be derived and used in the construction of international comparisons and strategic planning studies.

Table 6 - Indicators applied to comprehensive ICT structure surveys

Indicator	**Computation used**	**Country taken as 100**
Personal computer index	Personal computers per capita	New Zealand
Main lines index	Main telephone lines per capita	Sweden
Electronics production index	Share of electronics revenue in GDP	Ireland
Electronics consumption index	Per capita 'consumption' of electronics as a share of GDP per capita	Ireland
Technical Graduates Index	Total graduates per 1,000 population	The Netherlands
Literacy Share	Percentage of population that is literate	None (100% taken as 100)
Internet hosts Index	Internet hosts per 1,000 population	Denmark
Television Set Index	Number of television sets per 100 population	The United Kingdom

Source: Mansell R. – Wehn U.: Knowledge Societies: Information Technology for Sustainable Development, http://geogr.elte.hu, 1998

Eight indicators are chosen based on data availability and their value in provoking thought about different patterns of development in knowledge societies.

Three factors were important in constructing the indices. First, it is desirable to adjust for population in measures of infrastructure and skills. A larger sized country will often have a larger infrastructure or a larger number of skilled individuals, but not necessarily higher levels per inhabitant. All the measures of infrastructure and skills as well as the two measures of `outcome', Internet hosts and television sets, are adjusted for population. Second, in developing an indicator for production and consumption experience it is desirable to measure the relative specialisation of the economy in electronics.

For these measures, the share of electronics in GDP is used to `scale' the size of electronics experience in the total economy. Third, it is desirable to graph different countries on a common scale. Therefore, one country must be chosen as the `extreme' or highest level against which to benchmark the level of other countries. Several of the values for the indicators are very high for a few countries, and it is not desirable to choose the country that is absolutely the largest in the world. This would mean that a great many countries would have very small values on the index. An approach was used to select the country `taken to be 100' in the analysis. The available indicators are particularly deficient for developing and smaller countries. These limitations prevent the comparison of many countries for which useful insights might be developed using this technique. For those desiring to replicate the technique, different indicators might be chosen based upon the availability of data.

4.2 Enterprises and economic sectors

Since May 2004, the Hungarian enterprises have to come through in the market of the EU, which means both a lot of opportunities and a more intense competition. The use of ICT has a significant role in raising competitiveness. It can be observed that the development directed at the usage of ICT have become more emphasized in the life of companies recently. In order to stay alive and maintain their competitiveness, by all means enterprises have to keep pace with the development of information technology.

From the perspective of the development of both the economy and society, it has a great significance that the information technology sector has become a key sector in material and intellectual development. In the Lisbon conference held in March 2000, the leaders of the EU set the aim of reaching the development levels of the US and some Far East economies and transforming Europe into the most competitive knowledge-based economy in the world by 2010. The European Commission determined the principles and objectives needed to accelerate Europe's transition towards a knowledge based economy in the eEurope initiative in 2000, focusing on exploiting the advantages offered by information and communication technologies. In 2002, the original eEurope initiative was reviewed and new targets were incorporated beside the existing ones: wider access to computer networks or extending the number of broadband Internet connections, for instance. The new action plan became known as "eEurope2005", in which guiding principles were provided to the member states.

4.2.1 Eurostat and the Hungarian Central Statistical Office

In order to follow structural changes in the economy, quality statistical data relating to the information society have an utmost importance. The Council of the EU adopted a resolution on the implementation of the eEurope 2005 Action Plan on the 28th of January in 2003, setting the target of improving the quality of data needed for making international comparisons and making data collection more frequent with the intense involvement of **Eurostat** and other national statistical offices. One of the most important steps toward reaching this target was the endorsement of Regulation (EC) No 808/2004 of the Parliament and the Council concerning the Community Statistics on the Information Society, entered into force on the 11th of May in 2004. According to

Article 4 of the Regulation, based on the module of "enterprises and the information society", member states are obliged to transmit the aggregate data required by the indicators determined in Eurostat's model questionnaire on an annual basis.
In Hungary, the use of ICT by enterprises has been surveyed by the Hungarian Central Statistical Office since 2001, enterprises are required to transmit data relating to their ICT usage on an annual basis.
The main points of HCSO's survey on ICT usage are:

- the use of ICT,
- the use of the Internet,
- enterprises having a web site on the Internet,
- sales through computer networks,
- purchases through computer networks,
- applying security facilities,
- data on the number of employed.

4.2.2 The compound indicator introduced by eEurope2005

In order to measure the use of information and communication technology, there was a need for a compound indicator that expresses the characteristics of ICT usage by enterprises in one single figure. The **eEurope2005** Action Plan defined a compound indicator for measuring the ICT development level of enterprises, which can be divided further into two compound indicators.

List of the data required for calculating e-business readiness and ICT adaptation indices:

- Percentage of enterprises that use the Internet,
- Percentage of enterprises that have a web site,
- Percentage of enterprises that use at least two security facilities or applications at the time of the survey,
- Percentage of total number of persons employed using computers in their normal work routine (at least once a week),
- Percentage of enterprises having a broadband connection to the Internet,
- Percentage of enterprises with a **LAN** and using an **intranet** or **extranet**.

List of the data required for measuring ICT usage in business:

- Percentage of enterprises that have purchased products and services via the internet, EDI or any other computer mediated network where these are less than 1% of total purchases,
- Percentage of enterprises that have received orders via the internet, **EDI** or any other computer mediated network where these are less than 1% of total turnover,
- Percentage of enterprises whose IT systems for managing orders or purchases are linked automatically with other internal IT systems,
- Percentage enterprises whose IT systems are linked automatically to IT systems of suppliers or customers outside their enterprise group,

- Percentage of enterprises with Internet access using the internet for banking and financial services,
- Percentage of enterprises that have sold products to other enterprises via a presence on specialised internet market places.

The disadvantage of this compound indicator is that there are not always available data or measured frequency on every case.

4.2.3 The compound indicator introduced by GKIeNET Ltd.

Having the compound indicator defined by eEurope2005 as a guideline, **GKIeNET** Internet Research and Consulting Ltd. produced a new compound indicator, which, based on the available data, can be used as a more accurate indicator of the ICT development level of the Hungarian business sector. The defined indicator (ICT development index) is a simple arithmetic average of the three composing indices in which the sub-indices are also composed of the simple arithmetic averages of other indicators expressed in percentage.

1. Business ICT Access Index

- Percentage of enterprises using the Internet,
- Percentage of enterprises having and maintaining a web site,
- Percentage of enterprises having a broadband connection to the Internet,
- Percentage of enterprises with a **Local Area Network**,
- Percentage of enterprises having a server,
- Percentage of enterprises having an integrated Enterprise Resource Planning system.

2. Business ICT Usage Index

- Percentage of total number of persons employed using computers in their normal work routine (at least once a week),
- Percentage of total number of persons employed using the Internet in their normal work routine (at least once a week),
- Percentage of enterprises having a web site updated at least once a week,
- Percentage of company web sites containing product details and price lists,
- Percentage of enterprises with Internet access using banking and financial services via the Internet.

3. E-commerce Index

- Percentage enterprises whose IT systems are linked automatically to IT systems of suppliers or customers outside their enterprise group,
- Percentage of enterprises whose IT systems for managing orders or purchases are linked automatically with other internal IT systems,
- Percentage of enterprises that have purchased products and services via the internet, EDI or any other computer mediated network,

- Percentage of enterprises that have received orders via the internet, EDI or any other computer mediated network,
- Percentage of online purchases in percentage of total purchases,
- Percentage of online sales in percentage of total sales.

This compound indicator also has a shortcoming as there are not always available data for calculating the sub-indices mentioned above.

4.2.4 Other data sources

Following the resolution of the Hungarian government, the Ministry of Informatics and Communications together with the Information Society Coordinating Committee worked out the **Hungarian Information Society Strategy** (**HISS**), after organizing intense professional and social debates. This national strategy defines the vision, plans and actions through which Hungary will take the path of a new development and modernisation. The strategy intends to achieve the development of a knowledge-based economy and a modern information society in Hungary, on both state and local levels, within ten years. The HISS systematizes the tasks by determining the fields where action needs to be taken; it designates the key areas within them, determining the tasks to be jointly performed by the various participants. It has six key objectives: enter the age of information, as intensely and innovatively as possible; provide a comprehensive vision for the construction of a knowledge-based economy and an information society; promote the growth of competitiveness and successfulness of the Hungarian economy; demonstrate that information and communication technologies are not mere opportunities but effective tools; have a long-term plan and programme for the development of the information society, approved by the Government and reflecting the adoption of European values; provide guiding principles and an organisational framework for designing coordinated plans and operative programmes for developing the information society.

Table 7 - Fields of operation and main directions outlined by The Hungarian Information Society Strategy

Field of operation	Main direction	Field of operation	Main direction
Electronic content and services	Economy	Infrastructure	Access
	Public administration		Infrastructural services
	Culture	Knowledge and learning	Knowledge and learning
	Education	Legal and social environment	Legal and social environment
	Health care	Research and development	Research and development
	Environment protection	Equality of Chances	Equality of Chances
Infrastructure	Broadband infrastructure		

Source: Indikátorok a MITS monitoringjához (Indicators for monitoring HISS), 2004

For performing this or any other research, the data provided by Eurostat are not enough, further quantitative and qualitative empirical studies are needed. This applies to studies on households as well.

The **quantitative** approach can be applied successfully in those fields where collecting and aggregating a great deal of data or sets of data is possible by conducting statistical surveys or by using questionnaires.
Qualitative methods are generally directed at gaining deeper and more insightful knowledge, data collection is done by using a relatively smaller sample. These qualitative results cannot be measured or quantified. Qualitative surveys can be applied successfully in cases when the motives and driving forces of behavioural patterns are examined.

Table 8 - Comparison of qualitative and quantitative research approache

Designation	Qualitative research	Quantitative research
Aim	understanding the motives and the causes of a problem	determining data gained from the sample and making generalizations based on the findings
Sample	small, not necessarily representative sample	large, representative sample
Data collection	non-structured	structured
Data analysis	non-statistical	statistical
Result	understanding the initial problem	suggestions for making decisions

Source: Eibel, http://www.tankonyvtar.hu/marketing/marketingkutatas-080905-7, 1994

4.2.5 Study model

I did not study the information and communication sector separately, which gives the foundation of the information society, I examined its **diffusional effects** instead. I assumed that the adoptation of ICT devices was taking place in a different way in different economic branches.
The literature on the development of **ICT** distinguishes five development stages [**Figure 3**]. These stages are built upon each other. With the help of the elaborated model, I measured the individual development stages. By averaging the data of the first three development stages, I examined the enterprises' willingness for adoptation.
With the help of an own model, which comprises nine elements, I analysed the development and growth of the size categories and economic branches.
Its steps are as follows:

1. Processing the data of the primary and secondary

Processing research data in this case means the calculation of the value of **single indicator**s. For instance, the rate of using emails belongs to them. At first, I calculated the value of single indicators correlated to the year 2006. When it was possible, I used secondary data; otherwise I reclined upon primary data. Then, I calculated the rate of growth in accordance with the base year.

Table 9 - An example of processing data in the primary stage of the research

Economic sector	(D) Processing industry		
Item	Do you use the Internet for finding some business information?		
Year	2006	Use	29
		No use	6
		No answer	15
	2007	Use	31
		No use	4
		No answer	15
Sample size	50		
Penetration in 2006	58,00%		
Growth from 2006 to 2007	4,00%		

Source: Individual research

2. Assigning single indicators to individual development stages, calculating potential indicators

I grouped the part of the processed single indicators – there were 80 single indicators per questionnaire – and I assigned them to the individual development stages. The table below shows the single indicators belonging to the development stages:

Table 10 - Grouping of simple indicators used for the calculation of potential indicators

Development stage (Potential indicator)	**Simple indicators**
0. EDI network, closed and cannot be scaled (**rate of EDI network**)	Rate of using **EDI**.
1. **Electronic presence** (**rate of electronic presence**)	Rate of enterprises having websites, rate of displaying information on products and services (product catalogues, price and service lists).
2. **Interaction/dialogue** (**rate of interaction/dialogue**)	Rate of using e-mail services, rate of finding information on the Internet, rate of using internet banking and financial services, rate of using electronic taxation, rate of placing advertisements and using marketing on the Internet, rate of using market observation on the internet, rate of providing information on products and services (product catalogues, service and price lists), rate of using education and/or training (access to interactive training materials), rate of access to internet-based after-sales services, rate of purchasing digital products.
3. **Transaction** (**rate of transaction**)	Rate of purchasing products and services (on the Internet), rate of selling products and services (on

	the Internet), rate of providing tailor-made services for regular customers, rate of providing online digital services and products, rate of providing an opportunity for making online payments, rate of providing mobile internet access, rate of providing opportunities for performing security transactions.
4. **Electronic markets** (indirect research) (**rate of electronic markets**)	Rate of follow-up orders, rate of invoicing and payment systems, rate of production, logistics and/or service systems, rate of purchasing systems, rate of selling systems, rate of other computer systems, rate of digital signatures.
5. **Compound nodes** (**rate of compound nodes**)	-

Source: Individual research

3. Calculating the values of potential indicators from single indicators

I used the single indicators to calculate the value of the **potential indicator**s. I determined the values of these indicators by arithmetic averaging. The potential indicator shows the permeation and the pace of growth of a given development stage in the studied economic branches between 2006 and 2007.

Table 11 - An example of calculating the potential indicators of the first development stage

Economic sector	(D) Processing industry		
Development stage	1. Electronic presence (rate of electronic presence)		
Grouped data		Penetration in 2006	Growth from 2006 to 2007
	Business information	58,00%	4,00%
	Information on products and services (product catalogues, service and price lists)	54,00%	0,00%
	Product marketing	50,00%	0,00%
	Job advertisements	24,00%	2,00%
Potential indicator		46,50%	1,50%

Source: Individual research

4. Studying potential indicators

I listed the potential indicators into quality categories in each economic sector.

Table 12 - The qualitative categories of analysing potential indicators

		Growth (in percentage)	
		below 6%	**below 6%**
Penetration (in percentage)	**below 50%**	Underdeveloped, slow	Underdeveloped, fast
	above 50%	Developed, slow	Developed, slow

Source: Individual research

5. Determining potential indicators at the individual development stages [**Figure 19**]

Using the method shown above, I performed the quality categorization of all development stages in each and every economic branch, then I illustrated the given results with the help of a **bubble diagram**.

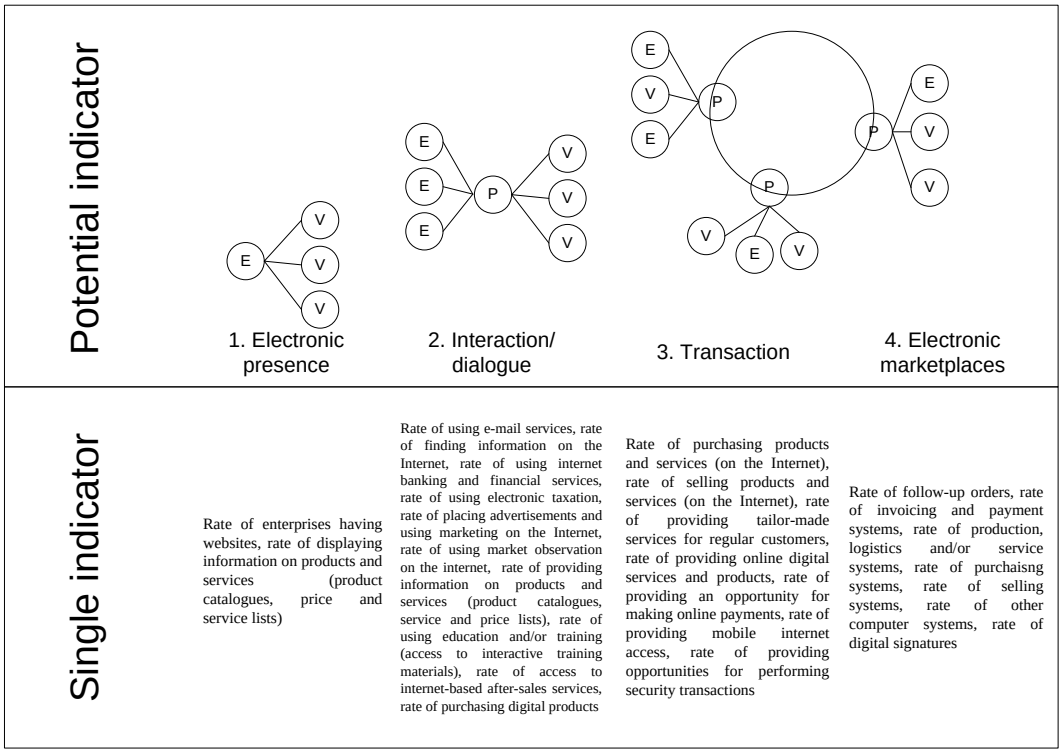


Figure 19 - Determining potential indicators at different development stages

Source: Individual research

6. Calculating the values of compound indicators by using potential indicators

I created a new **compound indicator** by the arithmetic averaging of the values of the potential indicators (1. the rate of electronic presence, 2. the rate of interaction or dialogue, 3. the rate of transaction).

7. Studying compound indicators

I calculated the values of the compound indicators for all economic branches. I assumed that the integrated indicators determined more paces of **adoptation with various speed**. Based on this assumption, I defined three different paces of adoptation:

- **Fast adoptation** (fast pace of growth – 6 %-12 % -, annual rate of growth may reach 12 %);
- **Average adoptation** (average pace of growth –3 %-6 % -, maximum annual rate of growth is 6 %);
- **Slow adoptation** (slow pace of growth – 0 %-3 %-, maximum annual rate of growth is 3 %).

I showed the values of the compound indicators in accordance with the pace of growth and the extent of the pace of adoptation.

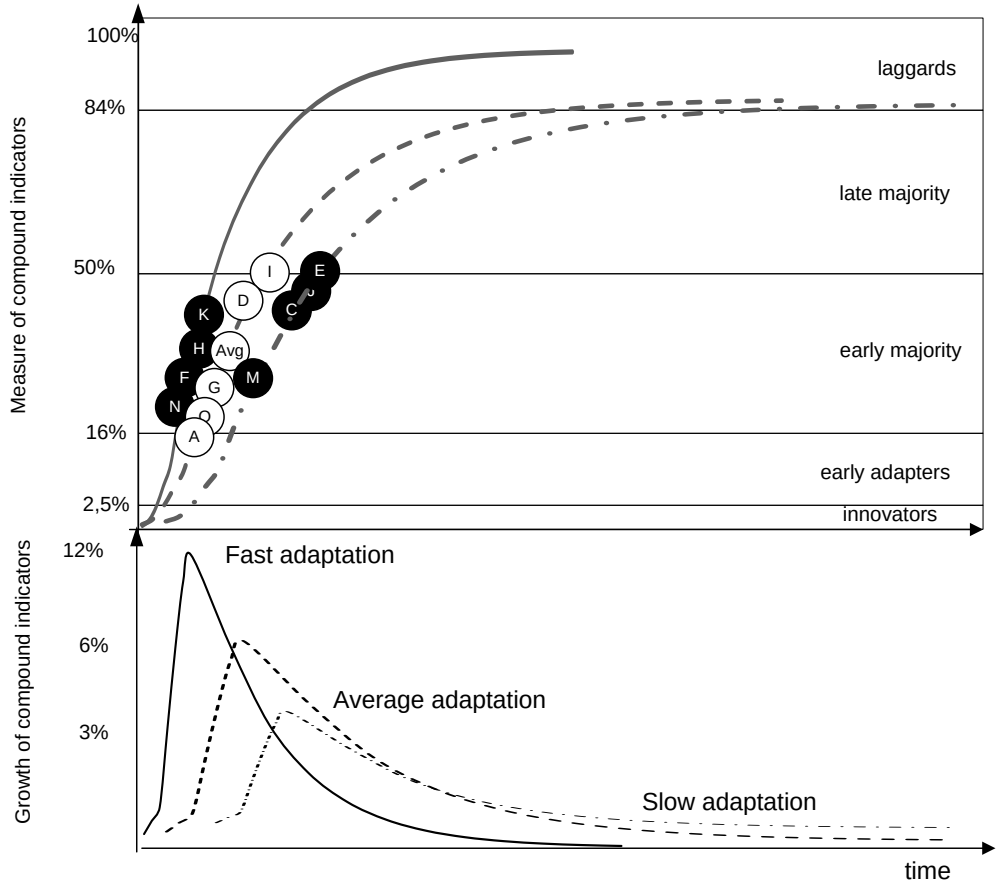


Figure 20 - The compound indicators in several economic branches in the various adaptation stages

Source: Individual research

8. Defining the categories of adoptation

In order to evaluate the newly joined enterprises, I borrowed quality categories from the literature.

Table 13 - Judgement of freshly joining enterprises based on the indicators

Adaptation category	Innovator	Early adapters	Early majority	Late majority	Laggards
Compound indicator value in percentage	0-2,5	2,5-16	16-50	50-84	84-

Source: ***Z. Karvalics L. – Dessewffy T.*** *- Internet.hu, A magyar társadalom digitális gyorsfényképe (Internet.hu, A digital snapshot of the Hungarian society), 2003*

9. Conclusions on the pace of growth and the general state of an economic branch

Some conclusions can be drawn from the pace of adoptation of the examined economic branches – provided that the environmental conditions were constant – on how fast they can reach the category of developed (above 50 percent) branches and on what category the newly-joined enterprises are in.

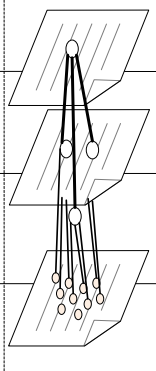
Levels of research		Measures	Qualitive categories	Displaying methods
1. Area		1. Pace of adaptation	1. Innovators, early adapters, early majority, late majority, laggards	1. -
2. Dimension		2. Compound indicators	2. Fast, average, slow pace of adaptation	2. Adaptation curves
3. Subdimension		3. Potential indicators	3. Developed/ underdeveloped and fast/ slow growth categories	3. Bubble diagrams
4. Research data		4. Simple indicators	4. Developed/ underdeveloped	4. -

Figure 21 - Levels of research methods

Source: Individual research

This also helps to draw conclusions on the state, the development level, the growth of ICT usage in the studied economic branches as well as the information society of the country.

4.2.6 Evaluation of the hypothesis related to the quantification of the development of ICT

T1: THE DIGITAL OPPORTUNITY INDEX DOES NOT GIVE AN UNEQUIVOCAL PICTURE ON THE DEVELOPMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY IN SEVERAL COUNTRIES.

Originally, this indicator was created by the International Telecommunication Union with the purpose of getting an efficient tool for the surveying of **ICT** usage and accession.

This is the first e-index that is built upon internationally accepted indicators, comprising eleven separate indicators that are divided into three clusters: opportunities, infrastructure and utilization.

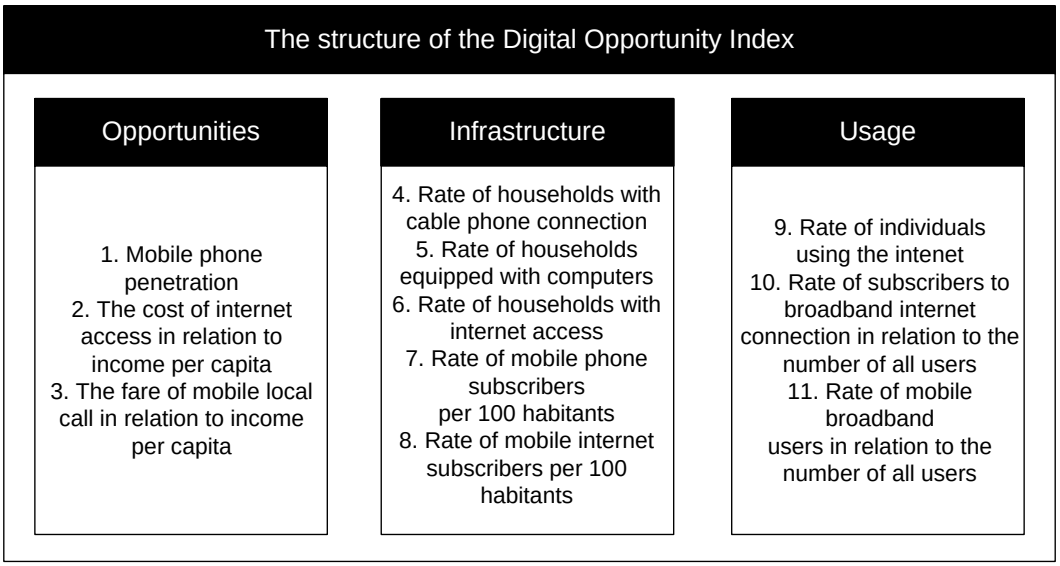


Figure 22 - The structure of the Digital Opportunity Index

Source: Individual research

When the **DOI** was created, the analysis of subjective factors was deliberately avoided because – according to the researchers – such qualitative factors would give too much room for interpretation, thus the overall image could be distorted.

With the help of the DOI index it is possible for us to get a comprehensive view on the state of preparedness for the information society in the examined countries. The aim of the primarily statistical and comparative analyses is to create international rankings where the individual countries are made comparable as far as possible. During the compilation of the indicator of preparedness, the researchers mainly relied on the secondary analysis of disposable, already existing data. This approach, however, constitutes several methodological challenges for the researchers making up the rankings.

The studies on the state of preparedness for the Information Society are not simply presentations of an actual competitive situation but they can also be regarded as stances: they reveal what factors are needed to shape up the Information Society by several research institutes, international organisations and governments, and what the indicators and rates are that can show a country developed. However, these studies in most cases fail to answer the question of what development stage can be stated as the limit of turning into a developed Information Society. Even if we are not able to determine the milestones of the transition unequivocally, it seems to be clear that we can find countries at different development stages, some of them are model countries, others are at the stage of preceding changes, preparing for the prospective transition.

As I pointed out earlier, the rankings based on the Digital Opportunity Index fail to determine exactly the criteria of the Information Society, they give only a framework for analysis and – based on an international comparative study – determine the position of several countries correlated to each other.

Three conclusions follow from this:

1. The country rankings based on the Digital Opportunity Index are not appropriate for a profound comparison, although they may help to identify „the losers and the winners.

2. The rankings give us only a limited insight to understand the annual (from one year to another) changes in several countries, so the data for 2006 cannot be understood with the help of the data for 2005, long-term changes should be considered here. Apart from this, it can be said that studies carried out by using the Digital Opportunity Index give a sort of „problem map" and allow to draw up certain trends. This also means that studies carried out by using this index cannot substitute the detailed surveys of the Information Society in individual countries.
3. The Digital Opportunity Index is only appropriate for comparing certain countries but cannot be used to demonstrate the inner context of the economy and the business sector.

From the methodological perspective it is clear that one of the important criteria of the successful surveys is being able to totalize differently measured indicators or to supplement them with own measures if it is needed.

Chapter 5 The empirical study of the development of information communication technology

Instead of using short definitions, we can get closer to the essence of the information society by comprehensive analyses covering all subsystems and by measuring the time when a country 'switches' from the previous stage to the stage of the information society. In order to get a better understanding of the stage of information technology, three system levels - the 'mini', the 'small' and the 'great' narratives - establish a framework for the literature of the information society [**Figure 23**].

Figure 23 - Survey of 'mini', 'small' and 'large' narratives by means of data sources

Source: Individual research

As the study of ICT is an interdisciplinary enterprise having both social and scientific implications, a combined process was needed involving the study of economic, legal, sociological and technical literature related to information society.

In consideration of the complexity of the studied subject, I have chosen several approaches and analytic methods. In the phase of data collection, I relied on Hungarian and international data (Statistical Office of the European Communities), and I managed to process a large amount of secondary information consisting of more than 6000 items. I extended my research to printed as well as electronic publications and artifacts accessible on the Internet. By conducting a primary research, I intended to reduce some shortcomings originated from secondary data sources.

As part of my research, I also conducted an empirical survey among Hungarian companies and enterprises. The questionnaire was filled by 554 respondents altogether, providing nearly 3.000 data records.

5.1 Studying the 'mini narrative' with the help of simple indicators

One of the most conspicuous characteristics of the information society is the growth in the numbers, variety and complexity of the technical devices used by enterprises as well as their continuous and extremely growing speed of change.

Information and communication technology appears more and more frequently in more fields of our everyday life (economic sectors, company size) and its usage changes the ways of production, trade and consumer consumption. Computers are built in traditional products, thus changing their operation.

If we are to study this process, we need to analyse three, well-defined aspects [**Figure 24**].

Information and communication technology surrounds the actors of economic life in various forms. These technical devices are closely connected to the four base dimension of information society. **Information** may be used as a resource and it may also be helpful in decision-making. Computers or workstations are very efficient devices for storing and processing information. Information composes an aggregation. The structural location of this aggregation makes up an information space. The technical embodiments of information space are the Internet, the extranet and the intranet. 'The Internet' is a widely-known English expression, which has the meaning of 'network of networks'. The Internet is a huge, global system that consists of millions of interconnected computer networks. It creates a kind of 'cyberspace' providing an alternative reality beside the real world.

The frequency parameter of Internet accessibility is one of the most important quantitative parameter for enterprises. An **intranet** is a private computer network that uses Internet technologies to securely share any part of an organization's information or operational systems with its employees. An **extranet** can be viewed as part of a company's intranet that is extended to the most important business partners of the company, usually via the Internet.

The following types of Internet access can be distinguished:

- Mobile,
- Other landline or wireless,
- Leased line,
- Cable television,
- xDSL,
- ISDN,
- Dial-up.

The reduced cost of producing and mediating information leads to a global system of interconnected local networks, individual personal computers and other electric storage devices. The stress is on cost reduction, which enables more economical data transmission for a wide range of users.

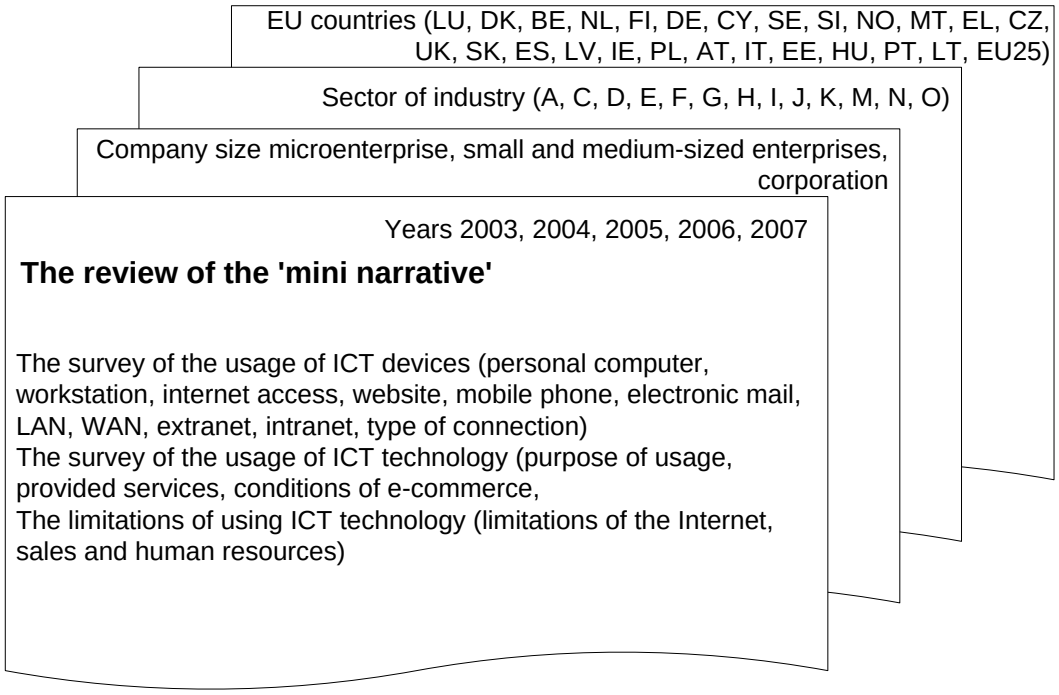


Figure 24 - Review of the 'mini narratives' in connection with time, size and economic sectors in the individual countries of the EU

Source: Individual research

If we accept that information can be regarded as knowledge and learning, it shows that information is a higher-level axiomatic unit, it is the basis for **communication**. Communication takes place in information space. Although information is a basis for communication, real communication can only be taken place by intelligence. Communication is an independent, axiomatic interaction which operates and takes effect as such. Its technological background is provided by a network but they are not identical to each-other.

A possible classifying aspect of networks is their size. Based on this, there can be:

- **Personal Area Network** (**PAN**),
- **Local Area Network** (**LAN**),
- **Metropolitan Area Network** (**MAN**),
- **Wide Area Network** (**WAN**).

The actions of a business organization take place in time and space (**timeliness**) As a result of technological development, space is reduced to an infinitely small part. The space-time continuum becomes timely and single-dimensional only with the disappearance of space.

According to **Daniel Bell**, a **network** is

- partly a relational characteristic of the communication system of enterprises in time and space, or rather of a given social communication pattern;
- and partly a criterion for the possibility of communication, which generates a continuous indirect presence.

The primary aspect of studying a business organization is to reveal the aim of their usage of communication and information technology and the reason why enterprises are present in various networks. As a new type of market structuralization, e-commerce is based on networks in trade. Electronic mails and other electronic data exchanges make up intercourses in networks.

There are human limits of using information and communication technology. These limits apply to network access, network usage and the availability of human resources.

5.1.1 The study of using information and communication technology

One of the important indicators of the penetration of information and communication technology is the number of existing enterprises using the necessary ICT devices.

The usage of **mobile phone**s reached high levels in the business sector [**Figure 28**]. The number of enterprises using mobile phones was 96 % in 2007. The rate of using **personal computer**s and **workstation**s is another important characteristic of the business applications of information and communication technology, its registered rate has been 92 % with an annual increase of around 1.0-2.0 percentage points since 2003. Within this hardware stock, the rate of desktop computers was 83 %, while the rate of laptops and portable computers was 12.5 %. According to the statistical handbook, the number of computer technology devices grew by 30 % from 2004 to 2005 [**Figure 25**].

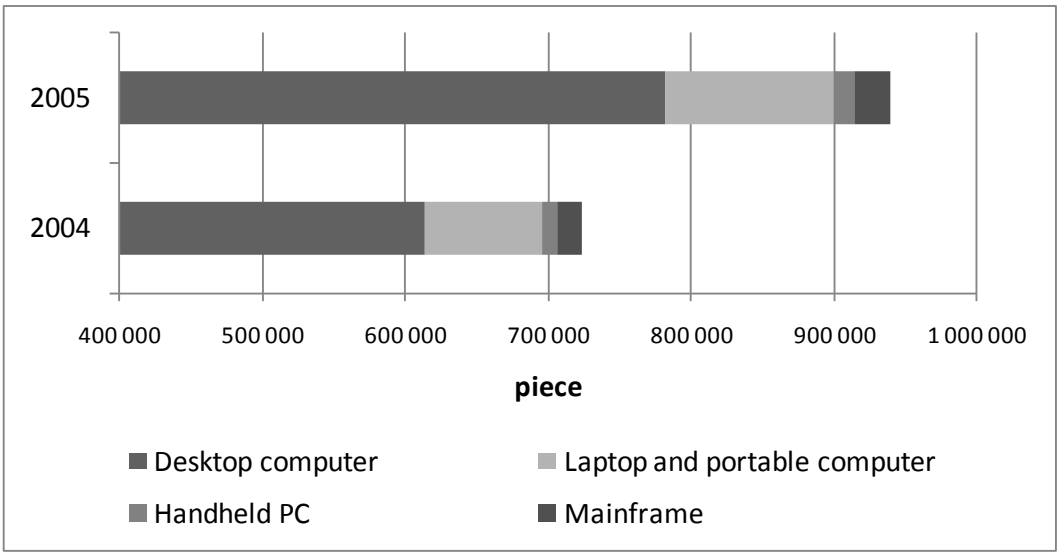


Figure 25 - Availability of personal and other computers by business organizations in 2004 and 2005 in Hungary

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, 2005

The rate of personal computers and workstations in the 27 countries of the EU reached [**Figure 26**] 96 % last year. The lowest penetration rate was found in the case of Romania (82 %), Bulgaria (83 %) and Lithuania (91 %) in the Eurostat database. The largest growth in penetration was experienced in the United Kingdom (16 %), Portugal (13 %) and the Netherlands (5 %) between 2003 and 2007. Hungary, with its rate of 3 %, exceeded the average growth of the EU-25 by 1 %.

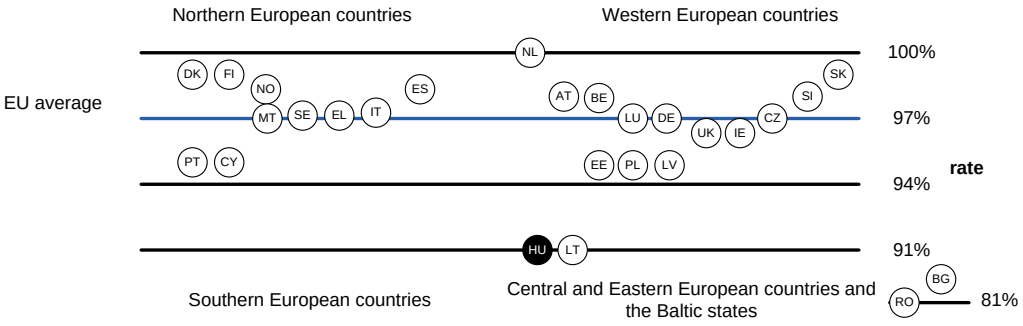


Figure 26 - Proportion of enterprises using personal computers in the 27 surveyed countries in 2007[1]

Source: Eurostat, Community survey on ICT usage in enterprises, 2008

It is characteristic to the scale of **Internet access** that 78 % of the enterprises in Hungary benefit from the opportunities provided by the Internet, which was an increase of 16 % in 2005 compared with the two previous years. The reported net turnover realized through computer networks was 41784.4 billion HUF in 2005, an increase of 7.5 % compared with the two previous years.

With its 80 % rate of Internet access, Hungary lagged behind the EU average by 13 % in 2005. Among the 10 new member states joining the EU in 2004, the average was exceeded by Slovenia (96 %) and The Czech Republic (95 %) and was reached by Slovakia (93 %).

The biggest backlog can be observed in the number of enterprises having and maintaining a **website**. Hungary's rate of 47 % is less than the EU average (63 %) by 13 % and this rate was enough to overtake only two countries (Latvia with 39 %, Portugal with 42 %). In Slovakia, the rate of enterprises increased from 47 % in 2003 up to 70 %. A 17 percent growth could be observed in the Netherlands, Portugal, Spain and the United Kingdom during this period. The Czech Republic reached a threefold increase compared with the EU average of 5 %, while Hungary could take pride in its 12 % increase.

Based on the first quarter records of **Eurostat's dataset** in 2008, the penetration of Internet access reached 86 %, which showed an 8 percent growth compared to 2004. During this period, the average of EU-25 increased from 89 % to 95 %.

The following countries showed a spectacular growth in this respect: Slovakia (from 71 % to 98 %, Latvia (from 74 % to 86 %), the Netherlands (from 88 % to 99 %) and Portugal (from 77 % to 90%). Based on these data, after leaving three countries behind in 2004, Hungary produced the lowest rate of penetration in 2007 [**Figure 27**].

[1] DK= Denmark, FI= Finland, SE= Sweden, NO= Norway, LU= Luxembourg, BE= Belgium, NL= The Netherlands, DE= Germany, UK= The United Kingdom, IE= Ireland, AT= Austria, CY= Cyprus, MT= Malta, EL= Greece, ES= Spain, IT= Italy, PT= Portugal, SI= Slovenia, CZ= The Czech Republic, SK= Slovakia, LV= Latvia, PL= Poland, EE= Estonia, HU= Hungary, LT= Lithuania, RO= Romania, BG= Bulgaria.

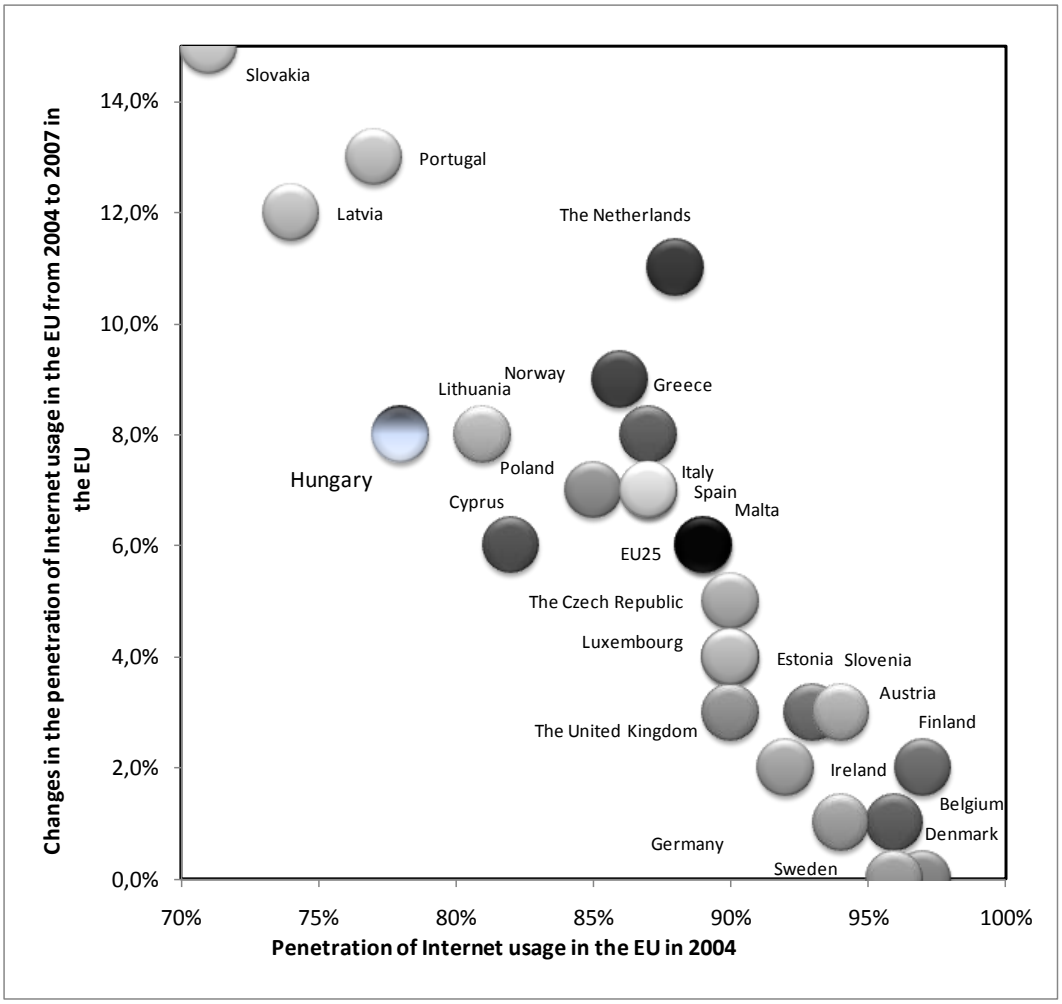


Figure 27 - Proportion of enterprises with Internet access and the growth of Internet usage in the EU from 2004 to 2007

Source: Eurostat, Community survey on ICT usage in enterprises, 2008

In terms of **Internet access**, Hungarian small-sized enterprises were behind the average of the EU-25 by 9 %, while in the case of medium-sized enterprises and corporations the handicap was 3 and 2% in 2007 according to Eurostat.

In terms of small-sized enterprises having Internet access, Hungary, with 85 % came in last behind Lithuania (86 %) among the surveyed countries. Although there was a 10 percent increase between 2004 and 2007 (the increase rate in the EU-25 was 6 % during the same period), it was not enough for Hungary to make up lost ground. If we compare the rate of small-sized enterprises having Internet access to those of the 10 new member states, lower levels were recorded only in Romania (63 %) and Bulgaria (70 %).

In terms of medium-sized enterprises having Internet access, Hungary continued to remain at the bottom of the table with its 96 % among the countries joined the EU in 2004 and before. It is worth noting that the rate of increase was 9 % between 2004 and 2007 as compared to the average growth of 2 % in the EU-25.

As regards corporations having Internet access, the penetration rate in Hungary was 98 %, putting the country on the same level as Slovakia, Lithuania, Norway and the newly-admitted Bulgaria.

When studying the penetration of Internet access in the Hungarian 'Manufacturing' sector, it can be stated that it was 8 % below the EU-25 average (94 percent) according to Eurostat. The growth rate was 10 % within the studied three-year period. It must also be noted that this pace of growth cannot be regarded as unique, Portugal's penetration rate, for instance, grew from 77 % to 89 % within the same three-year period. Hungary, with its penetration rate of 86 % in the studied economic sector, could overtake only Lithuania (82 %). Even lower development levels could be observed in the newly-admitted Bulgaria (73 %) and Romania (66 %).

Based on the data for 2006, the penetration rate of enterprises having Internet access in the 'Electricity, gas and water supply' sector caught up with the EU average, which stood at 95 %. Those countries being overtaken by Hungary in this sector were Lithuania (93 %), the United Kingdom (93 %), Norway (93 %) and, of course, the two newly-joined countries.

Looking at the penetration rate of Internet access in the 'Construction' sector in 2007, it can be stated that Hungary, with its 86 %, was 8 % below the EU-25 average but it could overtake such countries as Cyprus (78 %), Portugal (80 %) and Romania (74 %). The pace of growth accelerated to more than 9 % between 2004 and 2007. Nevertheless, Hungary produced the same rate of penetration as Belgium did in 2003.

In international comparison, the penetration rate of 87 % in the 'Wholesale and retail trade, repair work' sector showed a very low level of usage in 2007. The EU-25 average was 7 % higher than that of Hungary's. Yet, Hungary's pace of growth was 12 % altogether within the studied three-year period. With the exception of Lithuania, every country having joined the EU before 2004 produced more favourable rates.

In the 'Transport, storage and communication' sector a 5 percent handicap could be detected compared to the EU-25 average. The Hungarian penetration rate in this sector in 2004 caught up with the EU average in 2004. Apart from the newly-admitted countries, only Lithuania and Cyprus registered lower rates.

In the 'Real estate, renting and business activities' sector the penetration rate of having Internet access (88 %) was 10 percent below the EU average. This was the biggest handicap observed among the six studied economic sectors. With this poor result, Hungary dropped to the bottom of the table among the studied countries.

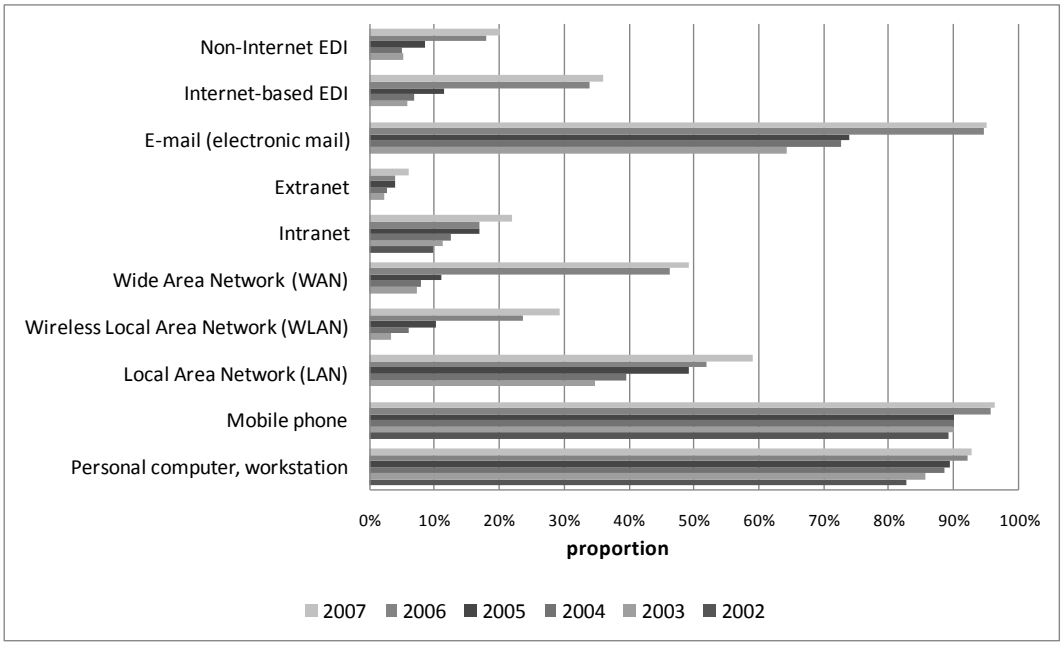


Figure 28 - Proportion of using ICT devices by business organizations in Hungary between 2002 and 2007

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, 2005

The use of **e-mail** increased from 64% to 95% in 2007. Among the other networks, the use of **Local Area Network**s was the most widespread with 59% of business organizations compared to previous year's 52% and 49% in 2005. This growth was badly needed because Hungary took the 24th place among the studied countries and was overtaken by such countries as Poland, Latvia and Slovakia.

The use of **Wide Area Network**s and **Wireless Local Area Network**s were much less prevalent. In 2004, 11% of business organizations, whilst in 2007 31% of them had and used Wide Area Networks. Wireless Local Area Networks were used by 10% of business organizations in 2004 and 29% of them in 2007. The use of **intranet**, **extranet** and **non-Internet EDI** continues to show low levels up to this day. Intranet was used by 17 % of business organizations in 2005 and 22% of them in 2007 with a 5 percentage point increase compared to 2006, whilst the rate of extranet usage was 4% in 2005 and 6% in 2007. This latter rate is 2 percent higher than it was in 2006. In international comparison, an 11 percent handicap can be observed compared to the rate of those countries joined the EU before 2004. In 2007, there was no other country in the EU (along with the newly-admitted ones) where the rate of the use of extranet was lower than in Hungary.

The average penetration rate of intranet in the EU-25 was double than that of Hungary's in 2004 [**Figure 29**]. With that penetration rate, Hungary was last in that year. In 2007, the EU average increased to 35% (a very slow, 1 percent growth in three years), whilst Hungary reached a 22% rate in terms of enterprises using intranet. This rate caught up to the level registered in The Czech Republic and Germany in 2004 or to the level registered in Romania in 2006.

Internet-based EDI was used by 12% of enterprises in 2005 and 36 % of them in 2007. Non-Internet EDI was used by 9% of enterprises in 2005, whilst this platform was used by 20% of them in 2007.

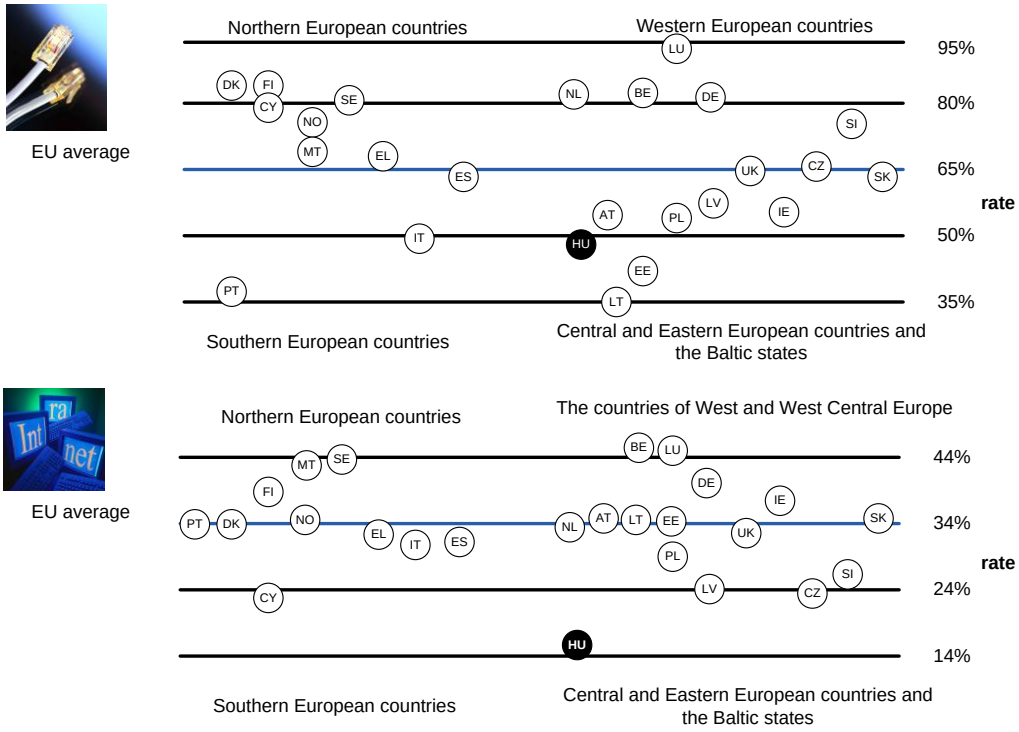


Figure 29 - Proportion of using Local Area Network (LAN) and Intranet by business organizations in the EU countries in 2005

Source: Statistics in focus, 20/2006; Eurostat, Community survey on ICT usage in enterprises, 2008

Regarding the use of information and communication technology **[Figure 30**], a higher penetration rate could be observed in the case of corporations, whilst it showed a declining tendency towards smaller company sizes.

In terms of **mobile phone**s, 95% of microenterprises used this device and 98% of small and medium-sized enterprises (SMEs) benefited from the advantages of it. In the case of medium-sized companies the penetration rate of **personal computer**s was 88 % in 2005, which increased to 98% in 2006. In the case of small-sized enterprises the figure was 95% in 2005 and 96% in 2006.

The penetration rate of mobile phones was 85% among microenterprises. The number of employees using personal computer on a regular basis was more than 40% among microenterprises, the same figure was 38% in small-sized enterprises and 24% in medium-sized enterprises in correlation to the total number of employees. **Wireless Local Area Network**s were used by 31% of medium-sized, 20% of small-sized and 17% of microenterprises in 2006.

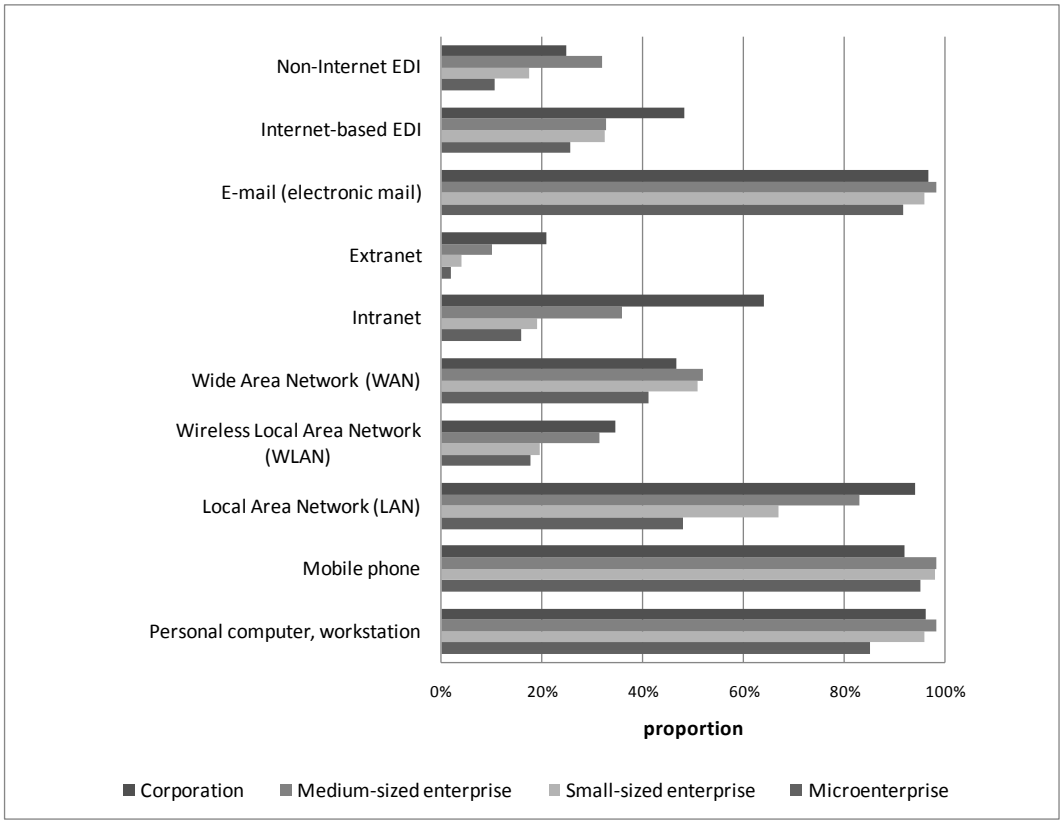


Figure 30 - Proportion of using ICT devices in connection with company size in Hungary in 2006

Source: Individual primary research

In terms of using **Local Area Network**s, the highest rate was observed among corporations with 94%, followed by medium-sized enterprises with 83%, small-sized enterprises with 67% and finally, microenterprises with not more than 48% in 2006. In the same year the penetration rate of **Wide Area Network**s was considerably lower, this new network system was used by 17% of microenterprises, 23% of small-sized, 32% of medium-sized enterprises and 47% of corporations. **Intranet** was known and used by less than one-fifth of microenterprises, while the same rate was more than 20% in small-sized, nearly 36% in medium-sized enterprises and 64% in corporations.

If we take a look at the penetration of **Local Area Network**s in international comparison, it can be observed that the rate among small-sized enterprises was nearly half of the EU-25 average, and the handicap was 11% in the case of medium-sized enterprises in 2005. The penetration of **Intranet** shows an even gloomier picture as Hungary held the last position in terms of small- and medium-sized enterprises among the 24 surveyed countries (24 member states without France, Norway included).

Extranet was used by more than one-fifth of corporations, one-tenth of medium-sized and 4% of small-sized enterprises; it was only used by nearly 2% of microenterprises. The 4-percent rate of small-sized enterprises was 10% less than the average of the EU. Among the newly-admitted countries the penetration rate regarding this company size was 13% in Romania and 2% in Bulgaria. Naturally, this rate was significantly higher in the case of the existing member states. The penetration rate observed among medium-sized enterprises was almost one-third of the EU average, which stood at 29% in 2007. This figure is the same as that of Lithuania in 2004 and Portugal in

2005. The usage of extranet in corporations in Hungary was 27% less than the EU average, which stood at 48%. That is the poorest result among the surveyed countries.
Internet-based EDI could be found in one-fourth of microenterprises and 32% of SMEs, while the same rate in corporations was 48%.
It can be stated that the penetration of information and communication devices had the highest rate in the sectors 'Financial intermediation' and 'Electricity, gas and water supply' [**Figure 31**].
The penetration rate of **personal computer**s in the field of 'Agriculture, hunting and forestry' was 93%, which was 3.6% higher than the national average. With this rate, it belongs to the group of those eight economic sectors where the penetration was higher than the average. The usage of **mobile phone**s with its 96% rate was a definitely promising figure. The usage of **Local Area network**s was 29%, which is a 20 percent difference from the average. The difference from the sector 'Financial intermediation' is more than 55%. The penetration of **Wireless local Area Network**s was spectacularly low in this sector, only 1.9%. The penetration of **WAN**, **intranet** and **extranet** was below 4%. A significantly high difference from the average could be observed in the case of intranet as it was more than 13% in 2005. The rate of the use of **e-mail**s was 60%, which is the second lowest result among the surveyed economic sectors.

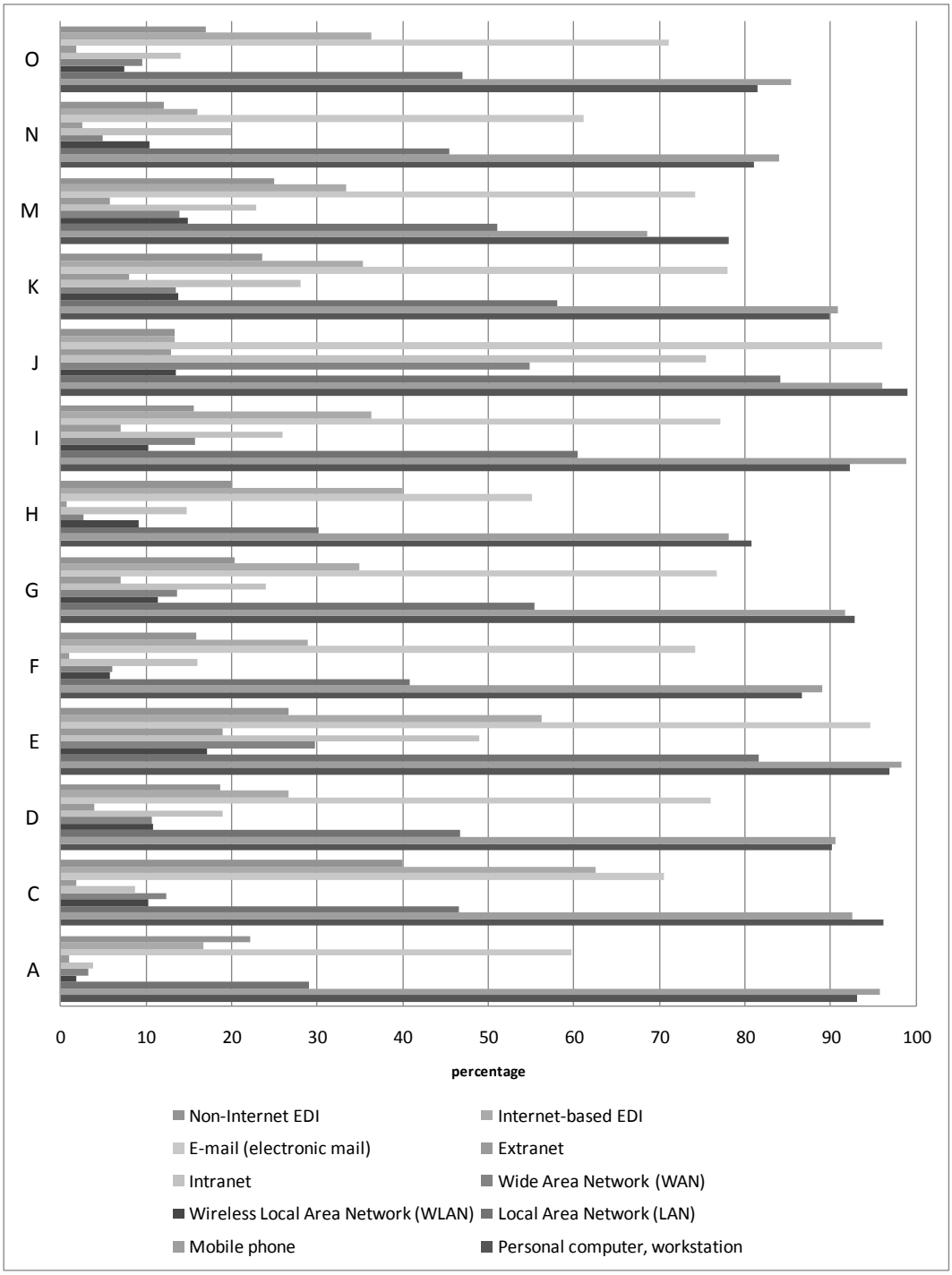


Figure 31 - Proportion of using ICT devices in connection with economic Sectors in Hungary in 2005[2]

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági Szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, 2005

[2] A=Agriculture, hunting and forestry, C=Mining and quarrying, D=Manufacturing, E=Electricity, gas and water supply, F=Construction, G=Wholesale and retail trade; repair work, H=Hotels and restaurants, I= Transport, storage and communication, J=Financial intermediation, K=Real estate, renting and business activities, M=Education, N=Health and social work, O=Other community, social and personal service activities.

The penetration rate of **personal computer**s in the 'Mining and quarrying' sector produced the third highest figure in the surveyed economic sectors with 96% in 2005. It proved to be 6.7 percent higher than the national average. The use of **mobile phone**s and **Wide Area Network**s was also above the average. The use of Local Area Networks and Wireless Local Area Networks was around the average with 47% and 10%. The use of **intranet** produced the second lowest rate among the surveyed economic sectors. The penetration rate of **extranet** was below 2% in 'Mining and quarrying', while the use of **e-mail**s was 70%.

In the field of 'Manufacturing', the use of personal computers and mobile phones was above 90%. This was a very slim difference (0.6%) from the national average [**Figure 32**]. The rate of using **Local Area Network**s was 47%, which was quite a good result in Hungary. Wireless local Area Networks and **Wide Area Network**s were used by only one-tenth of enterprises in this sector in 2005. Three in four companies used electronic mails in their communication.

In international comparison [**Figure 33**], the 47 percent penetration rate of using **Local Area Network**s was 14 percent lower than the EU-25 average, with this result, Hungary held the last position among the 24 surveyed countries. The result was even more unflattering in the case of using **extranet**: its penetration rate in Hungary was less than third of the EU average (14% and 4%) in 2007. Only Lithuania was overtaken by Hungary among the surveyed countries with this figure. In the 'Manufacturing' sector, the rate of using intranet was 33% in the EU and 19% in Hungary. With this figure, Hungary held the last but one position, overtaking only Cyprus (13%).

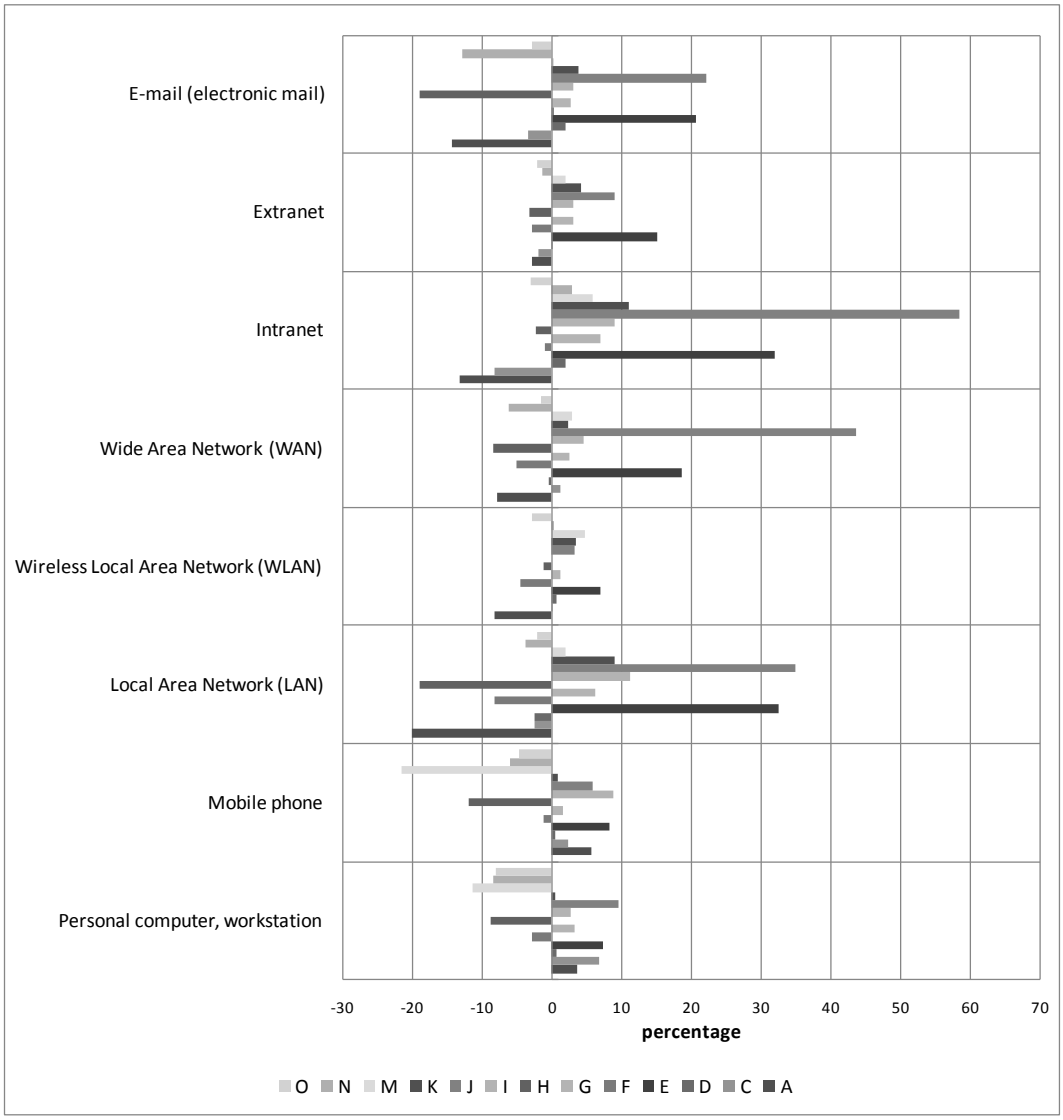


Figure 32 - Divergence of using ICT devices from the national average in connection with economic sectors in Hungary in 2005

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél (The availability and usage of ICT devices by economic organizations), Hungarian Central Statistical Office, 2005

The 'Electricity, gas and water supply' sector showed better results than the national average in each and every studied parameter. The penetration rate was over 90% in the usage of **personal computer**s, **mobile phone**s and **e-mail**s. It was over 80% in the usage of **Local Area Network**s. In the case of using **Wireless Local Area Network**s, this sector reached a penetration rate of 17%, which was the highest compared to all the other sectors. The use of **intranet** was above 49%, 27 percent higher than the national average in 2007. With this rate, Hungary managed to overtake Estonia (38%), Lithuania (19%) and was at the same level as the Czech Republic (49%). The use of extranet was 19%, being three times higher than the national average in Hungary in 2007. This figure was higher than that of Lithuania (15%), Estonia (13%) and Cyprus (13%).

In the 'Construction' sector, the penetration of personal computers was 87%, 2.5 percent lower than the national average in 2005. The use of mobile phones was 89%, allowing this sector to hold the 9th position among the 13 surveyed sectors in the same year. The penetration of using **Local Area**

Networks was 8 percent lower than the national average. The penetration of Wireless Local Area Networks and **Wide Area Network**s was below 6%. The combined penetration rate of **intranet** and **extranet** slightly exceeded 17% (16.1% and 1%). The use of intranet was 4 percent less than the EU average in 2007. This rate was higher than in Spain (12%), Cyprus (8%), the Netherlands (14%) and Slovenia (10%). (It can be explained by the fact that the use of extranet is more widespread in the aforementioned countries as the system integration reached a higher level there.) The use of e-mails was around the average with 74%.

Similarly to the 'Electricity, gas and water supply' sector, a higher penetration rate was measured than the national average in every surveyed parameter in the 'Wholesale and retail trade; repair work' sector. The use of personal computers was 93% and the use of mobile phones was 92% in 2005. The penetration rate of using Local Area Networks was 55%, the 4th highest rate among the other economic sectors. In terms of the penetration of Local Area Networks, this sector in Hungary was only the 18th among the 24 surveyed countries. Every tenth enterprise operating in this sector used Wireless Local Area Networks. The penetration of Wide Area Networks was 14%, while the penetration rate of intranet stood at 24%. The penetration of extranet was considerably low, only 7% in 2007. The penetration of extranet was one-third of the EU average, while the same figure was 60% in the case of intranet. Three in four enterprises used e-mail in this sector.

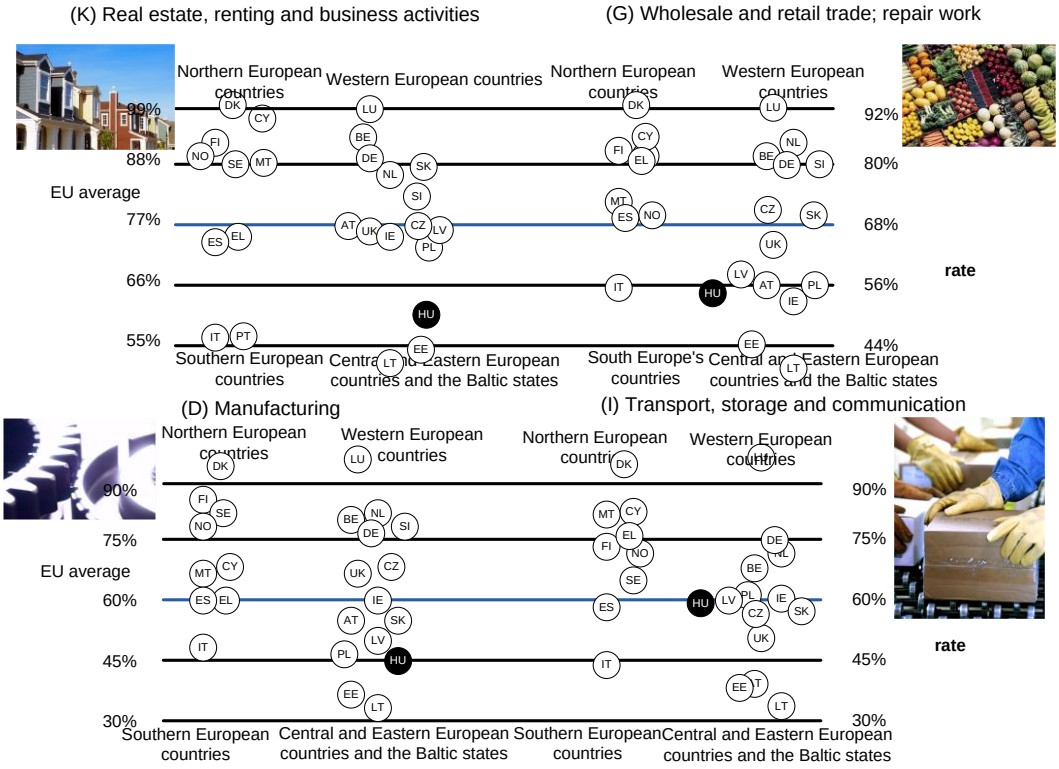


Figure 33 - Proportion of using Local Area Network by economic sectors in certain EU countries in 2005

Source: Statistics in focus, 20/2006, Eurostat, Community survey on ICT usage in enterprises, 2006

In terms of using ICT devices, the 'Hotels and restaurants' sector produced a worse result in every studied parameter compared to the national average. The penetration rate of Local Area Networks was remarkably low with its 30%. The use of e-mail was only 55% (by far the worst figure among the surveyed economic sectors). The penetration rate of mobile phones was last but one with 78%

among the surveyed sectors. The penetration of Wide Area Networks was only 2.7%, showing the lowest rate among the other sectors.

In the 'Transport, storage and communication' sector the use of **mobile phone**s and **personal computer**s showed a penetration rate above 90% in 2005. The use of mobile phones was particularly high with 99%, producing the highest figure compared to the other sectors. The penetration of Local Area networks was also high with 60%. It could be observed that there was no rate below the national average in this sector. In terms of **Local Area Network**s, the sector's position was quite favourable even in international comparison, as it reached the EU average. In terms of using intranet, this sector produced the lowest rate among the surveyed countries in 2005 [**Figure 34**]. The penetration rate of using **intranet** in the EU was 32%, 6 percent higher than that of Hungary in 2007. With this figure, Hungary could overtake only Lithuania last year.

The EU average rate was 16% in the case of using **extranet**; the Hungarian average was only 7% in this sector. This was the lowest rate measured among the surveyed countries.

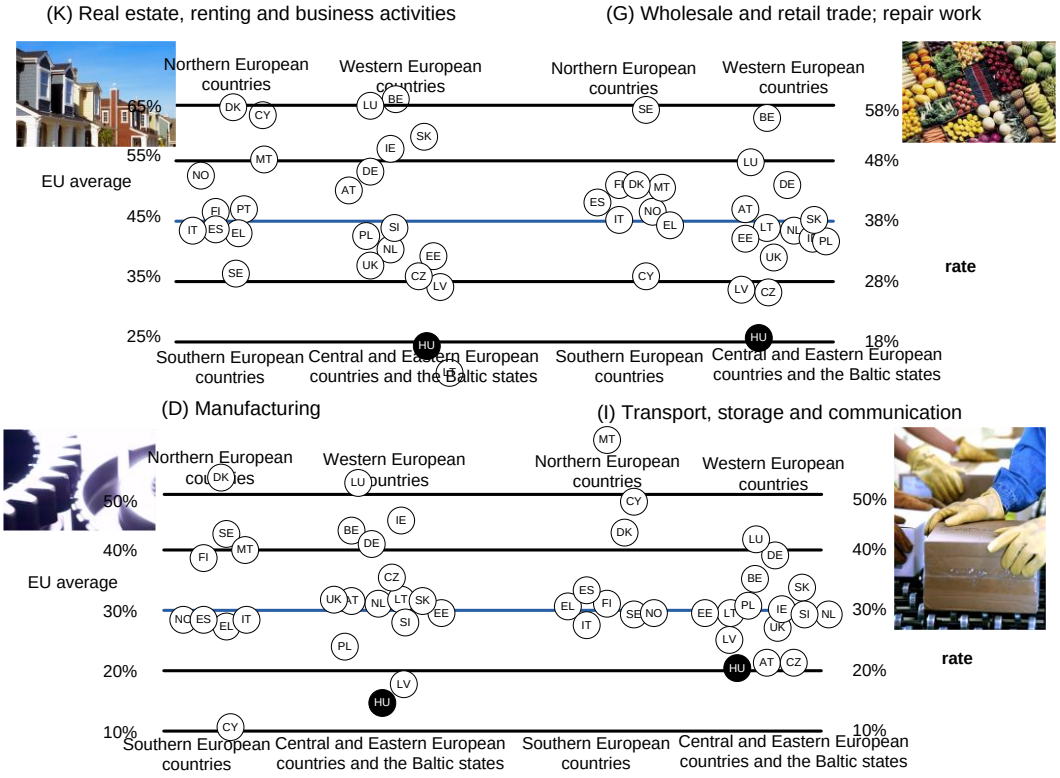


Figure 34 - Proportion of using intranet by certain economic sectors in the EU countries in 2005

Source: Statistics in focus, 20/2006, Eurostat, Community survey on ICT usage in enterprises, 2006

The 'Financial intermediation' sector showed the highest penetration rates in using personal computers (99%), intranet (75%), extranet (13%) and **e-mail** (96%) among the surveyed sectors in 2005. The penetration of Local Area Networks was 60%, 11 percent higher than the national average. The use of mobile phones was 96%, showing the third highest rate among the other sectors, while the penetration of intranet was 58% above the average.

In terms of using personal computers, the sector of Real estate, renting and business activities was the 8th, while in terms of using mobile phones it held the 7th position with 90% among the surveyed 13 sectors in Hungary in 2005. The penetration rate of using **Local Area Network**s was

58%, which was quite a good result for Hungary but it was considerably low in international comparison. Only Lithuania produced a lower rate among the surveyed 24 states. The Hungarian rate was 20% less than the EU-25 average in 2005. The representation of **Wireless Local Area Network**s was 15%, while the same rate was 13% in the case of Wide Area Networks. The penetration rate of **extranet** was 8% higher than the national average standing at 4%. **Intranet** was used by 28% of enterprises, showing the third highest rate in Hungary but holding the last but one position compared to the 24 surveyed states. The penetration rate of using **e-mail** was 78%.

The 'Education' sector produced the worst rates in terms of using **personal computer**s (78%) and **mobile phone**s (68%) among the surveyed economic activities. These figures were 11% and 22% less than the national average. The use of Local Area Networks was 51%, which was around the average, while the use of Wireless Local Area Networks was 15%, showing the second highest penetration rate among the surveyed sectors. The penetration of Wide Area Networks and **intranet** was 14% and 23% in 2005. The use of extranet and e-mail was below the Hungarian average in 2005.

The 'Health and social work' sector showed the third lowest penetration rate in terms of using personal computers (81%), mobile phones (84%), **Wide Area Network**s (5%) and **e-mail** (61%) among the surveyed sectors. The penetration of intranet (20%) and Wireless Local Area Networks (10%) exceeded the national average. Only six in ten economic organizations used e-mail in this sector.

The field of 'Other community, social and personal service activities' performed poorly in comparison to the national average in every studied parameter. Four in five organizations used personal computers and mobile phones. The use of **Local Area Network**s showed a penetration rate of 49%, the rates were above 10% in the case of using **Wireless Local Area Network**s and **Wide Area Network**s. The use of e-mail showed a rate of 71%, which was 3% lower than the national average. The use of extranet was not significant with its 2% rate in this sector.

The penetration of information and communication [**Figure 35**] devices produced the highest rates in the sectors 'Financial intermediation' (99%) and 'Electricity, gas and water supply' (97%). The penetration was also significant in the sectors 'Mining and quarrying' (96%), 'Wholesale and retail trade; repair work' (93%) and 'Transport, storage and communication' (92%) in 2005. The use of personal computers represented the lowest rate in the 'Education' sector with 78%.

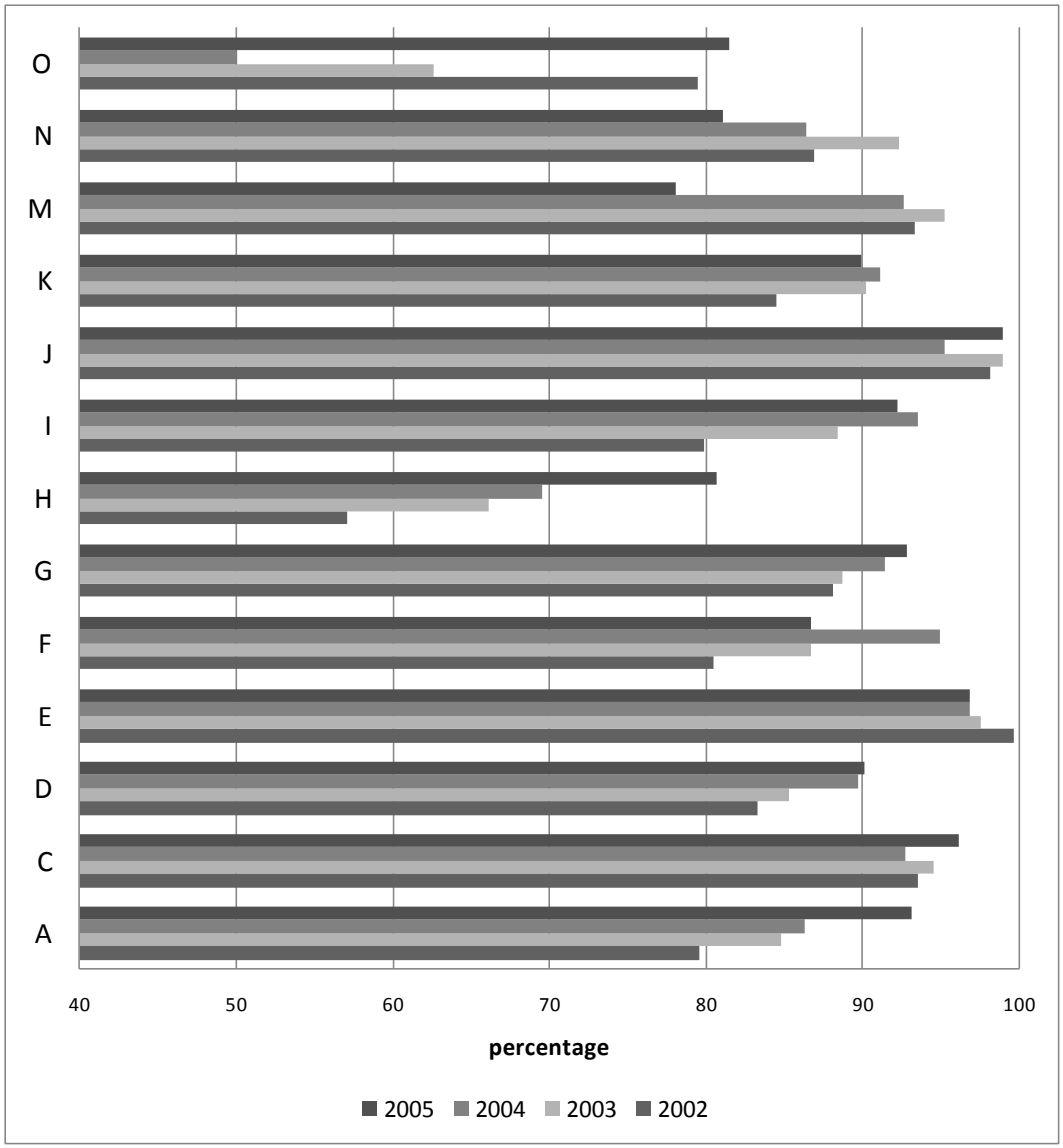


Figure 35 - Proportion of enterprises using personal computers by economic sectors between 2002 and 2005

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, 2005

The type of internet access is a very essential question of using the Internet as it determines the speed of connection. The greater speed improves the efficiency and quality of Internet usage, enabling it to become more widespread and have a more influential effect. The level of the connection speed along with the quality of the available information and communication devices establishes the infrastructural conditions for making the Internet more widespread.

The types of Internet access can be classified into four categories:

- Low-speed connections (dial-up, analogue; ISDN),
- Medium-speed connections (DSL, cable television),
- High-speed connection (leased line),
- Wireless connection (Mobile).

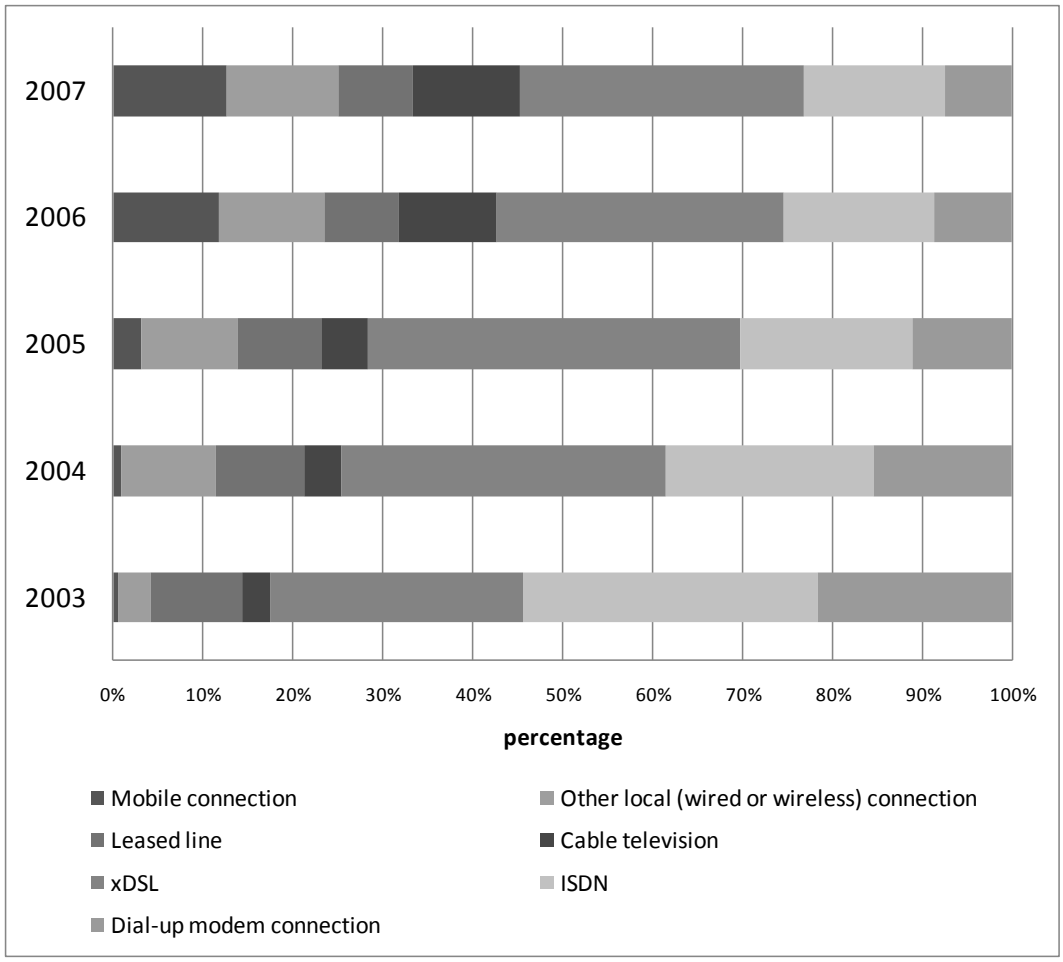


Figure 36 - Types of internet access for business organizations in Hungary

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, 2005

In 2005 the number of Internet access points in economic organizations increased by 37.000 compared to the measured 31.000 in the previous year. The growth was particularly significant in the case of broadband (xDSL and cable television) connections [**Figure 36**]. The number of **xDSL** access points exceeded 15.000 in 2005, which was a 37% increase compared to the previous year, while the number of **cable television** access points increased by more than 52%. After comparing the types of Internet access used by enterprises to other data from The National Statistical Office on Internet subscriptions, it became clear that enterprises were more likely to subscribe to **ISDN** and **leased line**s than private or government subscribers. Using **dial-up** and cable television connection types was less characteristic to enterprises.

The European Commission issues reports on the growth of the market of broadband connections in the EU every six months. The latest one was published by Brussels on the 15th of February in 2008. According to that report, in 2007 the number of broadband subscriptions increased by 52% in Hungary compared to the previous year. It can be regarded as an excellent result in itself, the pace of growth was higher only in Greece (156%), Ireland (75%), Poland (73%), Slovakia (73%), Cyprus (71%) and Latvia (69%) in the studied period.

However, if we take the total number of broadband connection in Hungary, the overall picture does not seem to be rosy at all. In this respect, Hungary was lagging behind in the last third part of the

EU ranking. It belonged to the group of such countries as Cyprus, Latvia, the Czech Republic and Lithuania, although there were five states performing even worse than Hungary: Bulgaria, Romania, Greece, Poland and Slovakia.

In terms of having broadband connection, some European countries belong to the frontline but the gap between the most and less developed countries has been widening. The difference between the best (Denmark) and the worst (Bulgaria) has slightly increased, reaching more than 30 percentage points. The main reasons for this were that there were no significant alternative infrastructure in some member states, and faster and more effective legislation processes would be needed. Investments should be encouraged in order to help more robust growth all across Europe.

In the EU, the most widespread broadband technology is still digital subscriber line (DSL). However, compared to 2006, the growth of **DSL** technology was down by 6%, while some alternative technologies were spreading, such as cable, optical connection or wireless connection (local loop).

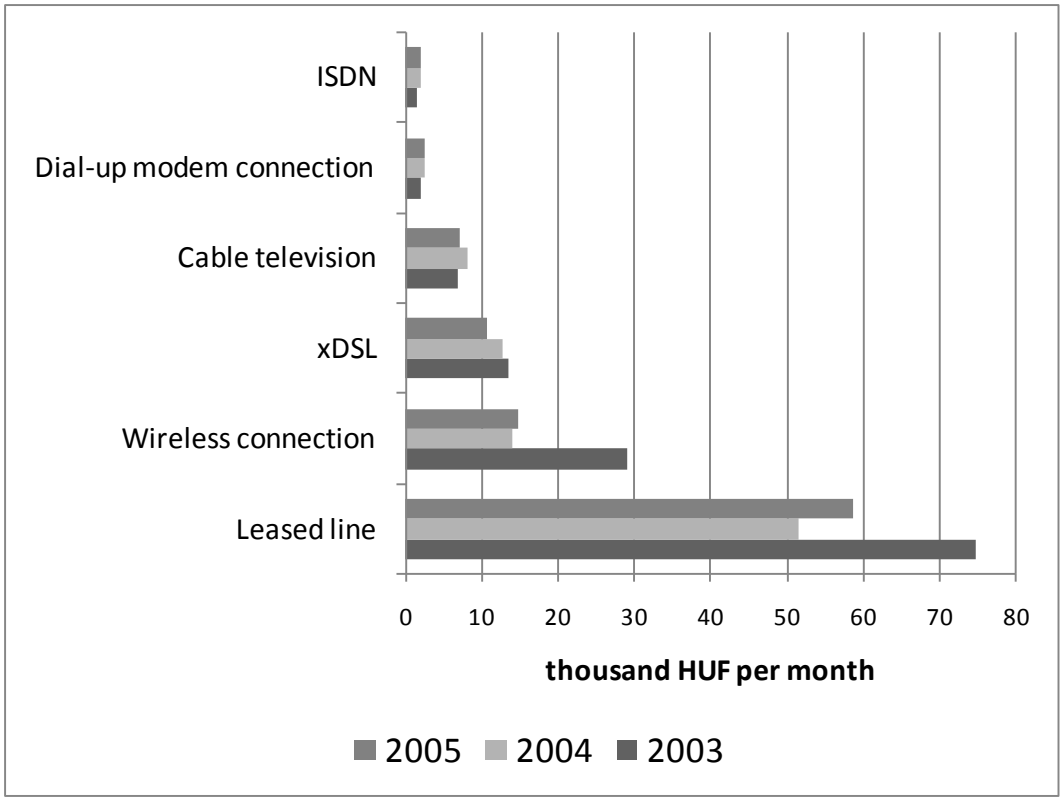


Figure 37 - Net subscription fees for Internet access services on average per month (for enterprises)

Source: Net subscription fees for Internet access services on average per month in 2006, Hungarian Central Statistical Office, 2006

The main cause of the drastic increase in the number of broadband connection in Hungary is that prices were favourable [**Figure 37**]. According to figures from the National Statistical Office, the price of leased lines reduced by 31%, while the price of wireless connections were down by 51% in 2004. There was a 6% reduction in the price of xDSL in 2004, which was followed by a 16% reduction in 2005.

Broadband communication is proportional to the size of enterprises [**Figure 38**], which is shown by the following rates: 1% of microenterprises, 4% of small-sized enterprises, 8% of medium-sized

enterprises, 17.5% of corporations. Low-speed connection was observed in more than a quarter of enterprises, while the rate of wireless, mobile connection was nearly 15%. Medium-speed communication was used by more than half of microenterprises and more than 40% of SMEs in 2006.

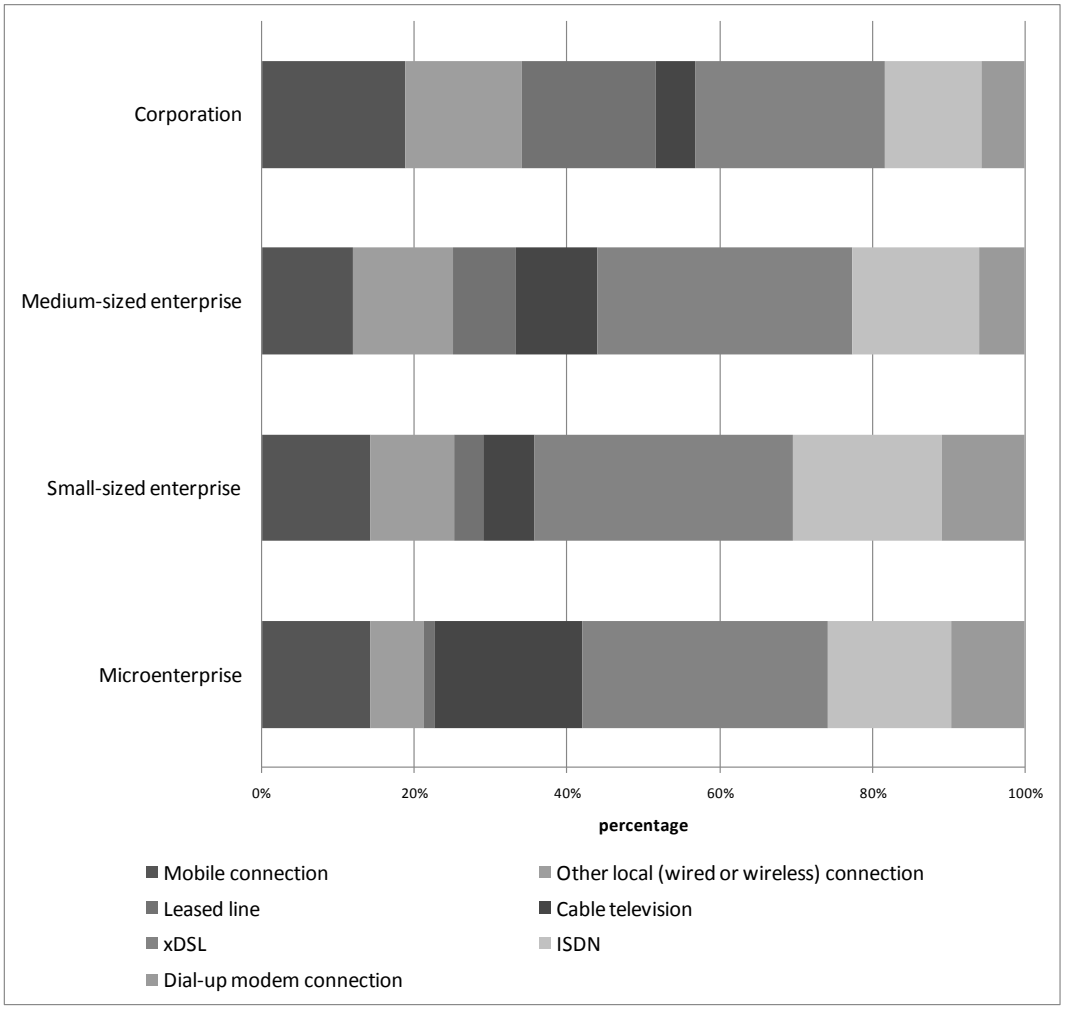


Figure 38 - Types of Internet access for enterprises having Internet connection in Hungary in 2006

Source: Individual primary research

Low-speed connection was particularly significant in the sectors 'Real estate, renting and business activities' (43%), 'Hotels and restaurants' (36%) and 'Agriculture, hunting and forestry' (33%) [**Figure 39**]. xDSL and cable television connection was rather significant in the sectors 'Health and social work' (55%), 'Wholesale and retail trade; repair work' (47%) and 'Financial intermediation' (45%). Leased line connections performed well in the fields of 'Transport, storage and communication' (17%) and 'Electricity, gas and water supply' (11%).

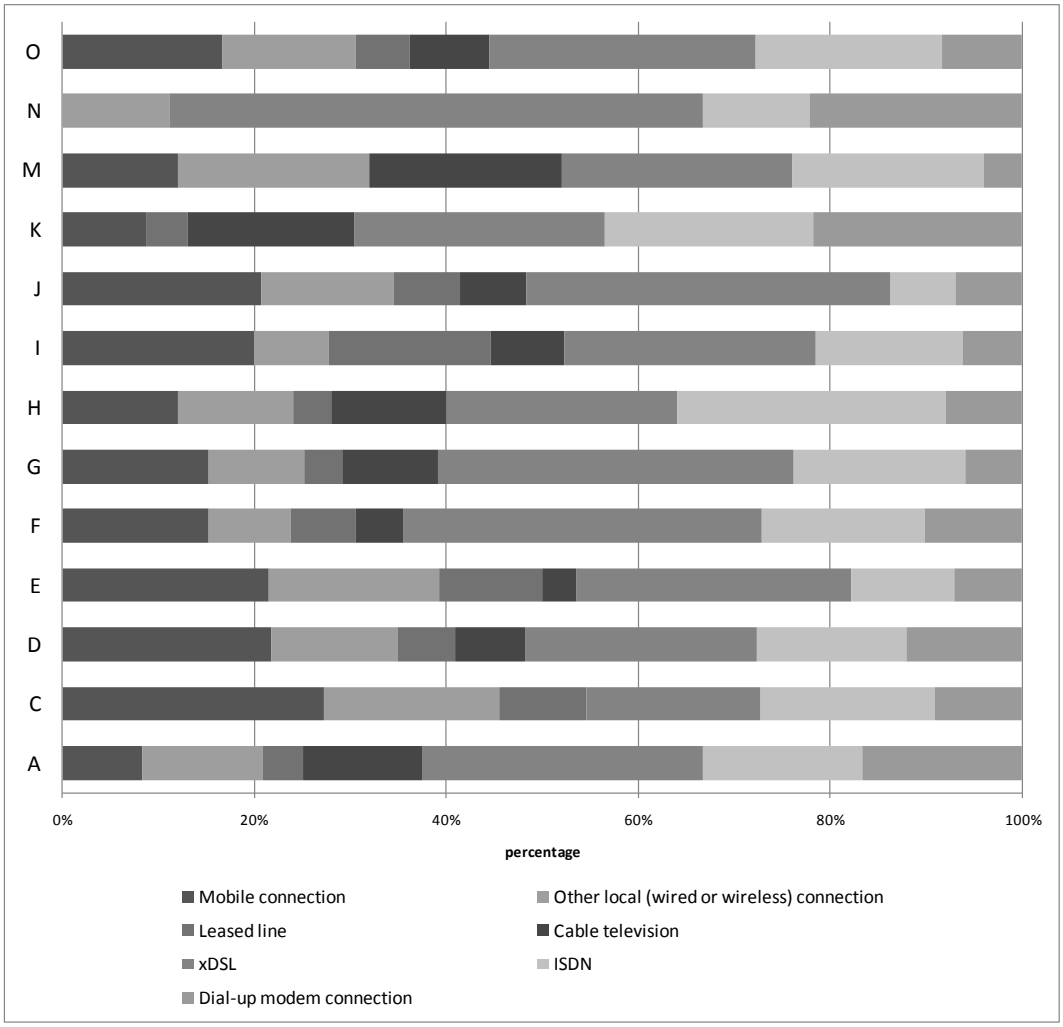


Figure 39 - Types of Internet access for enterprises having Internet connection by economic sectors in Hungary in 2006

Source: Individual primary research

5.1.2 The study of utilizing information and communication technology

5.1.2.1 Studying the purpose of utilizing information and communication technology

The analysis of the purposes of using the Internet belongs to the qualitative indicators of the development. The number of enterprises having Internet access is only a rough indicator of an otherwise dynamic growth; we can obtain a more detailed picture by reviewing what the Internet is exactly used for.

Analysing Internet usage preferences, it can be stated that the ranking of the most important purposes in using the Internet did not change essentially compared to the ranking in 2002. Enterprises using the Internet were mainly online for **searching for information** (96-98%) and **sending and receiving e-mail** (91-98%) [**Figure 40**]. The access to **education and training material**s increased year by year (17% in 2002 and 43% in 2007), as well as the role of **advertising and marketing** (40% in 2002 and 64% in 2007). A spectacularly dynamic increase could be observed in using **banking and financial service**s (46% in 2003 and 64% in 2007). **Market tracking** became more important for enterprises as it increased by 14% (40% in 2003 and 54% in 2007).

The role of **buying and selling products and services** was also significant (28% in 2005 and 49% in 2007). The access to **after sales services** attracted considerably less enterprises to the Internet (13% in 2005 and 25% in 2007). Based on these figures, it is clear that beside searching for information and sending and receiving electronic letters, other activities were becoming more significant on the Internet. In international comparison, the penetration rate of after sales services was 33% in the EU in 2007. In some northern countries (Sweden, Iceland and Norway), the same figure reached 70%. The penetration rate was more or less the same as Hungary's in the following countries: Austria, Latvia, Poland and Romania. The Czech Republic, Germany and Denmark produced rates around 50%.

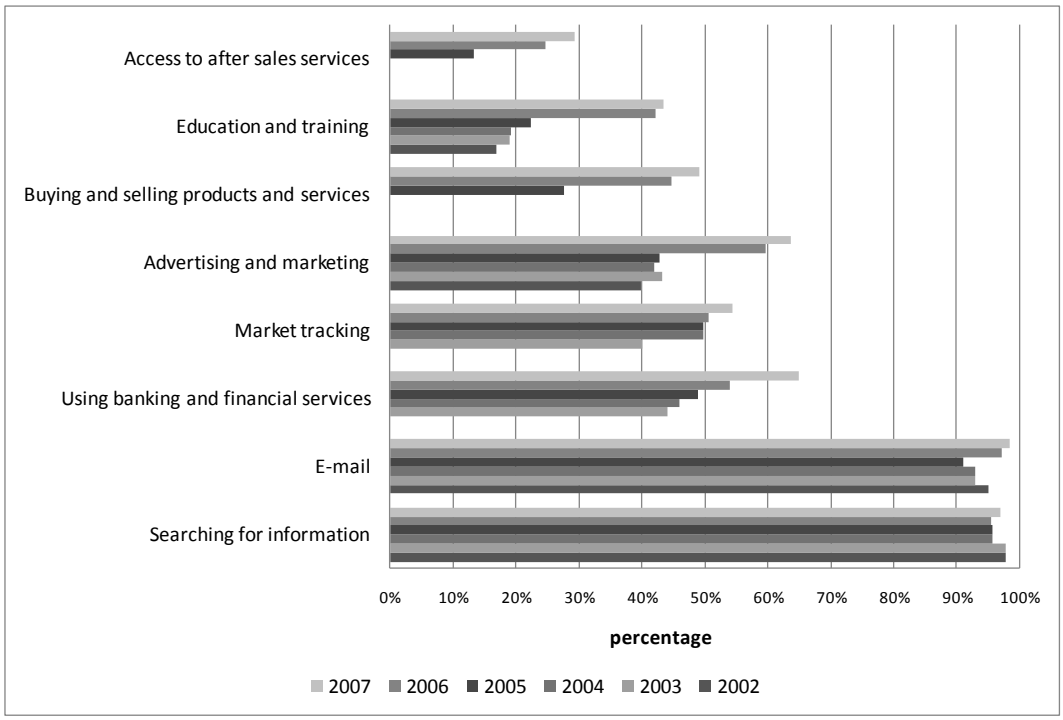


Figure 40 - Purposes of using the Internet in Hungary between 2002 and 2007

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, Individual research, 2006

The average penetration rate of using **banking and financial services** in the EU was nearly 80% [**Figure 41**]. Countries showing the highest rates were Denmark (93%), Slovenia (92%), Finland (91%) and Sweden (90%). Rates below 70% were observed in Hungary and in the newly-admitted countries, Romania (42%) and Bulgaria (44%).

The significance and the occurrence of **market tracking** has been declining in the EU year after year. The average rate of this activity was 49% in the EU-25, which was less by 4% than in 2005. The highest rates were shown by Slovenia (73%), Slovakia (70%) and Sweden (70%). According to my assumption, ICT with its devices is shifted from primary information extraction to information service. (It can be proven by the growth of penetration.) This could also be explained by the fact that in several countries such as Belgium, Bulgaria, The Czech Republic and Spain higher or lower penetration rates could be experienced instead of a monotonical decrease.

Although the access to **education and training materials** was not measured by the EU, the penetration of **e-learning**, which means web-based distance education using by ICT devices, is

well-documented. This activity was quite rare among Hungarian enterprises with a rate of 16% in 2007, which was 6% less than the average of the EU.

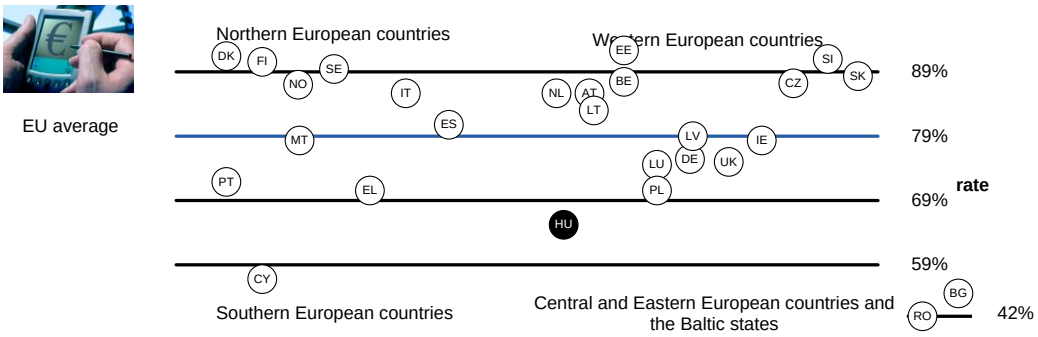


Figure 41 - Proportion of using banking and financial services in certain EU countries in 2007

Source: Eurostat, Community survey on ICT usage in enterprises, 2008

The penetration rate of sending and receiving **e-mail** and **searching for information** was above 90% in every company size [**Figure 42**]. The rate of using **banking and financial services** was 62% in microenterprises but it was more than 70% in the case of small-sized enterprises (72%), medium-sized enterprises (72%) and corporations (76%).

In terms of advertising and marketing, and market tracking, a penetration rate of above 60% could be observed in SMEs and corporations. Nearly third of the enterprises employing less than 10 workers used the Internet for advertising, marketing and market tracking. Access to education and training materials was significant only in corporations with 62%, the same rate for micro- and small-sized enterprises remained below 30%. The **access to after sales services** was not particularly characteristic to any size category.

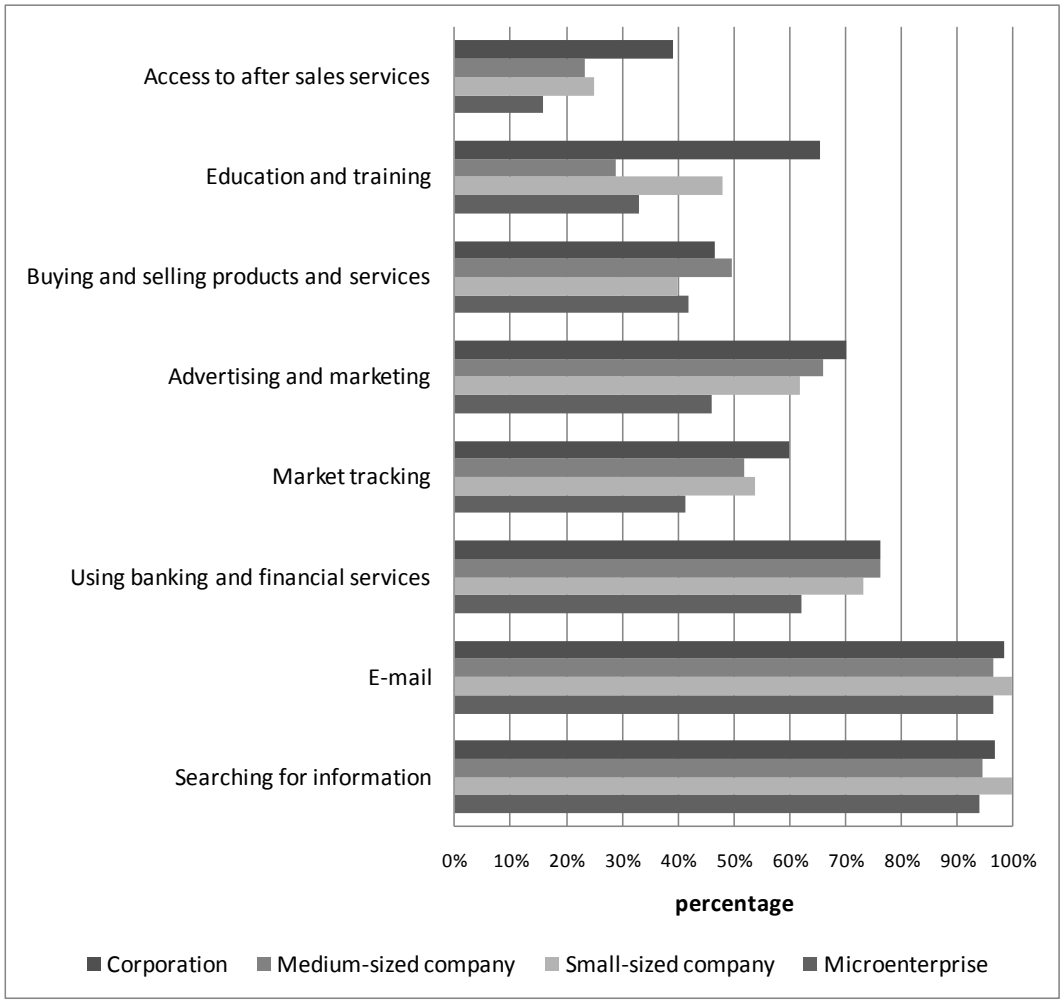


Figure 42 - Purposes of using the Internet in connection with company size in Hungary in 2006

Source: Individual primary research

The penetration of Internet users was dissimilar in various economic sectors [**Figure 43**]. The highest penetration rate was noted in the sectors 'Financial intermediation' (97%), and 'Electricity, gas and water supply' (95%) in 2005. This rate was higher than the national average (78%) by more than 17%. Rates above 80% were measured in the sectors 'Mining and quarrying' (88%) and 'Transport, storage and communication' (83%) - the EU's average stood at 90% in the given economic sector. The lowest rate was shown by the 'Hotels and restaurants' sector (59%).

In international comparison, the penetration rate shown by 'Manufacturing' (81%) was 10% less than the EU-25 average. With this result, the Hungarian 'Manufacturing' sector held the 18th position among the surveyed 24 countries.

The 'Wholesale and retail trade; repair work' sector became last but one with 80% compared to the other surveyed countries. 'Real estate, renting and business activities' with its 80% showed a rate 14% less than the EU-25 average, taking the last position among the surveyed countries.

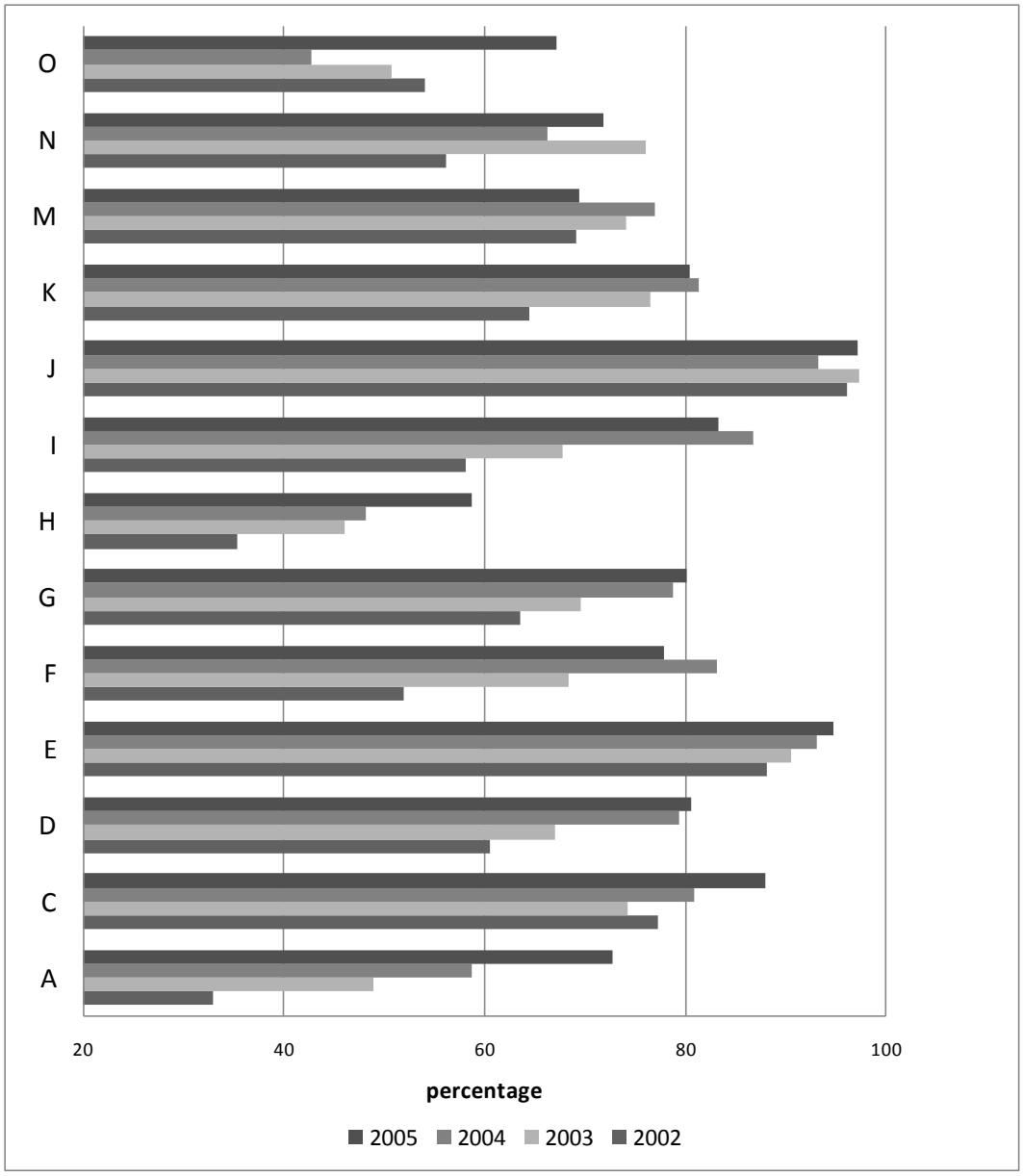


Figure 43 - Proportion of enterprises using the Internet by economic sectors in Hungary between 2002 and 2005

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, 2005

Examining Internet usage preferences in connection to economic sectors, it can be noted that using **banking and financial services** was most significant in the sectors 'Transport, storage and communication' (73%), 'Real estate, renting and business activities' (70%) and 'Construction' (70%) in 2005. Market tracking was an important purpose for 70% of enterprises operating in the 'Financial intermediation' sector. The Internet was used most frequently for the purpose of advertising and marketing by enterprises operating in the sectors 'Hotels and restaurants' (69%), and 'Other community, social and personal service activities' (65%). **Purchasing and selling products and services** was mostly characteristic to enterprises in the sectors 'Hotels and restaurants' (43%), 'Health and social work' (36%) and 'Real estate, renting and business activities' (32%). With the

purpose of accessing education and training materials, mainly enterprises represented in the 'Education' sector used the Internet (55%).

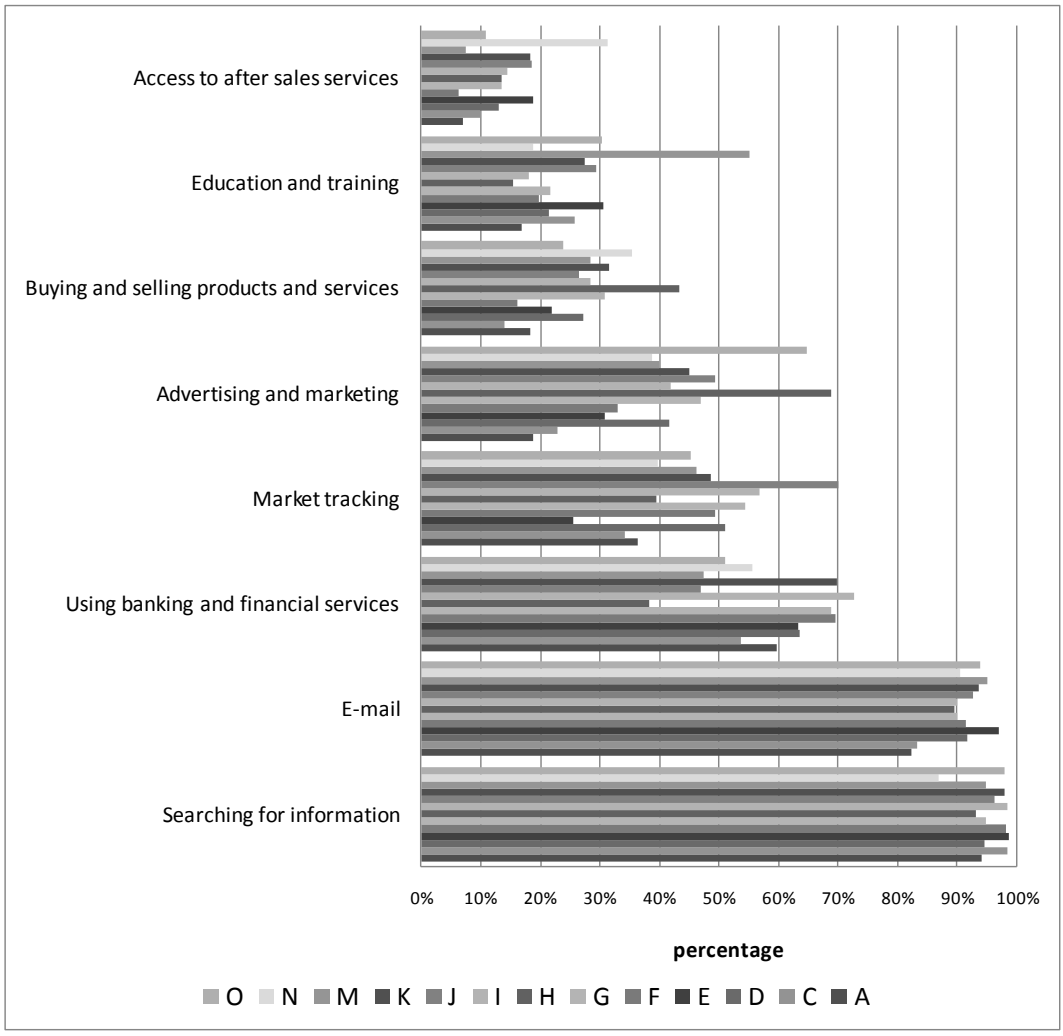


Figure 44 - Purposes of using the Internet in connection with economic sectors in Hungary in 2005

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, 2005

5.1.2.2 The study of services provided by information and communication technology

An also important indicator of using the Internet for business purposes is the penetration of **website**s and the quality of their content among enterprises. 47% of enterprises having an Internet connection had a web site in 2007 [**Figure 45**]. This indicates a 12% increase within three years. The penetration rate of enterprises having a web site in the EU was 65%. The highest rates were noted in Sweden (85%), Denmark (84%) and Finland (81%). On the other hand, the lowest penetration rates were shown by Bulgaria (31%) and Romania (28%) in the EU.

The rate of small-sized enterprises having a web site in Hungary was 43%, which was 18% less than the EU average in the same company size. Even lower rates were shown by Portugal (38%), Romania (25%), Cyprus (41%), Latvia (34%), Lithuania (42%) and Bulgaria (25%).

The penetration rate of medium-sized enterprises having a web site was 66%, considerably less than the EU average which stood at 83% in 2007. Hungary with its figure held the last position in the ranking of the surveyed member states. The rate of corporations having a web site was 17% less than the average of the EU, which showed 92%. Hungary could overtake only Latvia with its relatively poor result. In 2007, the penetration rate of enterprises having a web site was 49% in the 'Manufacturing' sector, 59% in 'Electricity, gas and water supply', 36% in 'Construction', 47% in 'Wholesale and retail trade; repair work', 44% in 'Transport, storage and communication' and 51% in 'Real estate, renting and business activities' in Hungary.

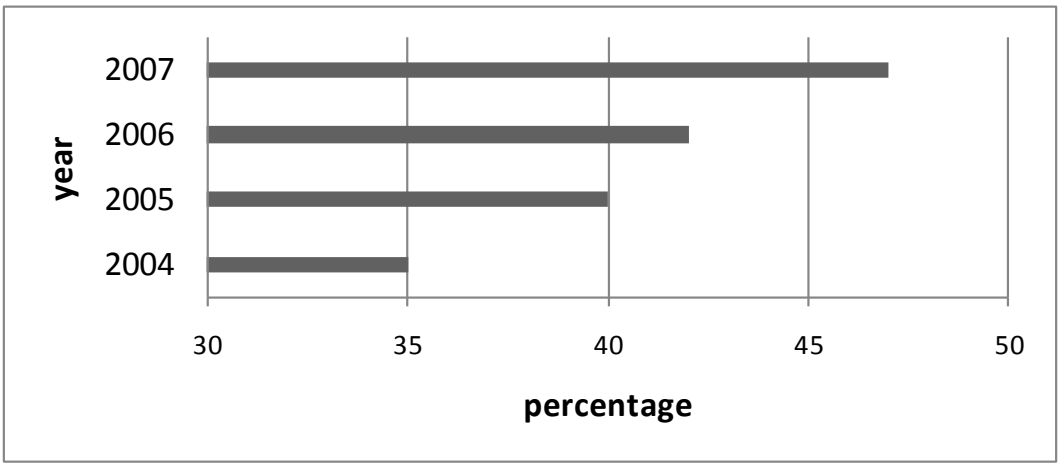


Figure 45 - Proportion of enterprises having a website in Hungary between 2004 and 2007

Source: Eurostat, Community survey on ICT usage in enterprises, 2008

The sequence of services available on enterprises' web sites did not change compared to 2002 [**Figure 46**]. Among the available services, providing **corporate information** (90% in 2002 and 93% in 2007) and **information on products and services** (91% in 2002 and 78% in 2007) remained prevalent. They were followed by product marketing (49% in 2005 and 62% in 2007), **selling products and services** (11% in 2002 and 38% in 2007), **customer service** (17% in 2002 and 38% in 2007), **job advertisements** (11% in 2002 and 45% in 2007) and finally **after sales services** (10% in 2002 and 44% in 2007).

The role of offering **online payment facilities** was not really significant (2% in 2002 and 12% in 2007). The reason for this low penetration can be explained by languid legislation processes and a slowly dispersing mistrust toward this type of service. Furthermore, offering **personalised content on website for regular visitors** was not remarkable either (4% in 2003 and 17% in 2007), along with **online service and digital products** (6% in 2002 and 16% in 2007), **providing Internet access through mobile phone** (3% in 2002 and 14% in 2007) and **offering security transactions** (3% in 2002 and 13% in 2007).

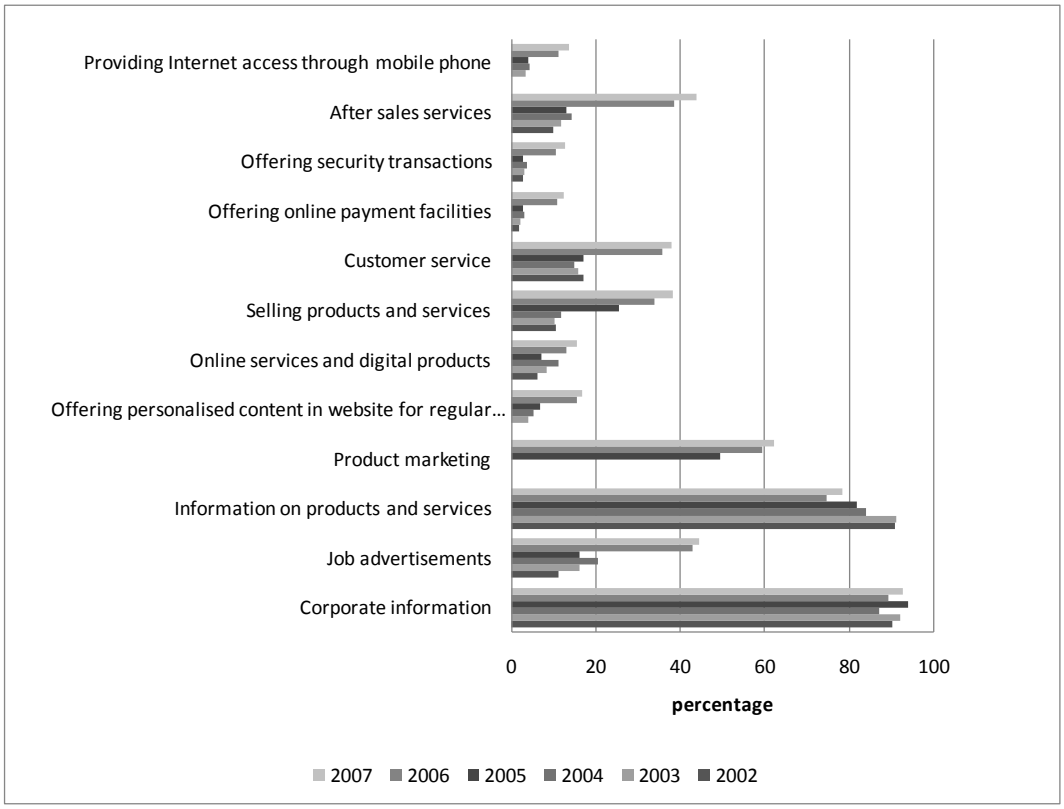


Figure 46 - Proportion of services offered on the websites of business organizations in Hungary between 2002 and 2007

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, Individual research, 2005

Microenterprises [**Figure 47**] did not reach a penetration rate higher than 71% in any of the surveyed services provided by their **website**s in 2006. The penetration rate was higher than 50% regarding **corporate information** (71%), **information on products and services** (68%), and **product marketing** (52%). The rate was higher than 25% in services such as **selling products and services** (48%) and **after sales services** (30%).

Low rates were observed in the remaining services, including job advertisements, offering personalised content on website for regular visitors, online service and digital products, customer service and offering online payment facilities.

There was a relatively high penetration rate shown by small-sized enterprises in the fields of corporate information (93%) and product and information on products and services (73%). In terms of medium-sized enterprises - similarly to small-sized enterprises -, high rates were measured in corporate information (89%) and information on products and services (79%), while the rate of product marketing (59%) was around the average. The remaining indicators signalled considerably low penetration rates.

In the case of corporations, the penetration rate of online service and digital products was 9%, corporate information was 8% and after sales services was 6% higher compared to medium-sized enterprises. The rate of job advertisements was 25% higher than the rate measured in the case of small and medium-sized enterprises, and there was a fourfold increase compared to microenterprises. The other surveyed parameters showed less than only 5% divergence.

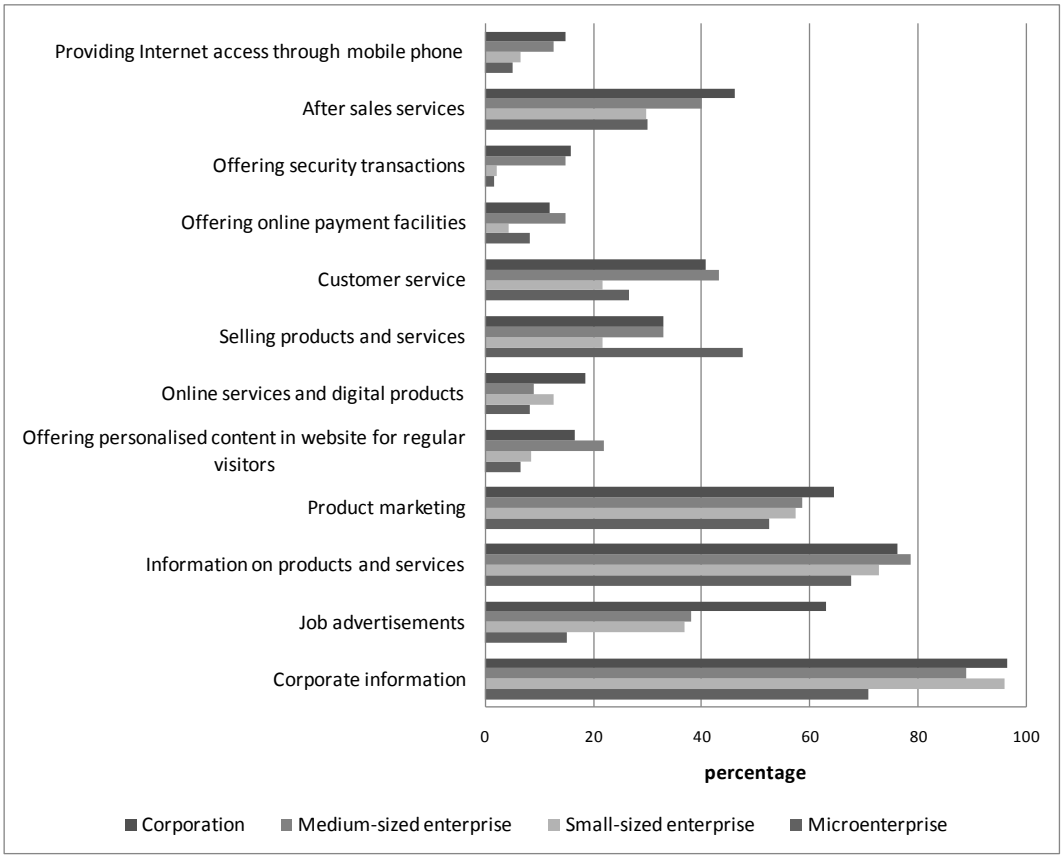


Figure 47 - Proportion of services offered on the websites of business organizations by company size in Hungary in 2006

Source: Individual primary research

Examining the services offered on the **website**s of various business organizations in connection with several economic sectors, it can be observed that **information on products and services** was mostly characteristic to the 'Financial intermediation' sector (97%) [**Figure 48**]. **Selling products and services** was significant in the fields of 'Hotels and restaurants' (55%) and 'Health and social work' (44%). Offering **security transactions** was the most widespread in the sectors 'Financial intermediation' (17%) and 'Transport, storage and communication' (6%), while offering **online payment facilities** was mostly provided by the web sites of economic organizations operating in the 'Financial intermediation' (8%) and 'Construction' (6%) sectors.

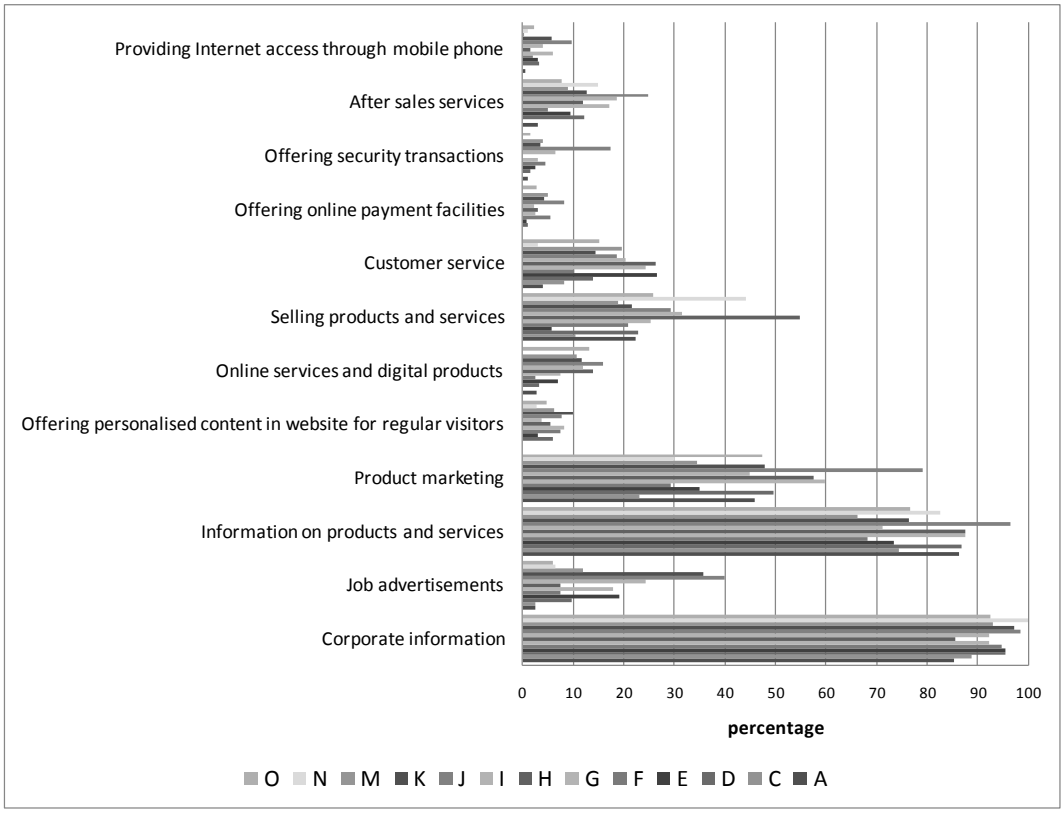


Figure 48 - Proportion of services offered on the websites of business organizations in connection with economic sectors in Hungary in 2006

Source: Individual primary research

5.1.2.3 The study of the conditions of sales provided by information and communication technology

In consideration to its economic effects, **e-commerce** is one of the most important forms of application of ICT devices, holding a prominent position in the EU's development plans. E-commerce has a share of 17% in retail turnover in those developed countries that has been successfully utilizing information and communication technology. Apart from its obvious importance, e-commerce could be observed only in 8% of enterprises (4% in 2004, 3% in 2003).

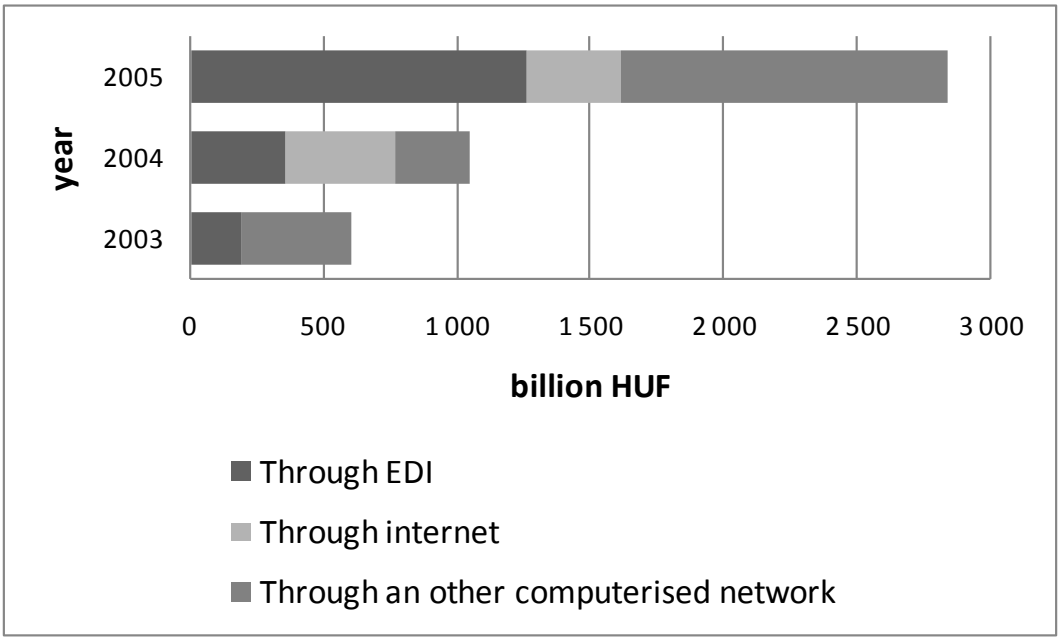


Figure 49 - Net turnover realized through computer networks in Hungary between 2003 and 2005

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, 2005

The net turnover realized through computer networks was 2844 billion HUF [**Figure 49**]. The same amount was 601.9 billion in 2003 and 1051.1 billion in 2004. 7% of the total turnover of enterprises resulted from purchases through computer networks, which was a 4% increase compared to 2004. 45% of the total turnover realized through computer networks was achieved on the Internet, 12% on **EDI** platforms and 43% through other computer networks.

In order to answer the question of what information and communication technology is used for by enterprises (search for information, product purchase or keeping in touch with their customers and suppliers), the following indicators should be examined:

- **Reordering systems** (stockpiling),
- **Invoicing and payment systems**,
- **Production, logistics and/or service systems**,
- **Purchasing systems**,
- **Sales systems**,
- **Other computer systems**.

These systems perform their tasks either independently or in an integrated way.

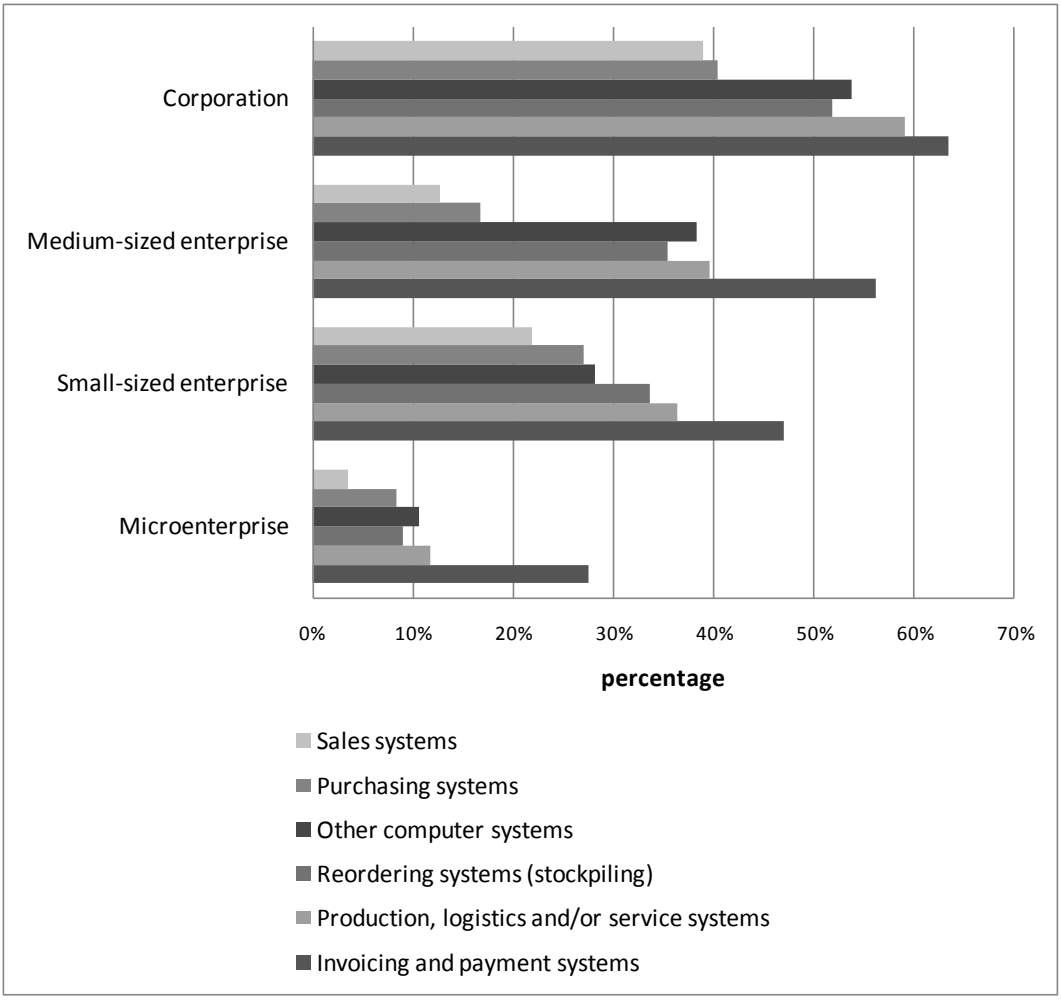


Figure 50 - Proportions of various systems used in computer networks by company size in Hungary in 2006

Source: Individual primary research

Among the indicators, e-invoicing (invoicing and payment systems) showed the highest penetration rate in every company size with an average of 46% [see **Figure 50**]. The category of corporations produced rates well above the average (by 17-25%) in every surveyed indicator. Microenterprises, however, reached rates below the average by nearly 10% regarding the following for indicators: reordering systems 9%, purchasing systems 8%, production, logistics and/or service systems 12% and other computer systems 10%. The rate of sales systems was 5% lower than the average, while in the case of invoicing and payment systems the difference was more than 25% in 2006.

Based on my questionnaire research, in the case of microenterprises the pace of growth did not reach the pace of the national average in five surveyed indicators (production, logistics and/or service systems was the only exception with 4%, while the national average stood at 2.5%).

In the sectors 'Transport, storage and communication' and 'Electricity, gas and water supply' the results were higher, while in 'Agriculture, hunting and forestry' and 'Education' they were lower than the national average in every surveyed parameter.

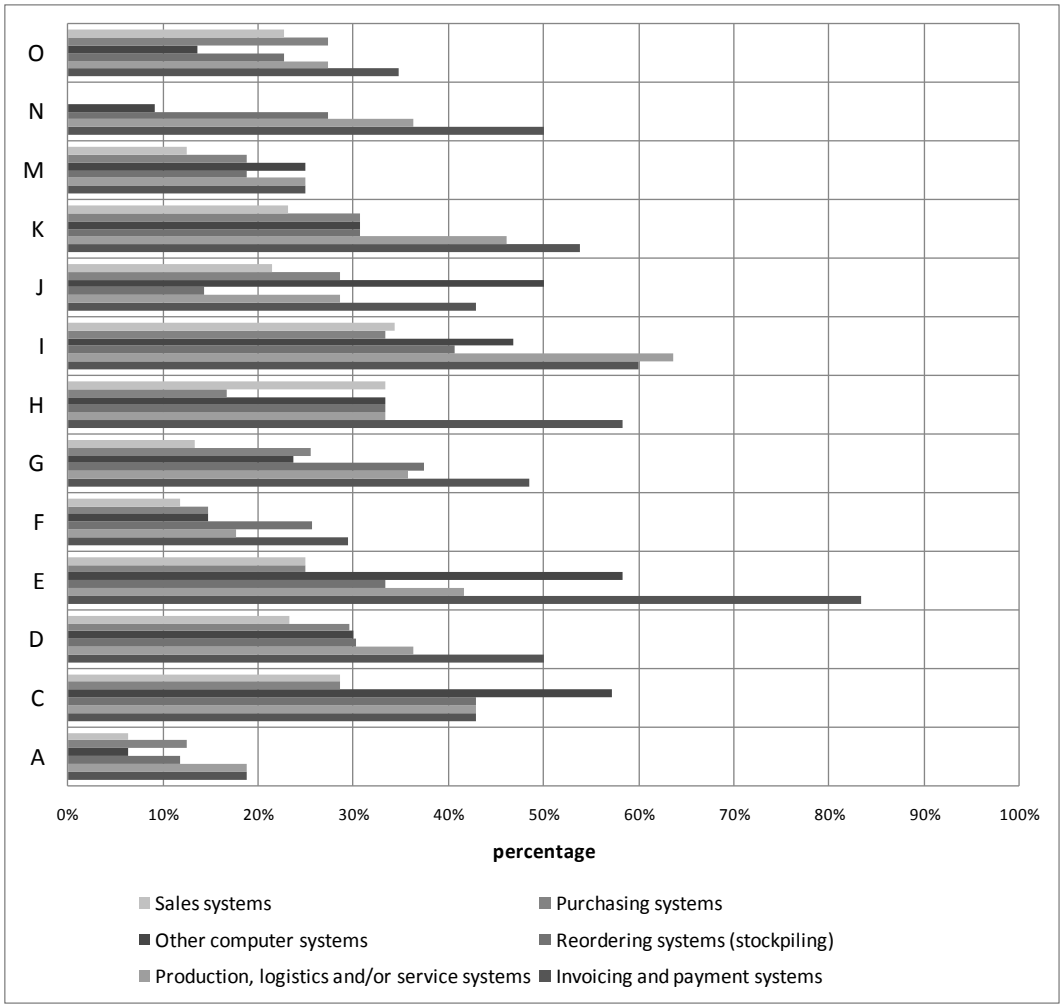


Figure 51 - Systems used in computer networks in connection with economic sectors in Hungary in 2006

Source: Individual primary research

5.1.3 The limitations of utilizing information and communication technology

Information and communication technology is advancing year by year with the appearance of more and more modern and up-to-date devices. Based on this, the technology outlook for the future may contain the following suggestions:

- Information and communication technology devices will have a more enhanced performance.
- The interconnectedness of devices will take place.
- Information processing and data exchange capacities will appear in the surroundings of ICT devices.
- The operation of IT systems will start showing more and more intelligent traits.
- Several types of services will start playing a major role in the operation of IT systems.
- The cooperation between the users of IT systems will become stronger.
- The secure operation (defence, safety) of IT systems will create a more and more challenging problem.

5.1.3.1 The limitations of Internet-based services provided by information and communication technology

According to the surveyed enterprises, the most important limit to the penetration of the Internet in 2004 was jeopardizing confidential information [see **Figure 52**]. In terms of judging the significance of the other limiting factors, no major divergence was shown by the surveyed enterprises (with a significance rate of 16-22%). The least significant limit was the difficulty of using the Internet because of its complexity, this factor was listed among the non-significant ones by 69% of enterprises.

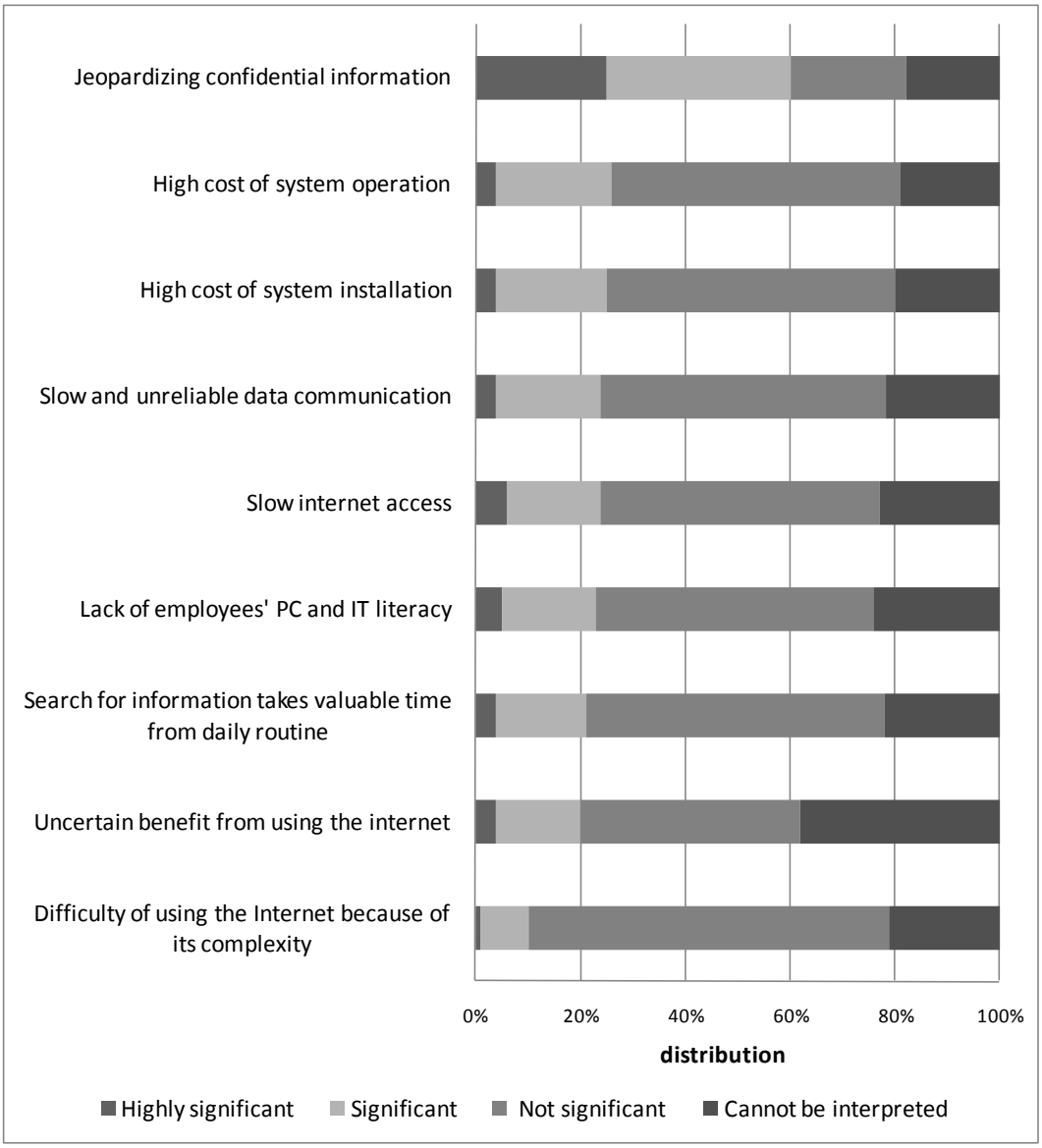


Figure 52 - Limits of using the Internet in Hungary in 2004

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben és 2005-ben (The usage and availability of ICT devices by business organizations in 2004 and 2005), Hungarian Central Statistical Office, 2005

5.1.3.2 The limitations of sales provided by information and communication technology

In 2004, the most significant limit to sales on the Internet was that they had more reliance on traditional trade based on personal contacts [see **Figure 53**]. The second most significant limiting

factor for enterprises was that their type of product or service did not support using e-commerce. These were followed by the limits of uncertainties regarding payment and the availability of confidential information to unauthorized persons.

High cost of installing and operating e-commerce systems and uncertainties around terms of agreement, delivery deadlines and warranties were also listed as significant limiting factors.

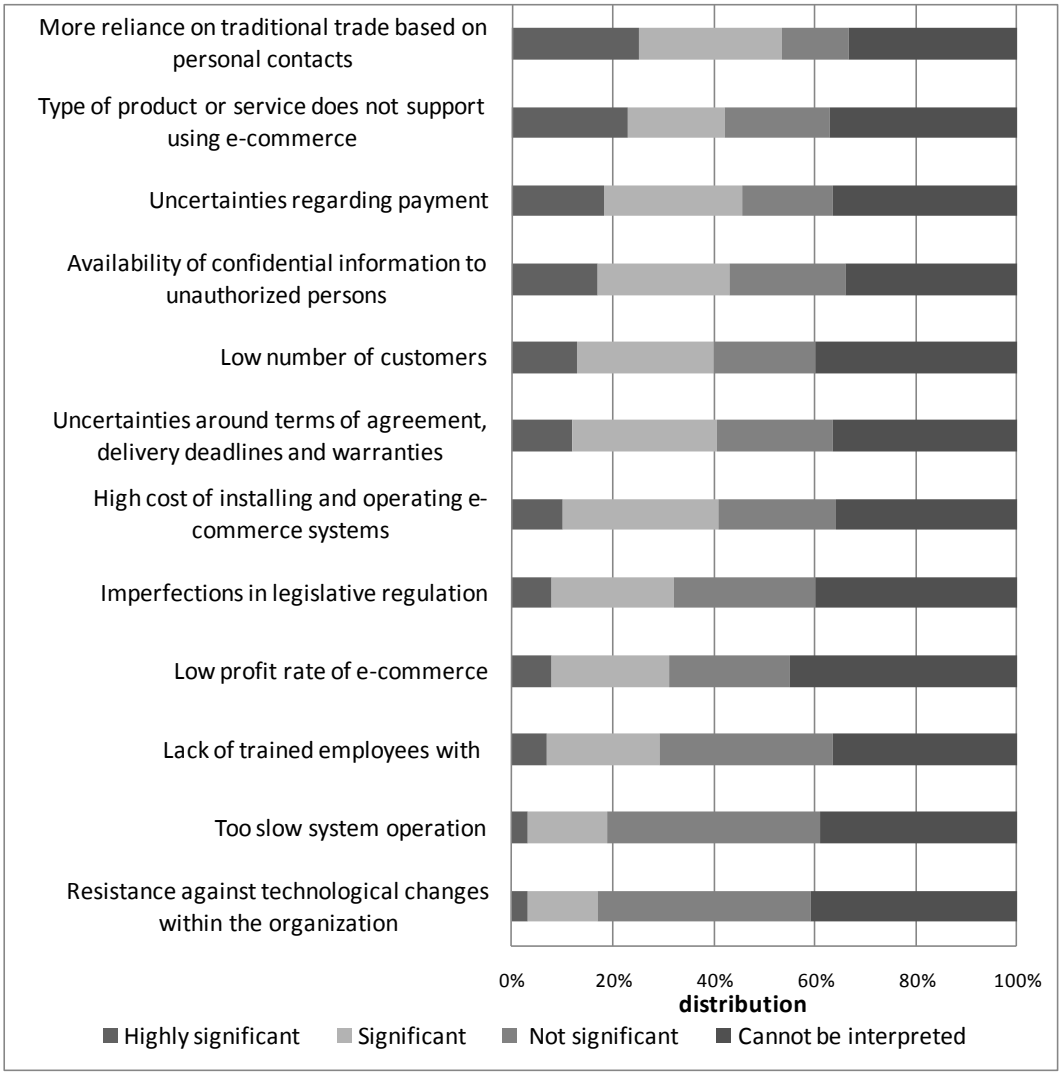


Figure 53 - Limits of using e-commerce in Hungary in 2004

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2004-ben (The usage and availability of ICT devices by business organizations in 2004), Hungarian Central Statistical Office, 2005

5.1.3.3 The limitations of human resources using information and communication technology

In industrial systems the division of job positions are characterized by strict listings, rigid regulations and tasks determined to the last detail. ICT, however, changes the traditional division of labour based on strict job descriptions. The ability to perform many tasks became an inevitable requirement. Only those experienced employees are able to meet the new requirement who received education in quality schools.

These employees have higher salary demands than the average. Because of the complexity of the required skills, there are not enough specialists for performing IT-related tasks.

In 2007, the primary reasons for the vacancies related to ICT in Hungary were excessive salary demands (32%), followed by the lack of work experience in the field of IT (23%) [**Figure 54**].

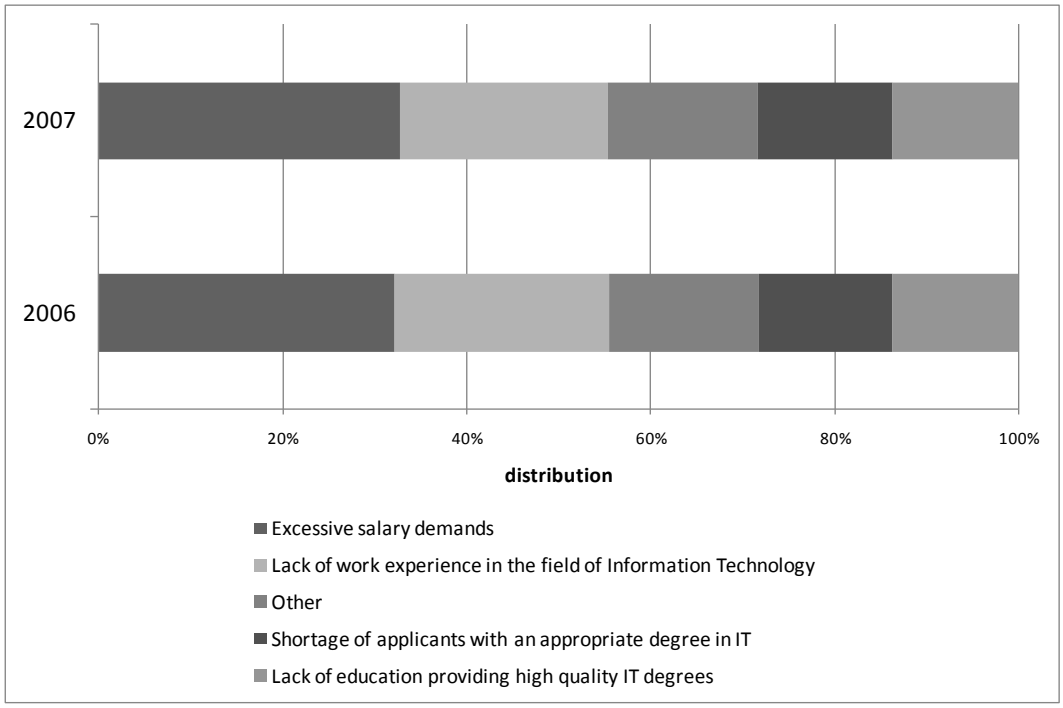


Figure 54 - Causes of labour shortage related to ICT in Hungary in 2006 and 2007

Source: Individual primary research

The occurrence of the two aforementioned parameters was higher in small-sized enterprises [see **Figure 55**]. 37% of the respondents complained about excessive salary demands, while 26% of them complained about the lack of work experience in the field of IT.

According to 20% of microenterprises, the cause of vacancies could be contributed to shortage of applicants with an appropriate degree in IT. Moreover, the same rate for medium-sized enterprises was 25%. This equals to the rates of excessive salary demands and lack of work experience. In this company size, 21% of the respondents stated that the root of the problem was the lack of education providing high quality IT degrees.

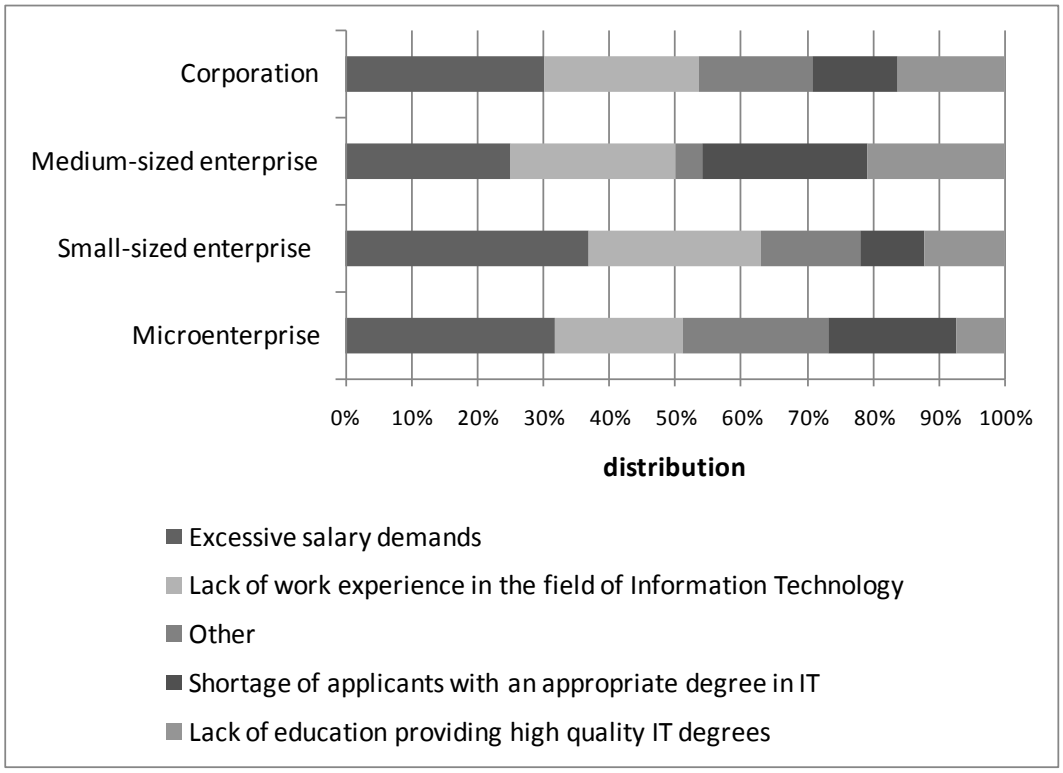


Figure 55 - Causes of labour shortage related to ICT by company size in Hungary in 2006

Source: Individual primary research

Excessive salary demands [**Figure 56**] were especially significant in the sectors 'Health and social work', 'Mining and quarrying' and 'Hotels and restaurants'. Problems triggered by the lack of work experience in the field of IT were mostly present in the 'Electricity, gas and water supply' sector. Shortage of applicants with an appropriate degree in IT was mainly characteristic to enterprises operating in the 'Agriculture, hunting and forestry' sector.

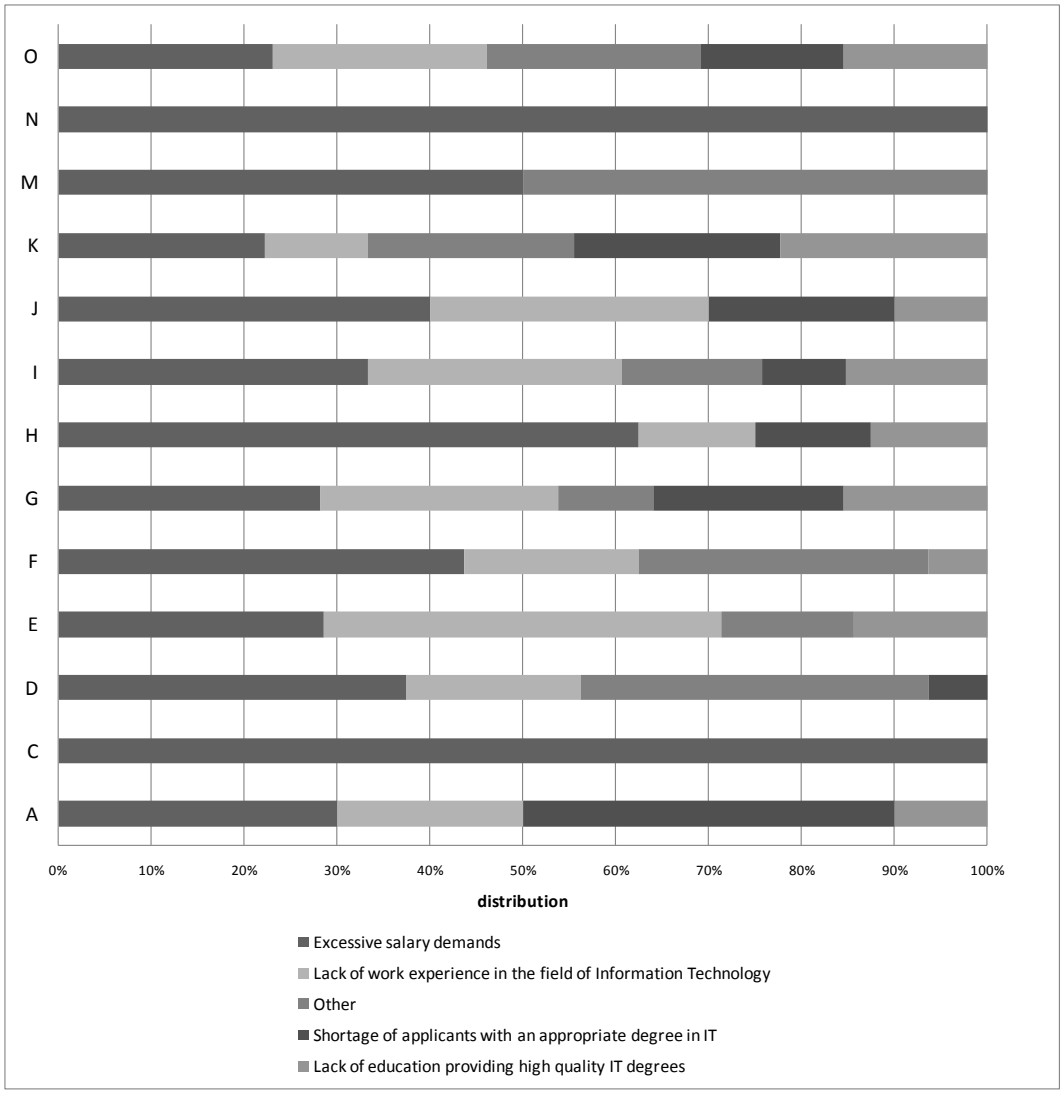


Figure 56 - Causes of labour shortage related to ICT in connection with economic sectors in Hungary in 2006

Source: Individual primary research

After reviewing the literature on the Hungarian sectoral employment structure, it can be noted that the rate of employees working in the service sector is expected to rise, while a falling rate of employees is expected in the agricultural and industrial sectors.

In the 'Agriculture, hunting and forestry' sector, the rate of employees (5.25%) is likely to fall in the future, which means an annual 0.2% decrease on average.

The number of IT employees was 1600 (2%) in this sector in 2005 [see **Figure 57**].

In 'Mining and quarrying' there was a drastic fall in the number of employees in the last ten years, employing only 0.36% of workers. The decrease is likely to continue, though at a considerably slower pace. The rate of IT employees was 4% in this sector in the studied year.

In 'Manufacturing' (22.9%) opposing to the growing trend in previous years, the number of workers in this sector is predicted to fall. Within the broader sector of 'Manufacturing', the same decrease is predicted in the manufacture of computers, electronic spare parts and telecommunication devices. In this sector, the rate of IT employees stood at 3%.

In 'Electricity, gas and water supply' a decrease is likely to take place in the total employment rate (1.6%). The number of IT employees working in this sector reached 1.5%.
7.9% of the employed worked in the 'Construction' sector. In Hungary, the number of employees is continuously growing and is predicted to rise in the future. The rate of IT employees working in this sector was 2% in 2005.
14% of workers was employed in the 'Wholesale and retail trade; repair work' sector in 2005, and a slight increase in their numbers is expected. The number of IT employees here reached 6%.
The proportion of employees in the 'Hotels and restaurants' sector was 3.8% and is expected to rise. In this sector, the rate of IT employees was 2.5% in 2005. The number of employees slightly declined in the 'Transport, storage and communication' sector (7.6%) between 1993 and 2005, although the number is expected to stagnate in the upcoming period. The number of IT employees in this sector was 2.5%.
In 'Financial intermediation' (2%), the rate of employment showed a steady increase, a trend which is expected to continue in the upcoming years. Here, the number of IT employees was relatively high, standing at 7%.
The fastest increase is predicted in 'Real estate, renting and business activities' (7% in 2005). This sector produced the highest proportion of IT employees with 11.1%. This can partly be explained by the fact that this economic sector contains a computer-related activity where the proportion of IT employees could reach 67% in 2005.
In the field of 'Education' (8.5%), after the decrease experienced in previous years, a moderate rise is predicted. Here, the number of IT employees reached 6%.
Similarly to the trend observed between 1993 and 2005, the rate of employees in the 'Health and social work' sector (6.9%) is expected to rise, though the pace of growth will accelerate according to the forecast. The rate of IT employees was 3% in this sector.
Finally, in 'Other community, social and personal service activities' (4.4%) a steady increase is expected opposing the decline experienced between 1993 and 2005. Here, the rate of IT employees exceeded 3%.

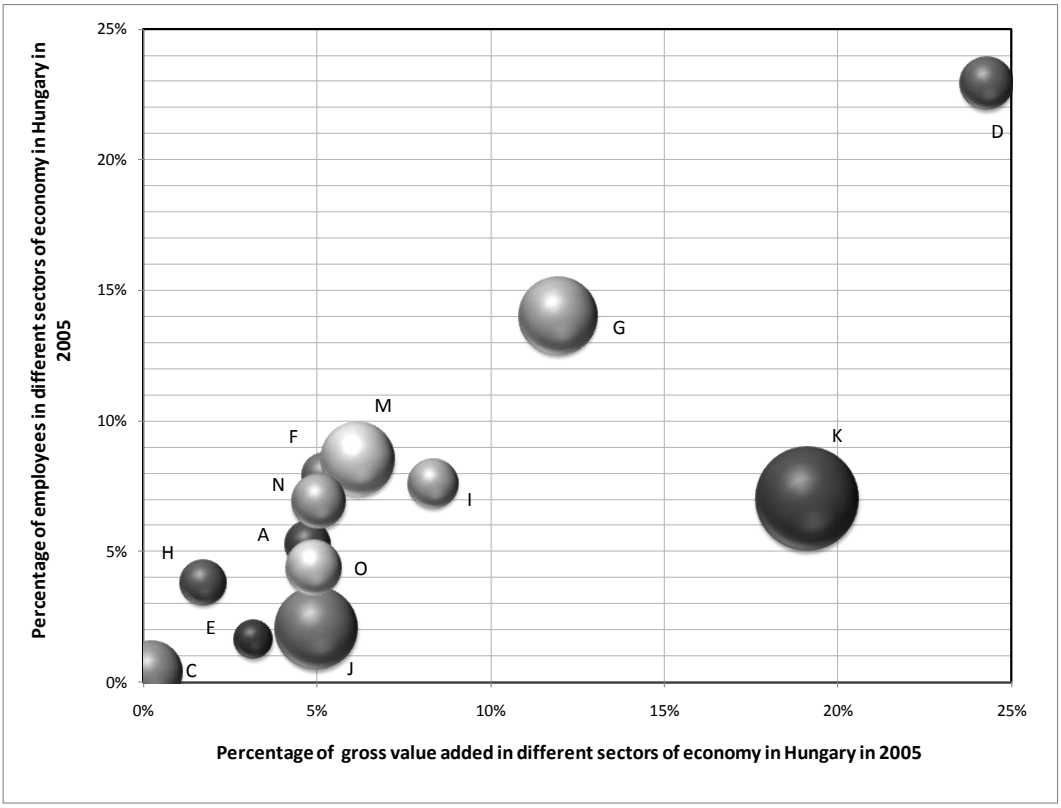


Figure 57 - Percentage of employees in the field of computer technology, in connection with gross value added and number of employees in different economic sectors in Hungary in 2005

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2005-ben (The usage and availability of ICT devices by business organizations in 2005), Hungarian Central Statistical Office, 2005

Based on my research and questionnaire, it can be stated that there is a structural unemployment among IT employees. In other words, the demand for their expertise appears in other professions and locations than their workforce can be found. This divergence has two distinctive causes:

- the structure of labour demand changes at a faster pace than the structure of labour supply,
- inflexibility of wages.

The rate of microenterprises employing IT specialists was 19%, while the demand for IT specialists stood at 10% with a lack of 7% in 2006 [see **Figure 58**]. In small-sized enterprises the rate of IT specialists was 47%, while the same figure was 72% in the case of medium-sized enterprises. The rate of enterprises looking for highly-trained IT specialists tend to rise along with the size of companies (the rate was 25% in small-sized and 36% in medium-sized enterprises). 12.5% of small-sized and more than 25% of medium-sized grappled with the lack of specialists in computer technology.

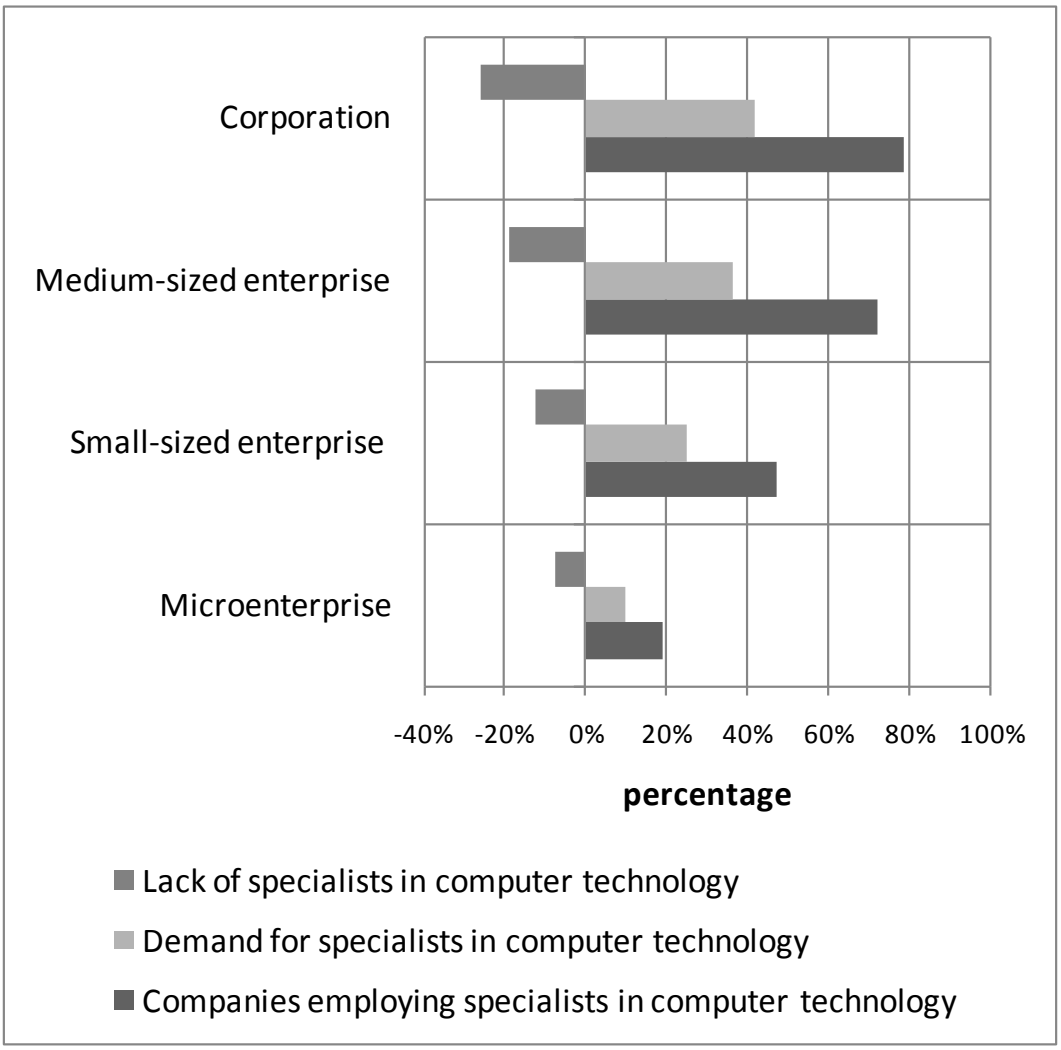


Figure 58 - Percentage of the demand for and the lack of specialists in computer technology and the number of companies employing them by company size in Hungary in 2006

Source: Individual primary research

According to my research [**Figure 59**], in 2006 IT or computer technology specialists were mostly employed in Hungary in the sectors 'Mining and quarrying', 'Transport, storage and communication', 'Electricity, gas and water supply' and 'Education' with a rate of more than 70% .

The highest demand for computer technology specialist was measured in the sectors 'Mining and quarrying' (62%), 'Transport, storage and communication' (42%) and 'Financial intermediation' (40%). 'Transport, storage and communication' (25%), 'Agriculture, hunting and forestry' (23%) and 'Real estate, renting and business activities' (23%) were the sectors mostly hit by the lack of computer technology specialists.

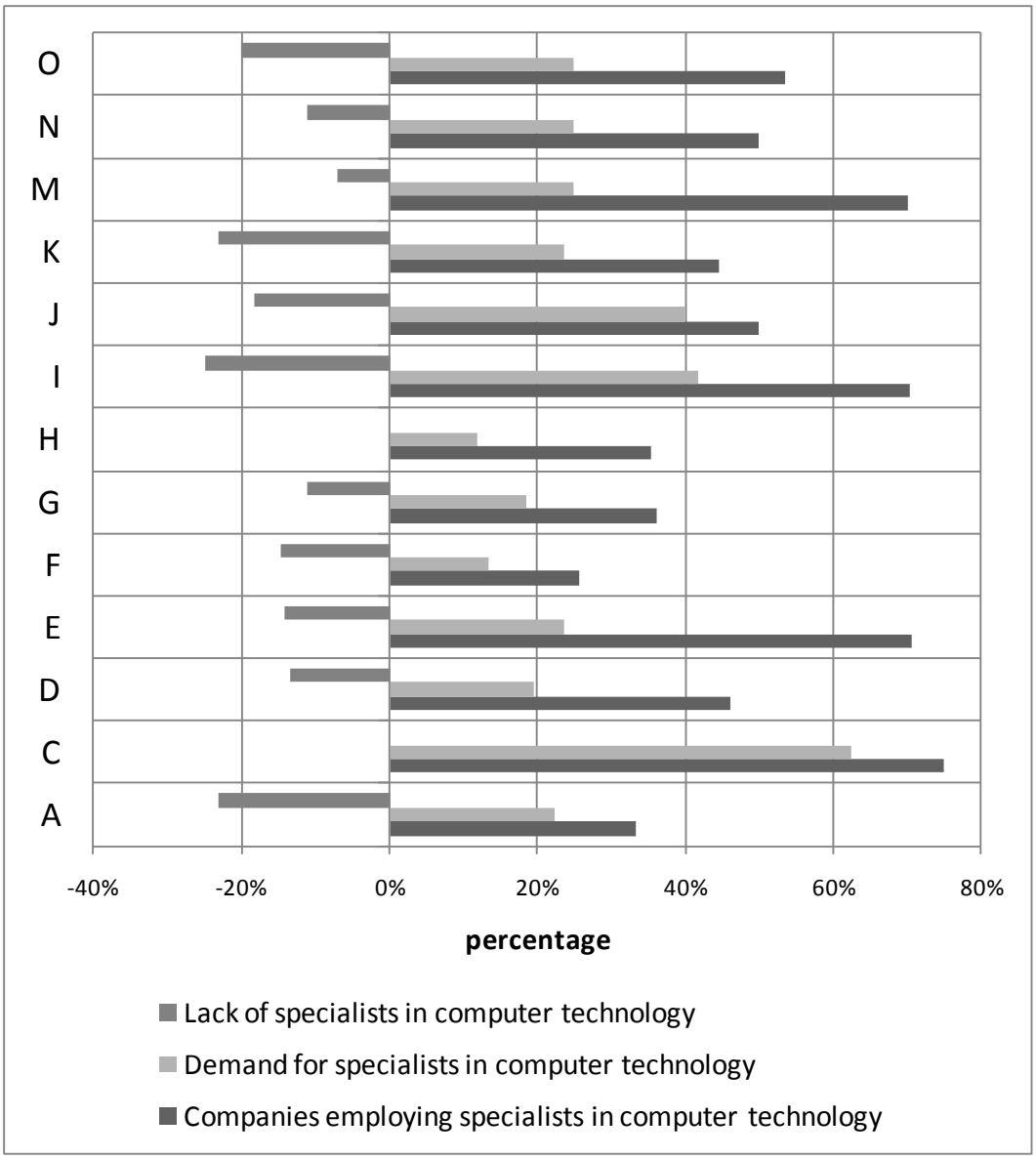


Figure 59 - Percentage of the demand for and the lack of specialists in computer technology and the number of companies in connection with different economic sectors in Hungary in 2006

Source: Individual primary research

5.2 The study of the 'small narrative' with the help of potential indicators

The penetration of information and communication technology and its related devices and the ways of how economic organizations are able to utilize or benefit from it have reached a growing importance. In order to enhance Hungary's competitiveness, it is very important to analyse to what extent information and communication technology becomes the part of our everyday life and business activities.

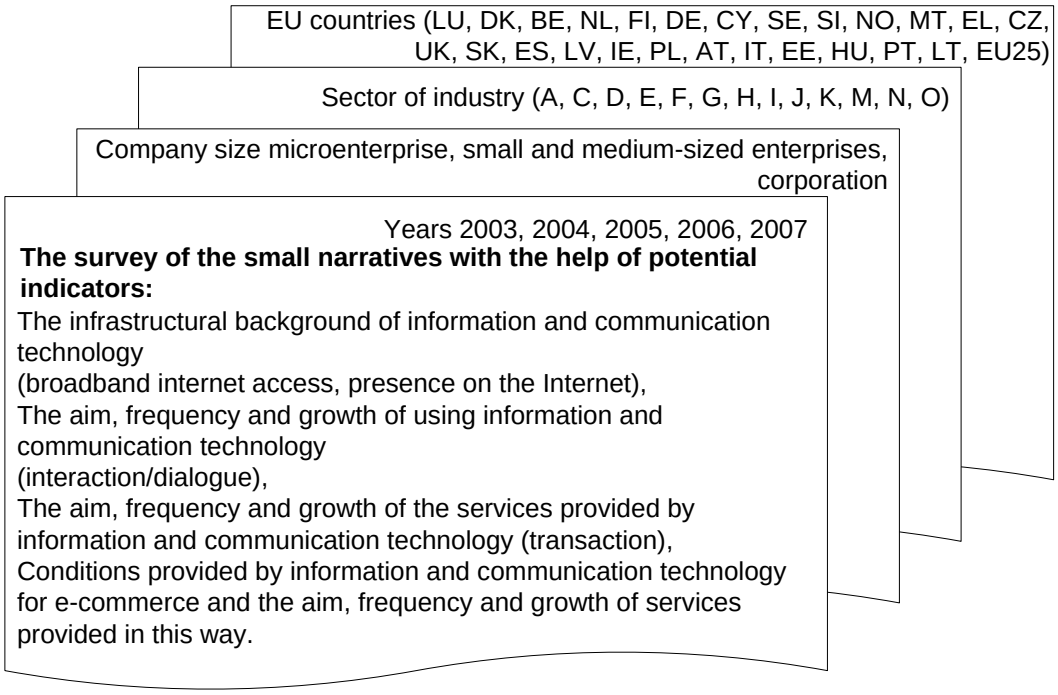


Figure 60 - Review of the small narratives in connection with time, size and economic sectors in the individual countries of the EU

Source: Individual research

The opportunities of economic organizations are largely affected by the availability of the infrastructure of information and communication technology.

One of the qualitative parameters of ICT devices and networks is broadband Internet connection. The common feature of broadband connections is that their speed can be a lot more higher compared to traditional dial-up connections, furthermore, we are provided with the opportunity to choose from broadband packages with different speeds. Today, the most frequent types of broadband connection are xDSL, cable television, leased line or microwave connection but operational connections can be established through an electrical wire or even a gas pipe. By definition[112], broadband is a type of Internet connection that provides a data transmission speed higher than 64.000 bits per second. This type of connection as a minimum requirement for quality services is also inevitable for network communication, electronic data exchange and buying and selling services online.

Information and communication technology - like any other element of infrastructure - definitely determines the future of the services based on it. The position of information infrastructure - especially the position of communication networks - can only be reassuring if their capacity does not constitute a limiting factor.

Business organizations use and provide services ensured by the use of information and communication technology.

The available communication network services are the following:

- network communication,
- electronic data exchange
- selling and purchasing products and services.

Network communication can be unidirectional or bidirectional. In the case of unidirectional communication (information search, market observation, advertising and marketing) information is directed to a person or organization without having the possibility to give a feedback or reply to the original piece of information by sending a message. Contrary to this, in the case of bidirectional communication every participant in the process has the opportunity to reply or forward their messages.

Electronic data exchange basically is using tax, banking and financial services. Its infrastructural background is established by **Electronic Data Interchange** (**EDI**). EDI enables various organizations to exchange information. The basic requirement towards the information system of any public administrative organization is the ability of exchanging structured information between their applications. The efficiency, reliability and availability of administrative processes requiring inside and outside communication can be dramatically improved by EDI. An EDI connection can be Internet and non-Internet based.

One of the biggest problems for a company when trying to sell their products and services is how to pass their products to the customers (selling and purchasing products and services, education and training) in a way that is both convenient for customers and economical and efficient for the company.

First, business organizations use services, then, in the next phase, they try to provide these services.

The possible forms of unidirectional communication are: putting some information on the company onto their web site, information on products and services, job advertisements, product marketing and customer service. (Some of these features can also be made bidirectional as well.)

The opportunity of performing safe and secure transactions also belongs to the area of electronic data exchange.

Offering personalised content in website for regular visitors, online services and digital products, selling products and services, offering online payment facilities, after-sales services and providing Internet access through mobile phone also belong to the direct services provided by a business organization.

The **electronification of trade** (the appearance of e-markets) between business partners requires a completely new way of thinking and new organization methods, while traditional ways of production, sales, ordering, purchase, financial and administrative processes are based on revolutionary new grounds. The automatization of supply chain processes significantly simplifies, accelerates, and makes trade more efficient and less expensive for every participant. ICT helps business organizations to save on transaction costs and also helps them to reduce their assets and capital, furthermore, they are able to optimize stock level inside warehouse and reduce the time needed to supply their customers. After reviewing the question of available network services, let us take a look at the stages a company follows in order to apply more developed business models such as electronic markets.

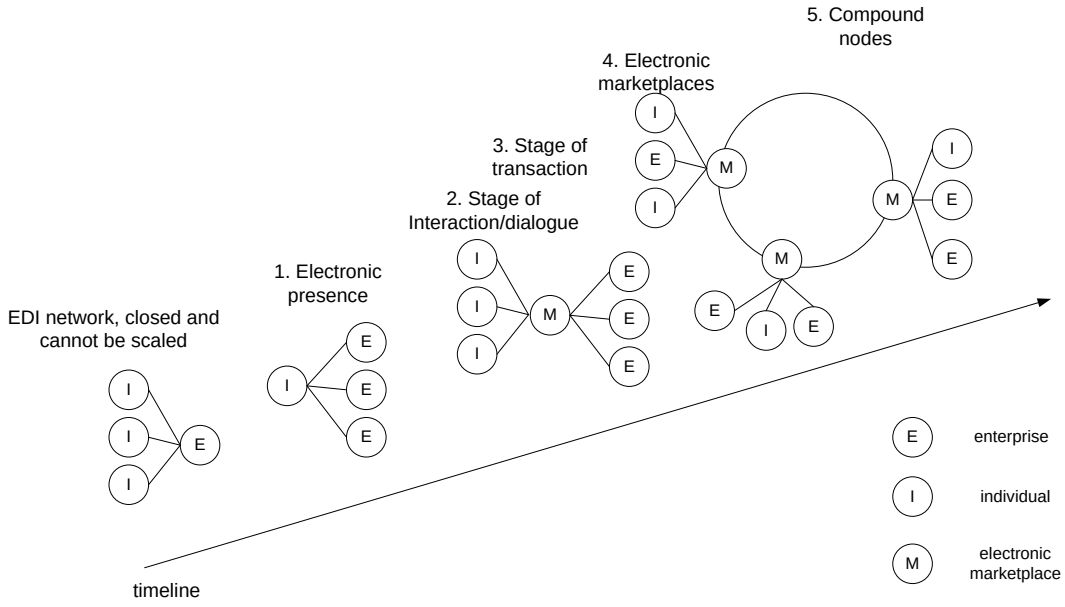


Figure 61 - The development stages of information and communication technology

*Source: **Kápolnai A. - Nemeslaki A. - Pataki R.**: E-business stratégia vállalati felsővezetőknek (E-business strategy for senior management), 2006*

The individual stages do not only mean a kind of timeline, they also signify the depth and the various approaches of using the opportunities provided by the Internet.

The first stage can be defined as „**electronic presence**", when companies solely use the Internet for reaching their marketing goals. They make their own web sites showing information on the company, on its products and services (brochures, service and product prices). They put job offers and product advertisements onto their own sites and onto the banners of other websites as well, thus exploiting the Internet as a new channel of advertisement and reducing the time being spent by users searching for information on a given product. In this case, companies use this electronic channel for a unidirectional communication.

In the second stage – which is called **the stage of interaction or dialogue** – electronic channels are used for cooperation by companies as a means of a two-way communication. The company maintains a two-way communication with its clients, suppliers and partners: receiving and sending e-mails, searching or asking for information, using banking services, conducting electronic taxation, interactive education and training, advertising or performing other marketing tasks, interactive market appraisal, requesting and sending information on products and services, providing after-sales services, purchasing digital products. In the next step, companies start using and advertising their web pages as sales and trading channel. Products and services marketed on the Internet can also be ordered online, the company has the chance of latching on to the e-commerce system by purchasing and selling products and services, customizing its web page for its frequent or regular customers, purchasing online digital products, making it possible to pay online, providing internet connection through mobile phones, providing platforms for safe financial transactions etc. Because at this level of business applications no third party can be found in the trading process, this is **the stage of transaction** or partnership.

The fourth stage of **e-commerce** between companies is evolving nowadays. At this stage, partners are linked to each other and organised into communities (Community Commerce) by a third party

or mediator. This mediator is called **e-marketplace**, which eliminates the majority of traditional middlemen and brokers from the transaction and plays a huge role in coordinating and serving business partners as well as supporting several business processes. The advantage of this form of transaction is the ability to integrate a large number of potential business partners. Enterprises head for acquiring a trading model based on cooperation and partnership. System approach is inevitable for cooperation, therefore those companies are ready to accept this new technology that introduced reordering systems (stockpiling), invoicing and payment systems, production, logistics and/or service systems, purchasing systems, sales systems, other computer systems and digital signature. Nevertheless, we need to emphasize that – as it is a new, evolving technology – it was only possible to measure the existence of the necessary conditions for introducing and using it.

E-commerce can be divided into several subclasses:

- online marketing,
- e-processes,
- e-cooperation,
- e-store,
- e-company.

Online marketing is the zero level of e-commerce, as this is the first step in the introduction of e-commerce for most companies and economic sectors. Unidirectional solutions (from company to customer) belong to this type of e-commerce; the most basic example of it is simple company web site. Nowadays online marketing is essential for companies to remain in competition.

E-processes are responsible for the efficiency of processes within an organization or company and also responsible for enhanced flexibility. The stress is primarily on the realization of a more effective electronic administration.

At the level of **e-cooperation**, the main aim is to optimize the supply chain both within a company and between companies. The essential element to achieve this goal is to strengthen bidirectional communication solutions.

In the case of **e-shop**s, the provider of a given service supplies a number of customers at the same time, establishing a continuous exchange of information. At the end of this process, customers make sure that they can obtain the required product or service in exchange of an adequate payment. In **larger e-shop**s - sometimes referred to as e-stores - there are usually more than one sellers. Offering products and placing advertisements reflect the mutual interest of several owners. Only the virtual space provided by the Internet makes e-stores a kind of real retail trade unit for costumers. Finally, an e-company is a company where information and communication technology is used for production processes, intercompany transactions and last but not least where ICT is also actively used in the distribution of end products or services.

These categories are not as strict as it may seem: companies tend to switch among them during time of their development.

5.3 The study of the 'great narrative' with the help of potential indicators

We live in an era of change of regime or that of paradigm shift, if you like. The economic utilization of computers started only in the past couple of decades, the use of ICT devices is even

newer than that: it has a history of ten years or so, however, the new products and services based on **ICT** developments are virtually everywhere around us.

One of the consequences of the explosive spread of ICT devices is a kind of deindustrialization process: traditional industrial methods are gradually replaced by ICT devices. The socioeconomic consequences of a new technology are highly dependent on the business organizations embracing it and the economic sectors as well [**Figure 62**].

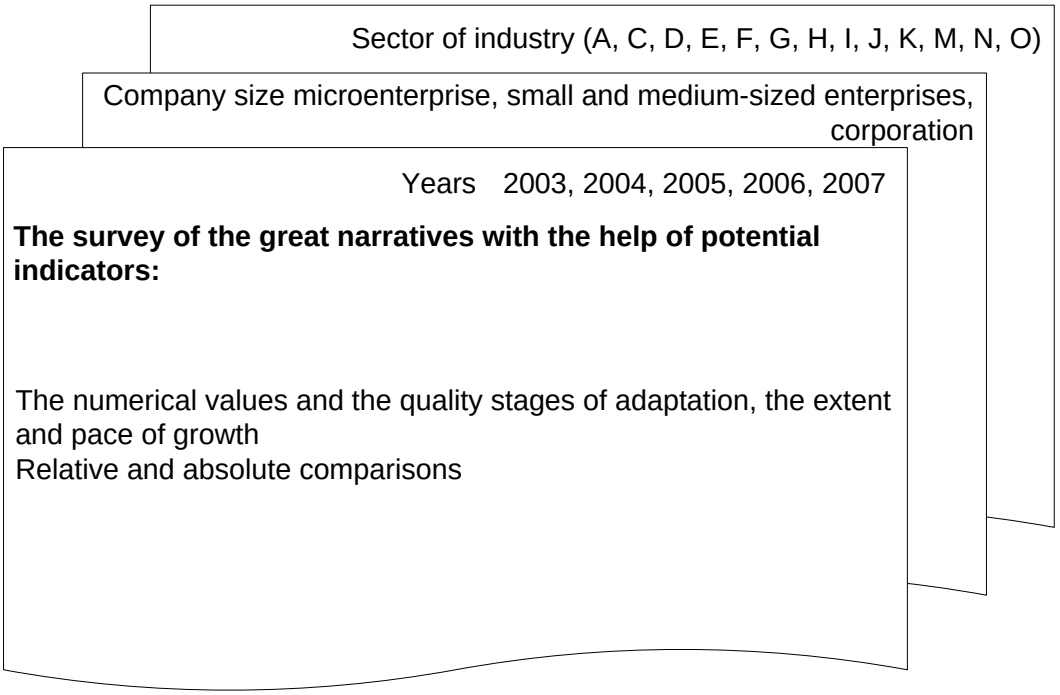


Figure 62 - Review of the great narratives in connection with time, size and branches of economy in the individual countries of the EU

Source: Individual research

The new applied technology becomes dominant in a new structure when it is generally used in a given area. Broadly speaking, we talk about general use when the number of users is higher than that of non-users.

According to the **diffusion of innovations** theory, the spread of innovations is basically a communication process, "a process by which an innovation is communicated through certain channels over time among the members of a social system". The spread of innovations takes place in social networks or so-called diffusion networks. The willingness of a company to **adopt an innovation depends** on the extent of network cohesion and on the structural equivalence of a company, which shows the exact position it holds within the network. Finally it also depends on the point at which an innovation reaches critical mass. This is a point in time within the adoption curve that enough companies have adopted an innovation in order that the continued adoption of the innovation is self-sustaining.

When analysing the diffusion of ICT devices, the introduction of a new category is needed: It is the category of **rejectors**. During my research I found that there were certain companies deliberately standing against the application of a given technology. This proves that the spread of a new

technology cannot reach a 100 percent rate, in order to get to the state of complete saturation, society and technology should be changed collectively.

5.4 The evaluation of the narrative-related hypothesis

Studying the causes of the development of ICT in Chapter 2, I managed to set up a system of information and communication technology based on strictly interconnected elements. Due to this interconnectedness, whenever a change appears, it waves through the whole system. Changes observed at the microlevel also appear at meso- and macrolevels as well. When certain simple indicators occur at the same time, the growth in quantity turns into a quality change which constitutes a new development category from the perspective of development theory. Changes at the meso level influence the context of civilization theory later in time.

Nathan Rosenberg stated that technology could be seen as a black box. He proved the analysability of the diffusion of innovations by practical observations and data on economic statistics. Based on his results it can be suggested that the appearance of ICT in several economic sectors and company sizes has different meanings at different levels of narratives.

At the level of practice and reflection I documented the occurring changes and divergence with the help of 150 simple indicators.

By using four situation indicators, I evaluated the development stages of economic sectors and company size categories, then I calculated and qualified the related growth values by conducting a primary research.

At the level of the civilization theory context, the adoption of information and communication technology takes place at a different time and pace in certain economic sectors and company sizes. Considering the use of ICT as a process, I managed to employ the concept of time in my research.

According to Nathan Rosenberg, innovation is based on skills and knowledge - if we accept that the use of ICT is the appearance of innovation, linking changes at the micro level to the forms of adoptation at the macro level becomes possible.

5.4.1 The evaluation of the hypothesis related to the 'mini narrative'

T2A: THE DEVELOPMENT LEVEL OF USING INFORMATION AND COMMUNICATION TECHNOLOGY IS DIVERSE IN CERTAIN ECONOMIC SECTORS AND COMPANY SIZES AT THE MICRO LEVEL.

In the past, European researches on the information society mainly focused on infrastructural conditions, questions of ICT usage and on the effects of ICT.

Infrastructural conditions can be divided into the groups of **personal computer**s and network access.

In Hungary, the rate of applying personal computers and work stations for business purposes was high (nine companies out of ten used either of them) in 2007, which measures up to the EU average, growing only by one or two percent. The penetration of personal computers among the Hungarian small and medium-sized enterprises is around the average in international comparison. In the case of microenterprises, the same rate is less by more than 30 percent compared to the average of the business sector, similarly to the other European countries. The penetration rate of personal computers in the sectors of ‘Manufacturing’, ‘Electricity, gas and water supply’, ‘Wholesale and

retail trade'; repair work, 'Transport, storage and communication' was high compared to the other sectors and proved to be ordinary in international comparison.
Network access makes it possible for enterprises to conduct their inside and outside communication, data exchange and electronic trade.
In 2007 the use of the Internet in the Hungarian business sector showed a considerable backlog exceeding more than 10% in international comparison. In terms of the Internet usage, Hungary could overtake only Romania and Bulgaria among the 27 surveyed countries. In the case of small and medium-sized companies, Hungary also overtook Lithuania beside the newly-admitted states. The penetration rate of the Internet usage was around the average in the case of Hungarian corporations.
In the 'Electricity, gas and water supply' sector the penetration of the Internet reached the EU average while the same rate was 8% less in the other Hungarian economic sectors than the EU average. Apart from the newly-admitted countries, Hungary could overtake only one state with this result among the 27 surveyed states.
When the Hungarian economic sectors are compared to each other, it can be observed that the highest penetration rate was measured in the sectors 'Electricity, gas and water supply', 'Transport, storage and communication' and 'Financial intermediation'.
The type of Internet access is one of the technical conditions of the Internet usage and a quality determinant at the same time. The rate of broadband connection is a quality parameter among other types of Internet access. In terms of broadband connection, Hungary could be found in the last third part of the EU ranking table in 2007. The rate of broadband connection tends to grow with company size in Hungary. The rate of this type of connection in micro-, small and medium-sized enterprises grows compared to each-other, still showing a considerable backlog in relation to enterprises of the same size in the EU. However, the penetration of broadband connection in Hungarian corporations equalled to the EU average. In terms of economic sectors it can be stated that the use of broadband connection was mainly characteristic in the sectors 'Electricity, gas and water supply', 'Transport, storage and communication', 'Financial intermediation' and 'Wholesale and retail trade; repair work'. In international comparison the EU average was reached by the 'Electricity, gas and water supply' and 'Transport, storage and communication' sectors.
A necessary technical condition of the inside network communication is the availability of a local area network. Six enterprises out of ten used local area network in Hungary in 2007. This figure showed a huge, more than 15% backlog compared to the EU average, lower figures were measured only in the case of the newly-admitted countries. The penetration rate of local area networks among Hungarian corporations was only a percent less than the average of the EU. However, a considerably poorer result was shown by small and medium-sized enterprises, with more than 20% below the average of the EU. The use of local area networks was mainly significant in the sectors 'Financial intermediation' and 'Electricity, gas and water supply'.
One-fifth of executive directors asked in the survey conducted by **GKIeNET** said that the spread of information and communication technology did not transform their companies' markets. One-fifth of them said it would transform their market to a negligible extent while one-third of them expected a moderate transformation due to the penetration of ICT devices. A more profound change caused by information and communication technology was expected by 25% of survey respondents. The

rate of those executives who expected a bigger change was 75% among Hungarian corporations in 2007. In terms of economic sectors, executives anticipating deeper effects of information and communication technology were mainly represented in the sectors 'Electricity, gas and water supply', 'Transport, storage and communication' and 'Financial intermediation'.

The number of enterprises using information and communication technology is only a quantitative indicator of dynamic growth, a more detailed picture can be obtained by answering the question of what the available technology is used for.

Beside more traditional ways of using the Internet such as sending emails or search for information, a growing number of people uses other functions such as market observation, banking and financial services, advertising, buying and selling products and services and after-sales services. Similar to the other EU countries, the number of enterprises using the Internet for traditional purposes was spectacularly high: nine out of ten companies used the Internet for exchanging electronic mail and browsing the web. Although in some northern European countries (Iceland, Sweden and Finland) the use of traditional Internet functions started to decrease slightly, it can be explained by the appearance of new information technology. (Apart from using chat programmes and making online phone calls, blogs are becoming more and more popular in these countries.)

The traditional use of the Internet was very frequent in any surveyed company size, well above 90%. The use of email and search for information was the most frequent in the 'Electricity, gas and water supply' sector in Hungary **[Figure 63]**.

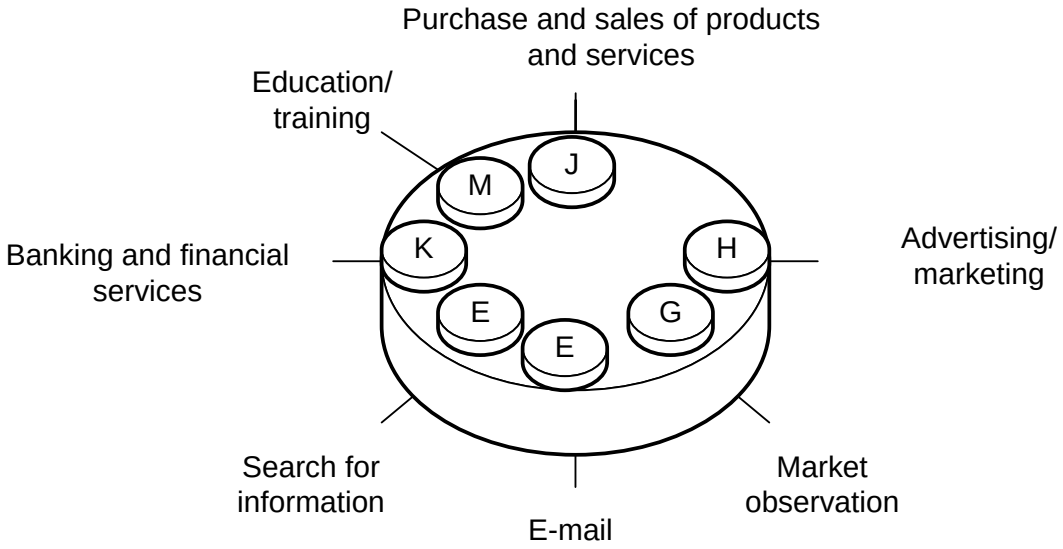


Figure 63 - Economic sectors using the given services on the Internet in Hungary in 2007[3]

Source: Individual primary research

In 2007, the highest penetration rate was shown by using **banking and financial services** among several Internet functions in Hungary. In international comparison, this figure was considerably lower, 15% less than the EU average. In this respect, Hungary could overtake the newly-admitted countries. Differences in the use of several Internet functions from the national average were the

[3] E = Electricity, gas and water supply, G= Wholesale and retail trade; repair work, H= Hotels and restaurants, J = Financial intermediation, K = Real estate, renting and business activities, M = Education.

highest in microenterprises, lower in small and medium-sized enterprises, and a 10% difference was measured in corporations. Considering all Internet functions, the highest penetration rate was shown by corporations.

Banking and financial services are mainly used by Hungarian enterprises in the 'Real estate, renting and business activities' sector. The most frequently used functions in several economic sectors were the following: **education and training** in 'Education', **buying and selling products and services** in the 'Financial intermediation' sector, **advertising and marketing** in the 'Hotels and restaurants' sector and, finally **market tracking** in the 'Wholesale and retail trade; repair work' sector.

Based on the surveys conducted by GKIeNET, a vast majority of executives (97%) knows that the opportunities provided by information and communication technology is not exploited fully by their enterprises. One-third of executives said that the available opportunities had been exploited only to a moderate extent. According to the responding executives, the opportunities offered by ICT are and will be exploited mainly in the fields of 'Financial intermediation', 'Real estate, renting and business activities' and 'Transport, storage and communication'. They also agree that the aforementioned opportunities can be taken primarily by corporations.

There is a great difference in the number of Hungarian enterprises having a **website** and the services available on them. Less than half of Hungarian enterprises having access to the Internet maintained a web site in 2007. Within the EU there is an increasing division between East and West and North and South in the number of enterprises having a web site. According to data from Eurostat, the number of enterprises maintaining a web site is well over 80% in the Scandinavian countries.

Not surprisingly, enterprises from Hungary, Romania and Bulgaria can be found at the end of the list.

In terms of company size, the highest penetration rate of having a web site was measured among corporations. Small- and medium-sized enterprises were trying to keep up with them, producing results slightly above the average. Microenterprises showed the least tendency to spend on maintaining a web site; although a dynamic growth can be expected, there are still a lot of microenterprises not planning to have a web site created in the near future.

Studying this question on a sectorial basis, it can be seen clearly that enterprises operating in the service sector have their own web sites at the highest rate. Among non-service sectors, the 'Manufacturing' sector contained the highest number of enterprises having their presence on the Internet. 'Agriculture, hunting and forestry' was well below the average as the number of enterprises owning a web site in this sector was negligible.

The most frequent services available on web sites was corporate information and information on products and services, the presence of other services types was not significant. Services provided on the Internet were almost equally frequent in the case of corporations and small- and medium-sized enterprises while microenterprises were lagging behind in this respect. On a sectorial basis, enterprises operating in the field of 'Financial intermediation' used their web sites for providing information on products and services, product marketing, offering online payment facilities, after-sales services and job advertisements [**Figure 64**]. **Customer service** was the most frequent **service available** in 'Electricity, gas and water supply', providing **company information** was most

prevalent in the 'Health and social work' sector, while **selling products and services** was most dominant in 'Hotels and restaurants' compared to other sectors in Hungary.

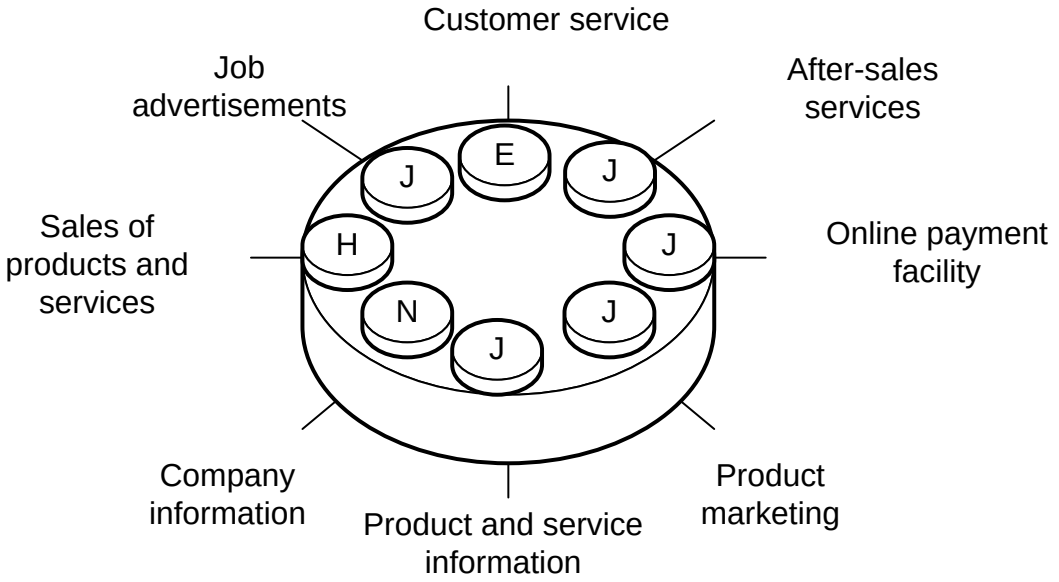


Figure 64 - Economic sectors providing the most frequent services on the Internet in Hungary in 2007[4]

Source: Individual primary research

Only a small minority of Hungarian enterprises uses their web sites for receiving online orders, and the number of enterprises carrying out at least a part of their purchases on the Internet is about the same. In this regard, Scandinavian enterprises lead the way in the EU, where the Internet is seen as an important trade channel. Based on the relative weight of e-commerce is rather small in the Hungarian economy, thus the net turnover realized through computer networks did not reach 1% in 2007. This is only a fraction of the net turnover realized on the Internet in other EU countries in 2007. The Scandinavian countries are also on the top of the EU's list in this regard.

The main obstacles to the development of e-commerce are the following: mistrust (uncertainties around terms of agreement, delivery deadlines and warranties), more reliance on traditional trade based on personal contacts, the lack of computer and/or Internet literacy and, last but not least, the lack of information on online business opportunities.

Based on the survey conducted by **GKIeNET**, two-third of the asked executives said that the rate of sales and purchases on the Internet would remain constant in the following year, approximately every fourth executive expected growth.

In the 'Agriculture, hunting and forestry' sector the level of constant sales and purchases is more expected than in other sectors as the fact that agricultural products and services cannot be sold on the Internet limits the opportunities for the companies operating in this field.

The executives of companies having a web site are implicitly aware of the transformation of their companies' markets due to the spread of the Internet and they are more optimistic about the present

[4] E = Electricity, gas and water supply, N = Health and social work, H = Hotels and restaurants, J = Financial intermediation.

and future opportunities provided by the Internet than those company leaders who manage a firm without having an access to the Internet.
However, those executives who manage a company with Internet access were united in expecting a higher than average growth both in online sales and purchases.
More than half of companies carrying out online purchases experienced that their purchase costs had remained at the same level on the whole; slightly more than 25% of them reported a reduction in purchase costs, causing a positive change in the operation of their companies. 60% of executives stated that the number of their suppliers had not changed due to online purchases in the previous year, while 30% of them reported that the group of their suppliers had become larger in numbers. According to more than two-fifth of the respondents, online purchases had no effect on their total sales volume, while 25% of them experienced a positive change in the form of growth in revenues.

5.4.2 The evaluation of the subhypotheses related to the 'small narratives'

T2B: THE INFORMATION AND COMMUNICATION TECHNOLOGY HAS CERTAIN DEVELOPMENT STAGES AND THESE STAGES ARE PRESENT AT THE MESO LEVEL OF THE ECONOMY AND ITS SECTORS AT THE SAME TIME.

The infrastructural development level of the economic organizations was calculated using the arithmetic average of the percent occurrence of **personal computer**s, **work station**s, **mobile phone**s, **local area network**s and Internet access. Outside connection was represented by the Internet access, inside network was equal to local area network, the use of computer hardware and software was shown by work stations and the opportunity of mobile communication was indicated by mobile phones. In order to calculate the penetration rate of these devices, I also determined the growth relative to the base year. The advantage of using simple indicators is the fact that they can be measured easily and they are well-documented back to 2002. Its disadvantage is, however, that there is no quality difference between the devices listed in the calculation. The position of a surveyed country, company size and economic sector can also be evaluated by the formerly introduced categories of qualification (developed, underdeveloped) and pace (fast, slow).
The use of information and communication technology was developed (84%) in Hungary. The growth of the simple indicator was 3% from 2004 to 2005, which can be considered low.
If the available technology is examined based on company size, its penetration rate was above 85% in corporations and medium-sized enterprises in 2004, which can be explained with the high number of mobile phones and personal computers. In the case of small-sized enterprises, the value of the simple indicator was lessened by the relatively low rate of Internet access and local area networks [**Figure 65**]. Mainly the low penetration rate of local area networks (68%) was responsible for the poor value measured in microenterprises.
All in all, the use of mobile phones and personal computers was widespread in the Hungarian economy regardless of company size in 2004, as a consequence of this; the pace of growth was relatively slow, below 6%.

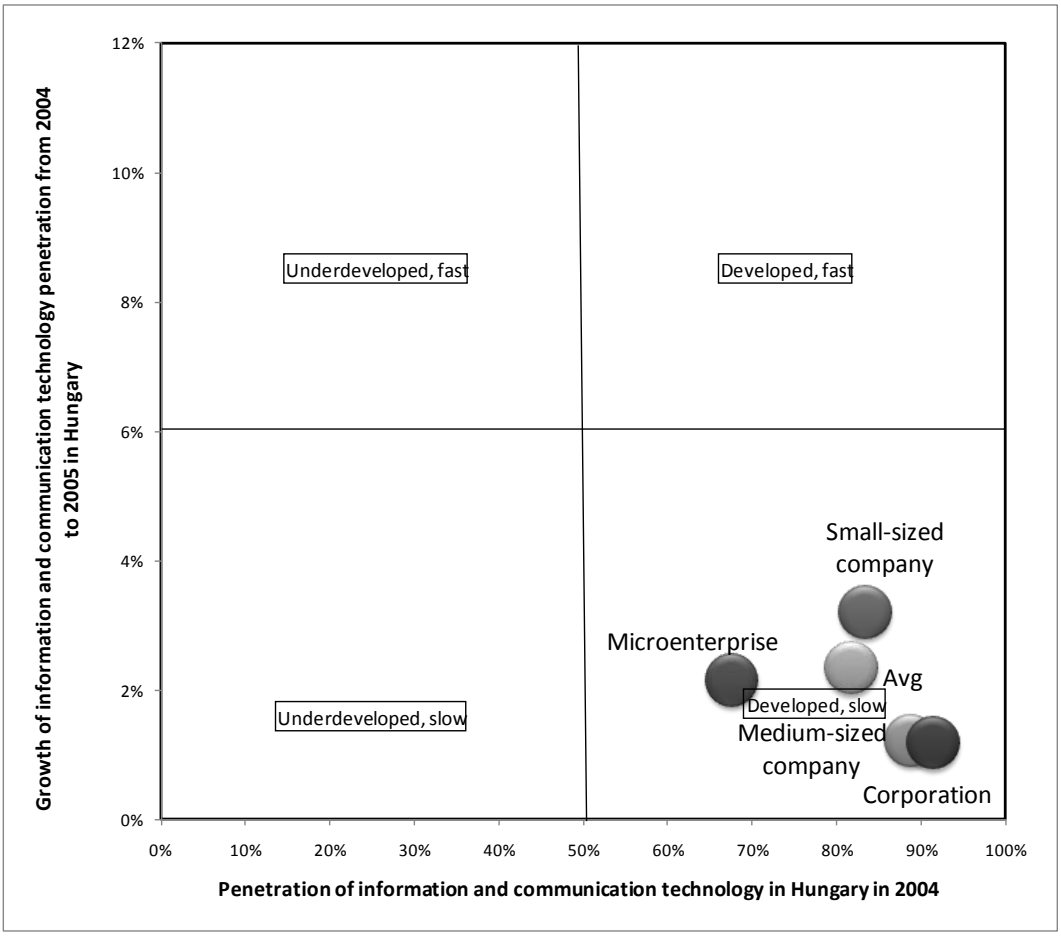


Figure 65 - The extent and growth of information and communication technology penetration by company size in Hungary in 2004

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2005-ben (The usage and availability of ICT devices by business organizations in 2005), Hungarian Central Statistical Office, 2005

The **infrastructural background** of microenterprises improved in the next couple of years. The penetration rate reached 80% by 2006. [**Figure 65**] The same rate exceeded 93% in corporations, small- and medium-sized companies. Between 2004 and 2007 the use of mobile phones and personal computers reached a considerably high penetration in Hungary regardless of the size of companies. Due to this fact, the pace of growth remained below 6%.

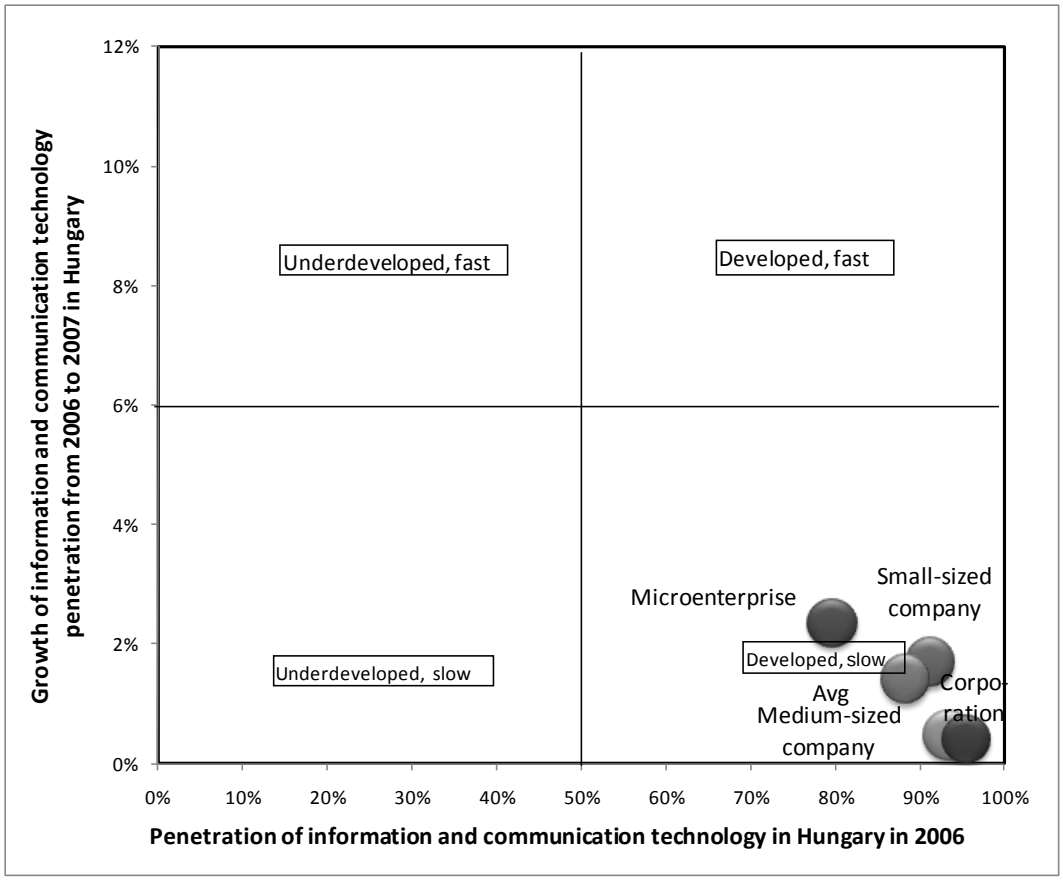


Figure 66 - The extent and growth of information and communication technology penetration by company size in Hungary in 2006

Source: Individual primary research

In terms of using information and communication technology, with the exception of the sector of 'Other community, social and personal service activities', every economic sector can be rated as developed in absolute terms. [**Figure 67**] The highest position indicator was measured in the sectors 'Financial intermediation' with 90% and 'Electricity, gas and water supply' with 85%. These high figures (compared to the other sectors) can be explained with the also high value of the simple indicator of local area networks (79% and 56%). The lowest position indicator was shown by the 'Other community, social and personal service activities' sector (41%). This sector was labelled as underdeveloped because the number of those who used information and communication technology in this sector was higher than of those who did not. Nevertheless, the position of this sector changed by 2006 because of a robust growth, which was more than 12%. That year every economic sector showed values above 50%, the field of 'Hotels and restaurants' had a rate of 55% due to the 16.3% penetration rate of local area networks in this sector.

'Agriculture, hunting and forestry' had a relatively low rate (65%), which can be attributed to the low number of Internet access and local area networks. The other economic sectors showed rates close to the national average (74%).

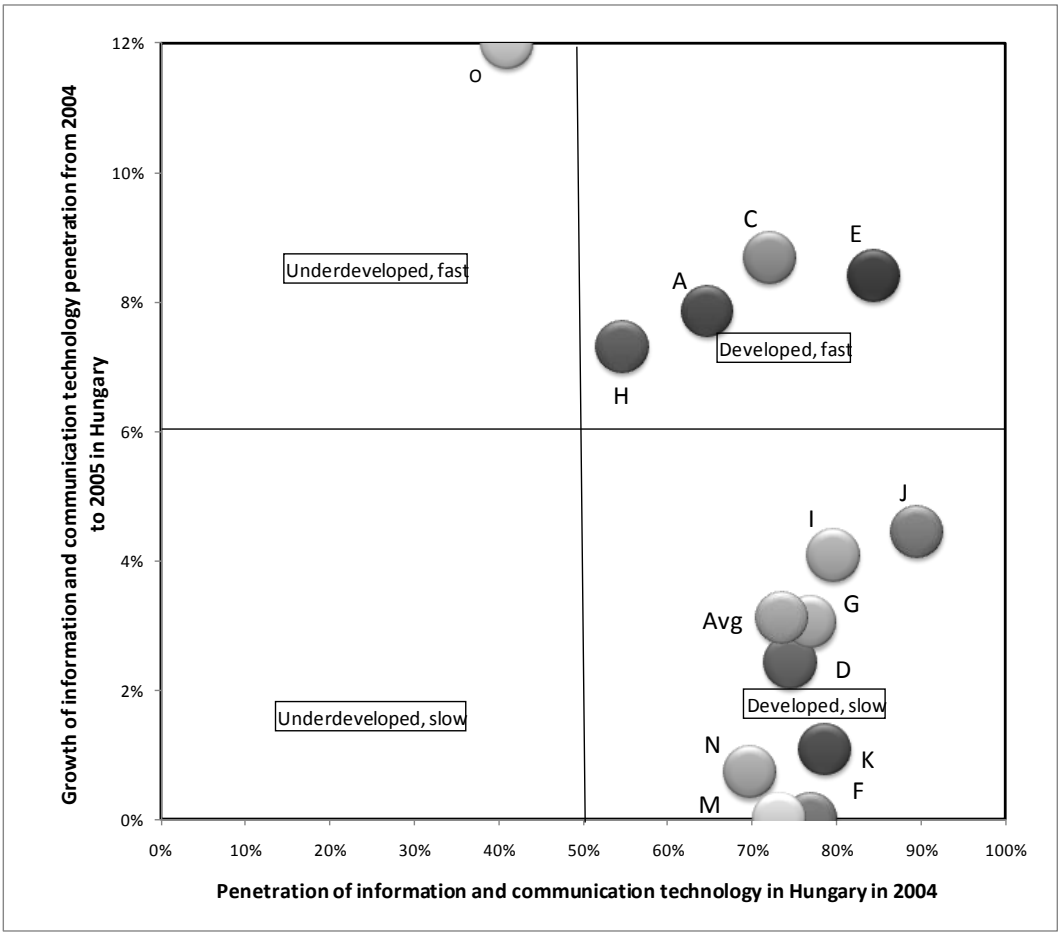


Figure 67 - The extent and growth of information and communication technology penetration in connection with economic sectors in Hungary in 2004

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2005-ben (The usage and availability of ICT devices by business organizations in 2005), Hungarian Central Statistical Office, 2005

One of the conditions of e-commerce is the availability of a quality Internet connection. In other words, it is not enough to have an access; its speed and reliability have to reach a certain level. This required level is represented by several types of **broadband connection** (xDSL, cable television and leased line). Examining the type of Internet access, it can be stated that the penetration rate of broadband connection in the Hungarian business sector was 70% in 2007. [**Figure 68**]

With this figure Hungary hold the 20th position among the 24 surveyed countries. Although Hungary underperformed by 11% compared to the EU average in this respect, the pace of growth of broadband connection reached 9%, which was an almost twofold increase compared to the EU average. More rapid growth was shown only by Slovakia (15%), Cyprus (14%) and Portugal (10%).

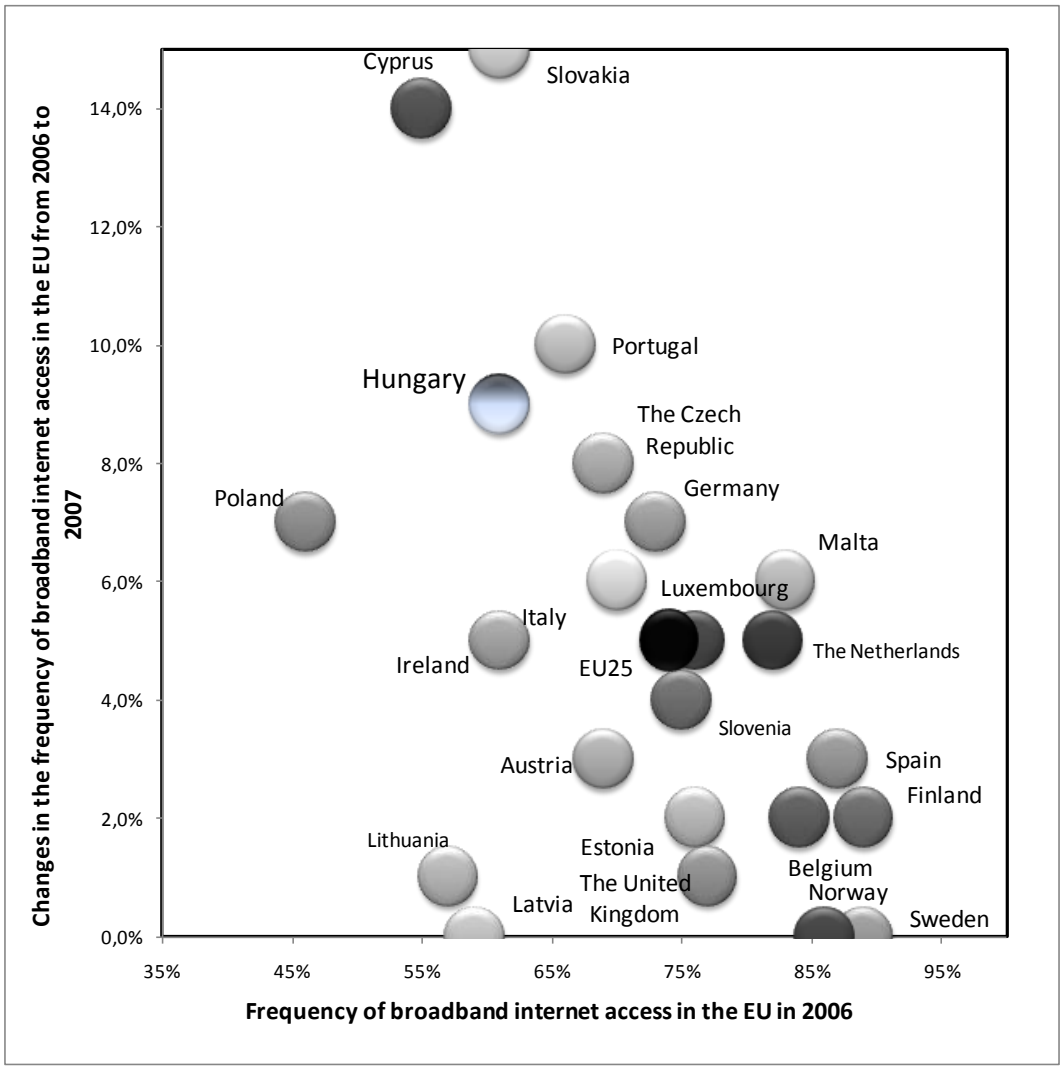


Figure 68 - The frequency and growth of broadband internet access in EU countries in 2006

Source: Eurostat, Community survey on ICT usage in enterprises, 2008

If we take a look at the broadband penetration rate in microenterprises, it is clear that nearly 25% of them had this type of access in 2006, while the same rate was 30% in 2007. In international comparison, it is only half of the rate measured in Germany (61%), two-third of Spain and less than Slovakia by 21%.

The penetration rate of broadband connection was 67% in small-sized enterprises in 2007. This meant a 9% increase compared to the previous year. According to **Eurostat**, the pace of growth was around 5%, with a penetration rate standing at 75%. Hungary's result was better than that of Lithuania's (48) and the two newly-admitted countries (Romania: 33%, Bulgaria 57%).

In terms of medium-sized enterprises, 83% of them had broadband connection in Hungary in 2007. With this figure, Hungary was next to last, overtaking only Lithuania (70%). Examining the growth in a four-year period, it can be observed that the fastest growth was produced by Slovakia (52%), Italy (45%), Bulgaria (44%) and Ireland (40%) regarding this company size.

94% of Hungarian corporations used broadband connection in 2007. This is less than the EU-25 average by 3%. In the last three years (between 2005 and 2007) the pace of increase was 11%, while the same figure was 44% in Bulgaria (89%) and 52% in Romania (73%). Hungary could

overtake such countries with its penetration rate as Slovakia (90%), Latvia (78%), Lithuania (86%) and Estonia (93%).

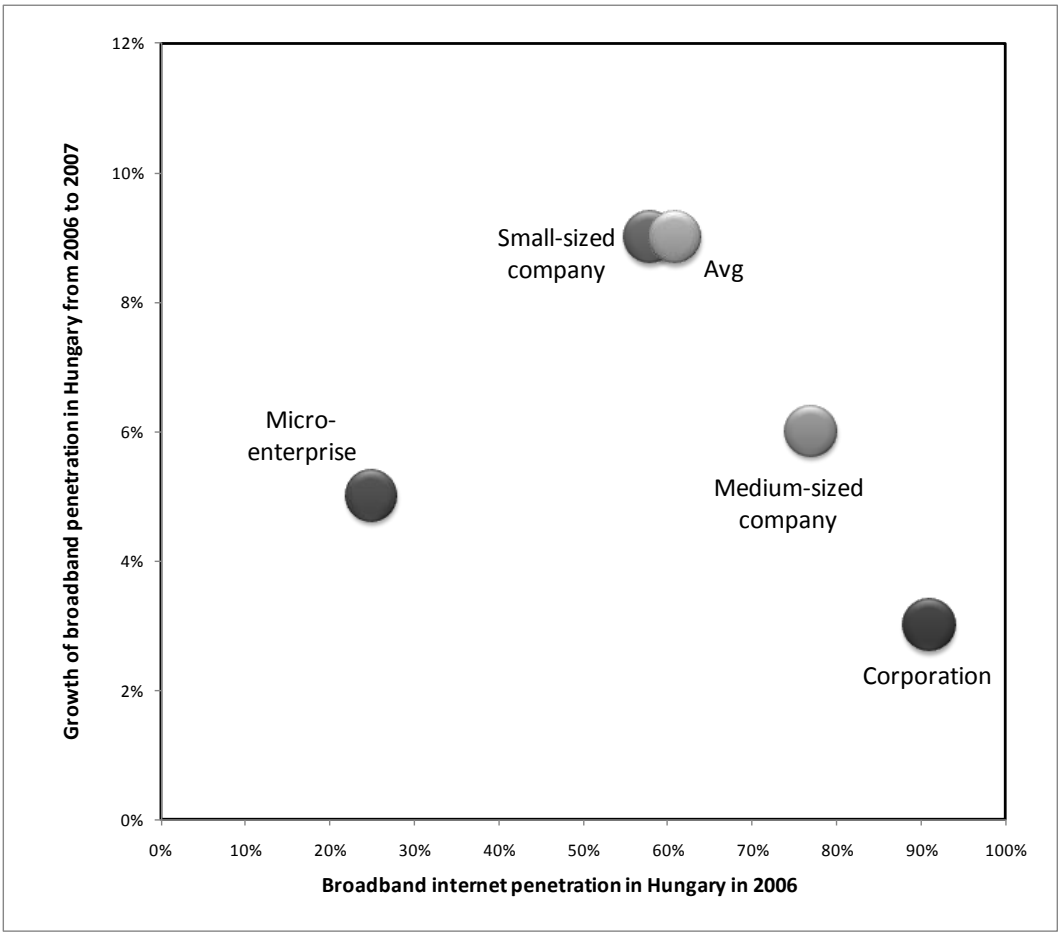


Figure 69 - The frequency and growth of broadband internet access by company size in Hungary in 2006

Source: Eurostat, Community survey on ICT usage in enterprises, 2008

The lowest penetration rate was measured in the sectors 'Mining and quarrying' (below 30%), 'Agriculture, hunting and forestry' (46%) and 'Education' (46%). It is not only the low penetration but also the slow pace of growth that prevents these sectors from further growth. The 'Hotels and restaurants' sector was also underdeveloped; however, it was able to produce a growth of 4%. The remaining economic sector can be considered developed. The largest increased was shown by the 'Manufacturing' sector (from 59% to 70%) in 2006. A larger increase than that was produced [**Figure 71**] only by Cyprus (from 38% to 59%) and Slovakia (from 58% to 72%). Reaching the mentioned rate of penetration was much needed as the EU-25 stood at 77%. With it 70% rate, Hungary was at the same level as Austria, Slovakia and Portugal. Considerably lower rates were measured in Lithuania (55%), Latvia (56%) and Poland (49%) in particular.

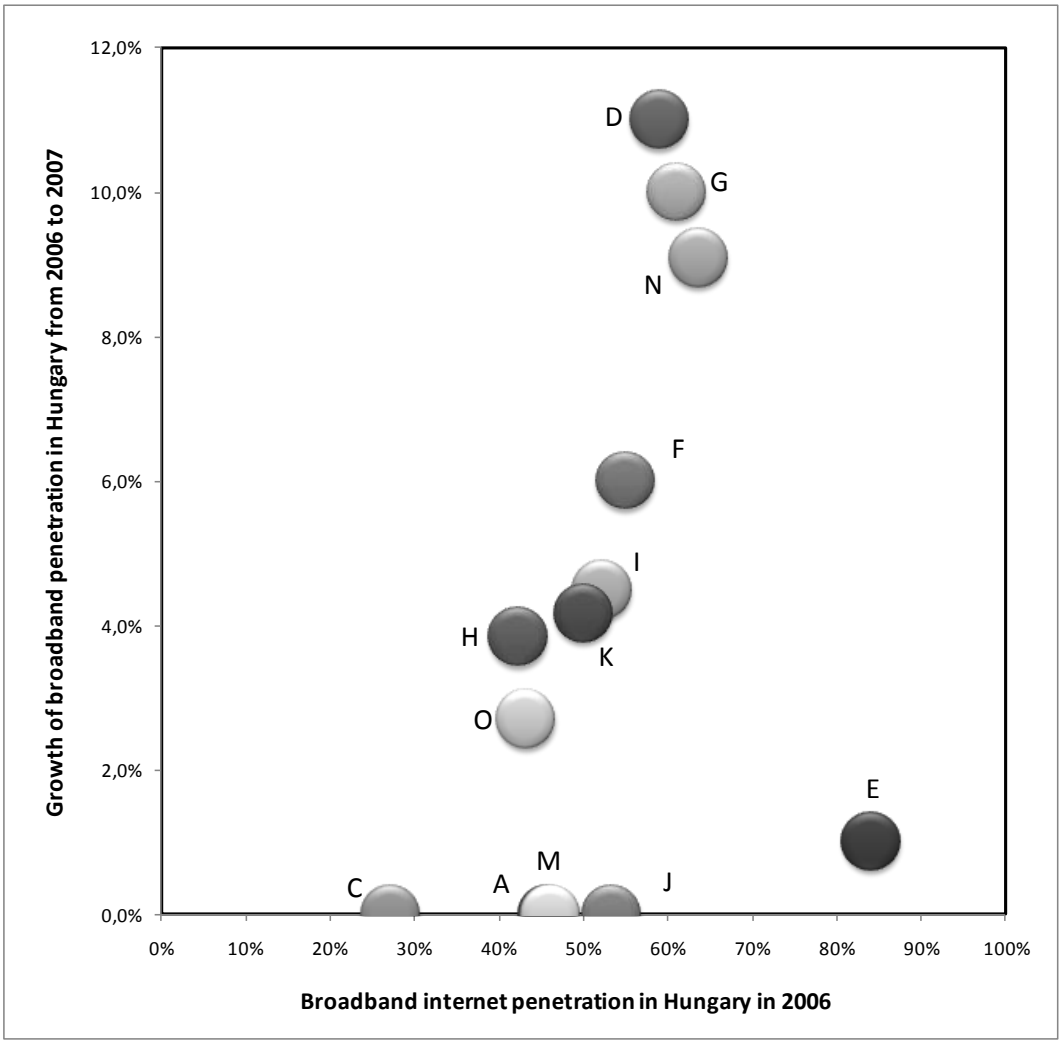


Figure 70 - The frequency and growth of broadband internet access by economic sectors in Hungary in 2006

Source: Eurostat, Community survey on ICT usage in enterprises, 2008

The 'Electricity, gas and water supply' sector reached the highest penetration rate (85%) among the surveyed economic sectors in Hungary in 2007, the increase was a modest 1% compared to the previous year. In international comparison, the largest pace of growth was produced by Lithuania (from 54% to 70%), Norway (from 80% to 97%) and Slovakia (from 83% to 92%). Slovakia's growth was especially spectacular, producing a 70% increase in the last four years (22% in 2004 and 92% in 2007.) More favourable results were shown only by two countries: Latvia (70%) and Lithuania (69%)

In 2007, the 'Construction' sector had the fifth highest penetration rate of broadband connection with 61% (a 6% increase) among the surveyed Hungarian sectors. This figure was less than the EU average by 13%. The fastest pace of growth was performed by Slovakia (from 50% to 74%) and Portugal (from 49% to 65%). Lower penetration rates than those of Hungary's were found in Austria (60%), Slovenia (59%), Lithuania (52%) and Cyprus (47%).

In the field of 'Wholesale and retail trade; repair work' the penetration of broadband connection reached 71% in 2007, which was a 10% increase. This was the second fastest-growing economic sector after 'Manufacturing'. In spite of its good result, the rate was still 14% less than the EU-25 average, overtaking Lithuania (56%), Latvia (58%) and Poland (53%).

The rate of broadband connection was 57% in 'Transport, storage and communication' in 2007, which was a 5% higher figure than in 2006. This sector proved to be the fourth fastest-growing one among the other surveyed sectors.

In the sectors 'Financial intermediation' and 'Real estate, renting and business activities' the penetration rate of broadband connection was above 50%. In the former economic sector the rate remained constant, the latter showed a 4% increase compared to the previous year, still behind national average by 15%.

73% of enterprises had broadband connection in 'Health and social work' in 2007, having the second highest rate among the surveyed sectors. Its pace of growth was also remarkable as it reached 9%.

The 'Other community, social and personal service activities' sector was classified as underdeveloped, showing a penetration rate of only 46%.

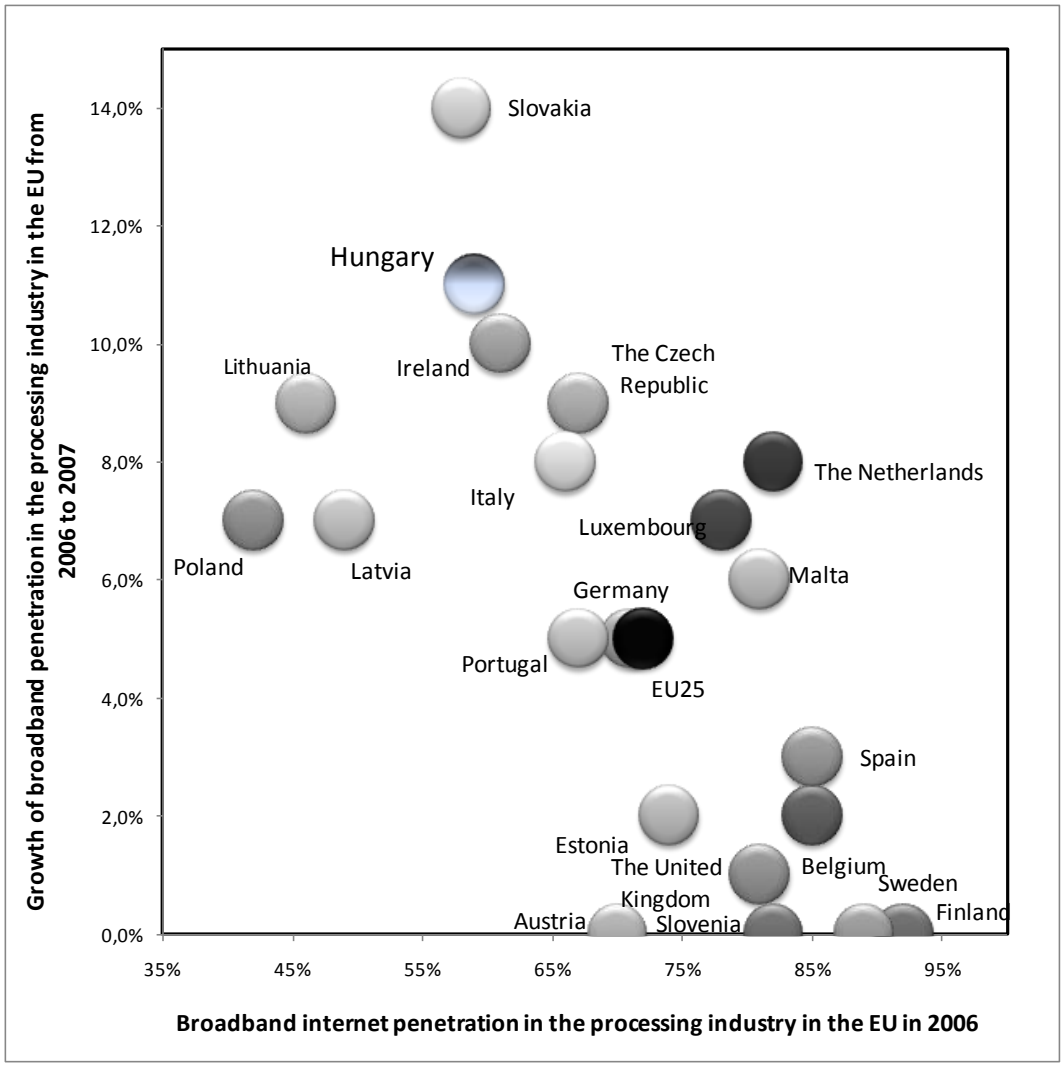


Figure 71 - The frequency and growth of broadband internet access in the processing industry in the EU in 2006

Source: Eurostat, Community survey on ICT usage in enterprises, 2008

The Internet is used as an outside source of information by enterprises while intranet and extranet (which is open to business partners) are considered an inside source of information. In order to create an inside source of information, the availability of extensive local area networks is needed.

Intranet gives a complex tool for enterprises to reorganize their communication completely and takes it to a higher level.

Extranet establishes a bridge between the publicity of the Internet and the privacy of a company intranet. It creates a connection between more organizations (business partners, suppliers etc.) located in different places, using web-based applications. Extranet **VPN** (**virtual private network**) provides the framework for safe and secure business-to-business network connections. Users can be identified, well-defined and selective access to data can be ensured and it is possible to publish customers' opinions, tender evaluations etc.

By using extranet, enterprises can reduce the cost of information search; they can cooperate with their suppliers and customers, for instance. As intranet and extranet have common features in terms of their aim and function, the real object of the study is to find out whether at least one of them is available for a company. In summary, the infrastructural background of an enterprise is only studied accordingly when the availability of extranet or intranet and its network infrastructure (**LAN** or **WAN**) is examined.

62% of Hungarian enterprises [**Figure 72**] had **intranet**, **extranet**, LAN or WAN in 2007. This figure showed an 8% increase compared to the previous year. It was less than the average of the EU by 14%. Unfortunately, Hungary became the last country among the surveyed ones in this respect. Even Bulgaria, as a newly-admitted country, could produce a higher penetration rate (66%) than Hungary.

27% of Hungarian microenterprises had intranet, extranet, LAN or WAN in 2007, showing a 3% increase compared to the previous year. In international comparison, this figure was at the same level as Portugal, the rate was 53% in Slovakia (a 19% growth in one year), 37% in Greece and 60% in Germany.

Taking a look at Hungarian small-sized enterprises, it can be stated that 59% of them had intranet, extranet, LAN or WAN in 2007, showing a 10% growth compared to the previous year. Even faster increase was measured in the case of Romania (23%), Portugal (13%) and Austria (13%). With its penetration rate, Hungary took the last position among the surveyed countries, lagging behind the EU average by 14% in this company size.

83% of medium-sized companies had intranet, extranet, LAN or WAN in 2007, which was less than the EU average by 9%. However, the pace of growth was the second highest (7%); only Slovakia produced a more robust increase with 8%. This relatively good result was not enough to move from the last position among the surveyed countries.

The same rate was 94% in the case of corporations, which was less than the EU average by 3%. Hungary got the poorest result in this company size as well but in terms of growth, it reached the second highest rate (3%) after Malta (6%).

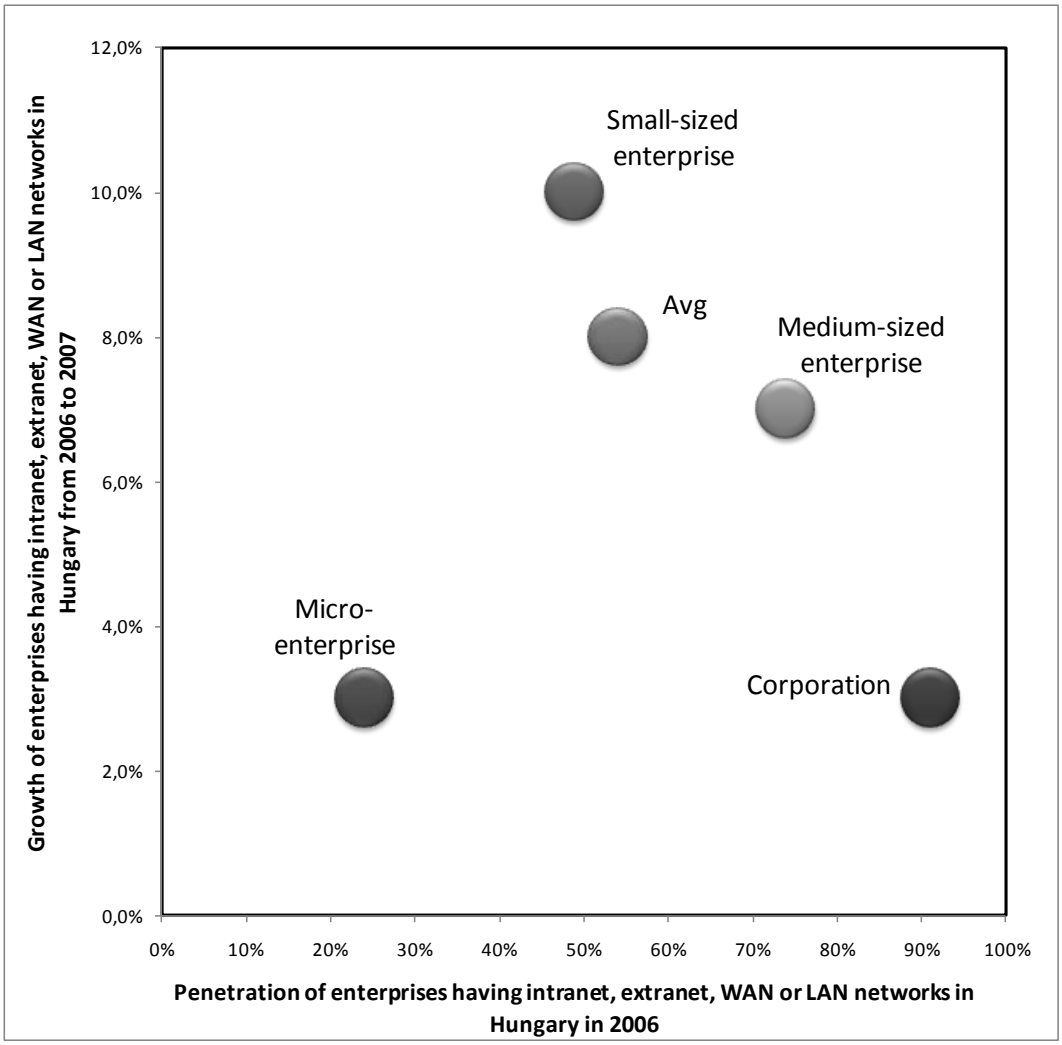


Figure 72 - The frequency and growth of enterprises having intranet, extranet, WAN or LAN networks in Hungary in 2006

Source: Eurostat, Community survey on ICT usage in enterprises, 2008

59% of enterprises in the 'Manufacturing' sector used intranet, extranet, LAN or WAN in 2007, showing a 10% increase compared to the previous year. This figure was below the EU average by 14% and was the poorest rate among the surveyed countries according to **Eurostat**'s data in 2008. The fastest pace of growth was shown by Slovakia (15%), Portugal (15%) and Austria (13%).

The penetration rate reached 91% in 'Electricity, gas and water supply', producing a 9% increase compared to the previous year. This was the highest rate among the surveyed Hungarian economic sectors, overtaking Estonia (77%), Lithuania (81%), the United Kingdom (84%) and Ireland (88%), and being at the same level with The Czech Republic.

The 'Construction' sector showed a penetration rate of 53%, which was below the EU average by 13%. With this result Hungary could overtake only Portugal (46%) in international comparison.

In 2007, 66% of enterprises had intranet, extranet, LAN or WAN in 'Wholesale and retail trade; repair work' in Hungary, producing an 8% growth compared to 2006 data. The backlog was 12% from the EU average, showing a slackening tendency as the average growth of the EU-25 was 3% from 2006 to 2007. With this penetration rate, only Poland (63%) was overtaken by Hungary among the surveyed states according to Eurostat's 2008 data.

The penetration rate of enterprises using intranet, extranet, LAN or WAN reached 73% in the 'Transport, storage and communication' sector in the EU in 2007, which was 8% higher than the Hungarian average. With this figure, Hungary took the last position in the ranking of the surveyed countries according to Eurostat's 2008 data. The fastest pace of growth was produced by The Czech Republic (14%) and Austria (9%). Hungary's growth was 3%, corresponding with the average of the EU-25.
In 'Real estate, renting and business activities', the penetration rate was 69% in Hungary, lagging behind the EU average by 16%. However, the pace of growth reached 8%, which was higher than the EU average by 5%. An even more robust increase was only shown by Finland (15%) and Austria (9%).

5.4.2.1 The purpose, frequency and growth of services provided by communication and information technology

In order to succeed in business life, more and more decisions are needed to be made quickly. The strong, inspiring or depressing effects of competition and business dynamics demand the availability of information that are analysed, evaluated or produced by experts or IT specialists. Generally, there is not enough time for using services from other providers, thus companies require a high-standard service from their local information management. There are plenty of information sources and services available to back up decision-makers. The process of assimilating and searching for information inside or outside the company calls for the possession and the use of new knowledge and methods (databases, intranet portal, data thesaurus, data mining, decision support and project management systems etc.)
The emphasis has shifted from the requirement of having complete information and their fast availability to quality and the ability to select from abundant sources.
During my research, I was examining the purpose of using information and communication technology in the following areas:

- **Search for information** on the pages of content providers with the use of information and communication technology. Basic data needed can be related to business, research or statistics. The use of softwares suitable for the query of structured data.
- Electronic mail (**email**), which is sent and received completely by using electronic networks.
- With the use of **financial services**, banking, insurance or investment transfers can be done from anywhere, anytime. Internet banking services provide the opportunity for current balance inquiry, money transfer, fixed-term deposits, modifying credit card limits, asking for a loan or credit cards, handling investments and adding pre-paid cell phone credit. There are financial services that are available through a cell phone either by sending a text message (SMS) or using WAP services. The most frequently used services by cellular phones are current balance inquiry, receiving reports on transactions, adding pre-paid mobile phone credit and card cancellation.
- **Market observation**, as one of the most important tools of business intelligence, tracks the actions and behaviour of other rival companies.

- The use of **marketing and advertising** with the help of information and communication technology. Here, another enterprise, economic actor, supplier or partner promotes their products or services on the Internet and they are used by the surveyed company in some ways.
- **The sales of products and services** with using information and communication technology facilitate fast and simple sales and purchases for enterprises.
- The use of education and training based on information and communication technology or the use of e-learning or distance education.

According to my assumption the frequency of various purposes of usage is higher when more users benefit from using this new way of communication. Those economic sectors and fields can be referred to as developed where the rate of users reaches 50%. This rate can only be reached if the penetration rate is high in more than one surveyed functions.

Based on my primary and secondary research, the surveyed purposes of usage showed different frequency rates. In Hungary the most frequent purposes of using ICT were **search for information** and sending and receiving **email**s in 2005. Less than 20% of enterprises used this new technology for **selling and purchasing products and services**. If I generate a potential indicator from the previously listed usage functions, it becomes possible to draw a conclusion on the frequency of usage [**Figure 73**]. Based on the newly generated potential indicator, it can be observed that the frequency rate of usage was the highest in the 'Education' sector (61%). The lowest rates were measured in the sectors 'Agriculture, hunting and forestry (47%) and 'Mining and quarrying' (47.5%). These two economic sectors must be regarded as underdeveloped as the numbers of users of ICT were lower than the number of non-users.

The growth of frequency in usage was the highest in the fields of 'Financial intermediation (5%) and 'Other community, social and personal service activities (4.5%). There were some economic sectors where the frequency of using ICT slightly changed or did not change at all: 'Education' (0.0%), 'Health and social work' (0.0%) and 'Agriculture, hunting and forestry' (0.0%).

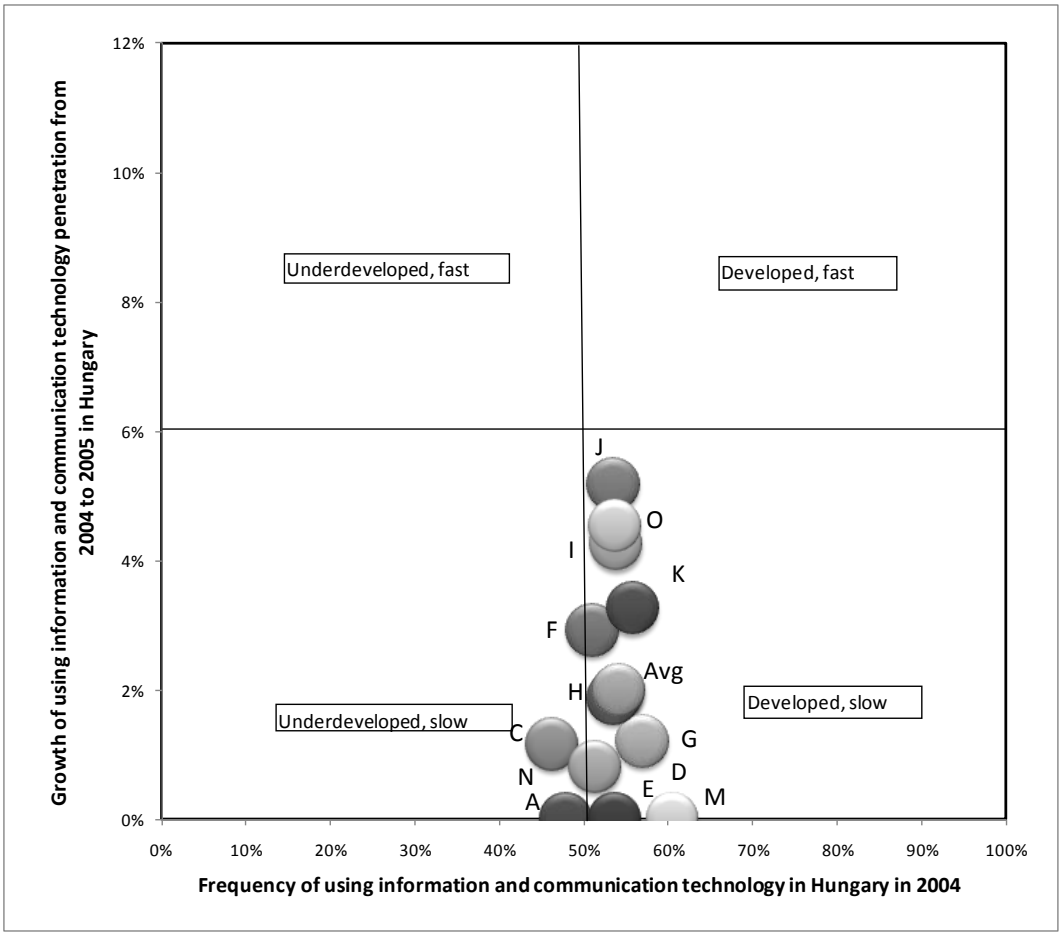


Figure 73 - The frequency and growth of using information communication technology in connection with economic sectors in Hungary in 2004

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2005-ben (The usage and availability of ICT devices by business organizations in 2005), Hungarian Central Statistical Office, 2005

Content providers are legal or natural entities or a mixed group of them that disclose information compatible to and available for any form of information and communication technology with or without time limitations in a textual, numeric, visual, audio and multimedia format. These legal or natural entities have to be identified unambiguously by users who are authorized to have access to the disclosed information.

Content providing also includes those types of information that are available through several networks (Internet, mobile, broadband or e-mail), although these technologies only a part of the definition.

Relating to content providing there are well-defined parts of content production and content handling:

- **content production** (writing, editing and authorization based on rule engines);
- **content compilation and outsourcing** (compilation, storage and data input);
- **content distribution** (supplying economic actors with finished content by using several information and communication technologies);
- **content maintenance** (archiving, content removal).

I studied the purposes of services provided and offered by information and communication technology in the following areas:

- Publishing **corporate information** by using ICT devices.
- Placing **job advertisements**.
- Displaying **product and service information**.
- **Offering personalised content in website for regular visitors**. Users should register or subscribe in order to get access to certain parts of a webpage; registration also helps the web site operators to give faster and more accurate services to visitors. In order to improve communication or raise the quality of services provided to users, operators may also give them some additional information. This means the possibility of providing customized services as well.
- Offering **online services** and digital products.
- **Selling products and services** by using information and communication technology.
- Operating **customer service** on the Internet.
- Offering **online payment facilities for economic actors**.
- **Offering the opportunity of performing security transactions**.
- **Providing after-sales services** with the help of information and communication technology.
- **Providing Internet access through mobile phone**.

According to my assumption the frequency of available services is higher when more providers give more services using this new way of communication. Those economic sectors can be referred to as developed where the rate of service providers reaches 50%. This rate can only be reached if the penetration rate is high in more than one surveyed functions.

Among the surveyed Hungarian economic sectors [**Figure 74**] the penetration rate was high but could not be seen as developed in the following sectors in 2005: 'Financial intermediation' (33%) and 'Hotels and restaurants' (27%). The lowest rates were produced by the sectors 'Mining and quarrying' (17%) and 'Agriculture, hunting and forestry' (19%) in the same year. The fastest pace of growth was shown by 'Other community, social and personal service activities' (9.5%), although the lowest penetration rate (13%) was measured in the same sector in 2004.

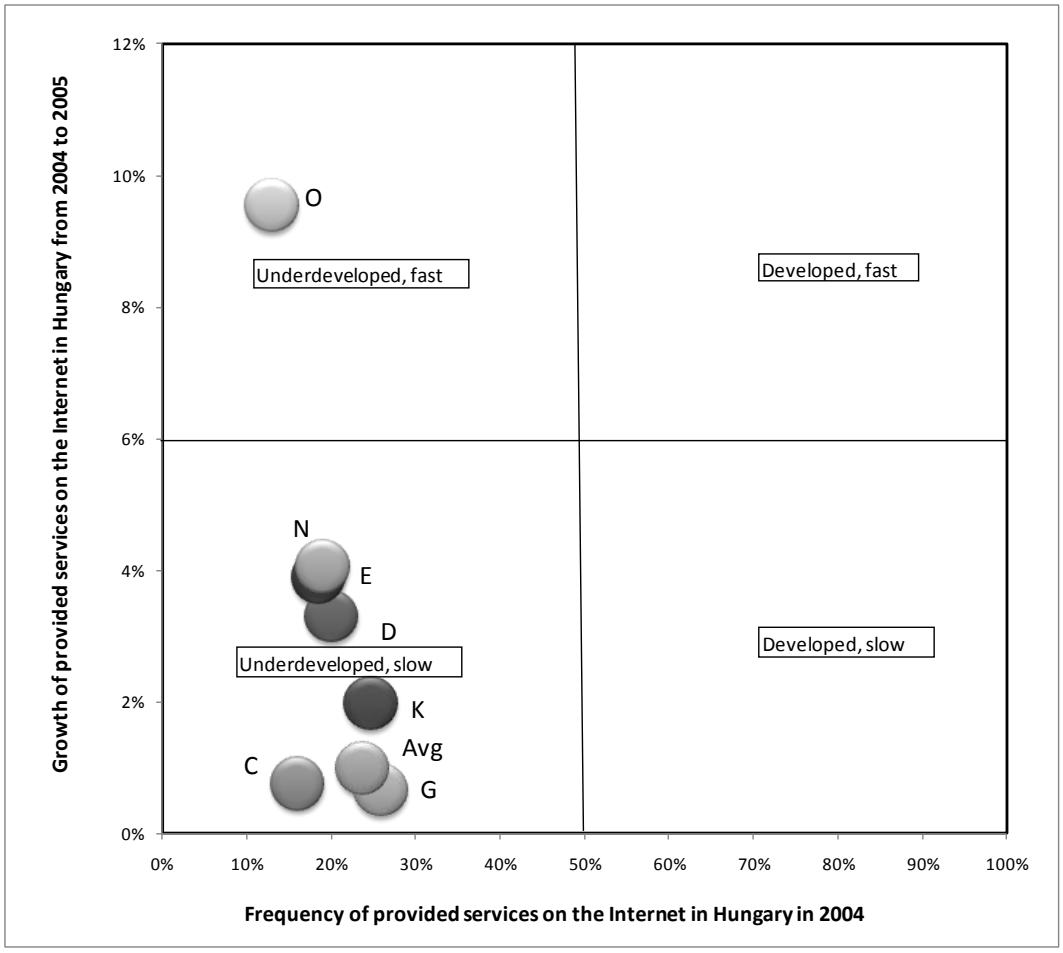


Figure 74 - The frequency and growth of provided services on the Internet in connection with economic sectors in Hungary in 2004

Source: Az információs és kommunikációs eszközök állománya és felhasználása a gazdasági szervezeteknél 2005-ben (The usage and availability of ICT devices by business organizations in 2005), Hungarian Central Statistical Office, 2005

The first development stage is the stage of e-presence (Kápolnai et al, 2003). In order to measure and quantify the penetration of e-presence, I used the figures resulted from measuring the penetration rates of **using the Internet**, together with the penetration rates of **local area network**s, **product marketing** and **job advertisement**s.

In 2006, **e-presence** could be observed in 55% of Hungarian enterprises [**Figure 75**]; the pace of growth was 3.2% from 2006 to 2007.

Regardless of company sizes, the number of enterprises using services classified as the parts of e-presence was higher than the number of enterprises not using these services. In terms of microenterprises the penetration rate of e-presence was 51%, the pace of growth was 3.5% between 2006 and 2007.

The potential indicator of e-presence was 15% higher in the case of small-sized enterprises. It can be explained with developed inside communication infrastructure and a significantly higher penetration rate of using job advertisements. The pace of growth in this company size was 3.5% between 2006 and 2007.

In terms of medium-sized enterprises, the potential indicator of e-presence was 68%, which was only a slight difference from the rate measured in small-sized enterprises. The pace of growth was

half as much as in the case of small-sized enterprises (1.6%).
The potential indicator of **e-presence** was 12% higher compared to the value measured in medium-sized enterprises. This high figure can be attributed to frequent usage and developed infrastructural background.

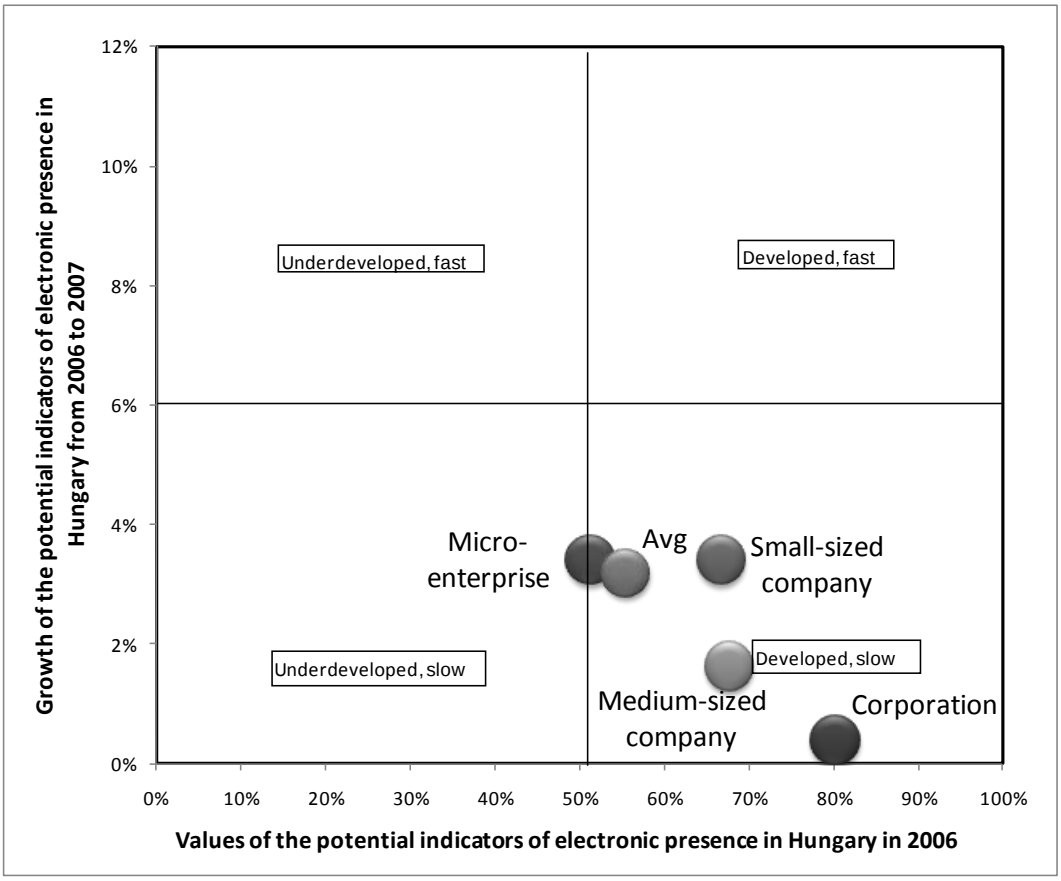


Figure 75 - The frequency and growth of electronic presence on the Internet by company size in Hungary in 2006

Source: Individual primary research

Examining e-presence [**Figure 76**] in various economic sectors, it can be observed that its potential indicator showed high rates in the sectors 'Mining and quarrying' (71.4%), 'Electricity, gas and water supply' (69%) and 'Transport, storage and communication' (68.5%) in 2006. The main reason for these robust rates was the high penetration in these surveyed sectors.
The penetration rate showed an underdeveloped level (below 50%) in the sectors 'Agriculture, hunting and forestry' (40%), 'Construction' (42%) and 'Education' (48%). Fast growth could only be detected in the 'Construction' sector with 6.6%.

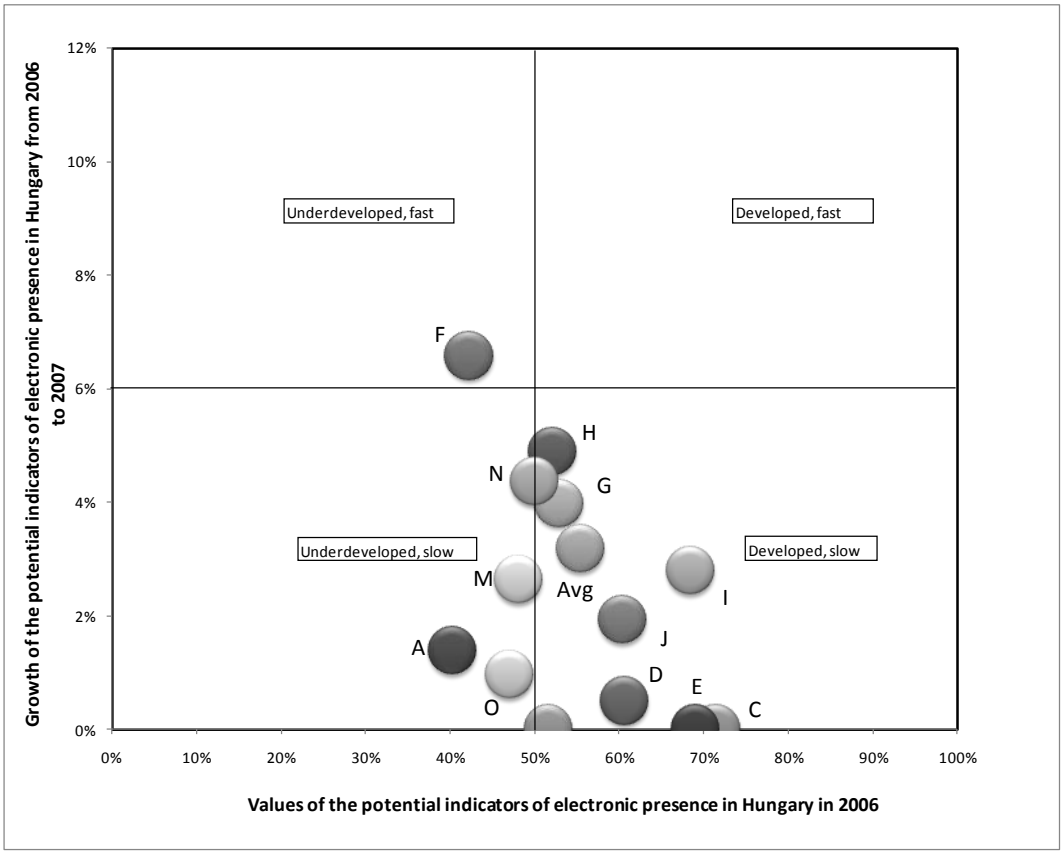


Figure 76 - The frequency and growth of electronic presence on the Internet in connection with sectors of economy in Hungary in 2006

Source: Individual primary research

The second phase of using information and communication technology takes place when more enterprises or users can resort to the new, real or virtual interactive services at the same time, irrespectively of their physical location.

Data transfer usually happens between two locations but only one of them is fixed, the other can even be a business organization. A data provider can be multifarious according to its functions. For instance, it can be a financial institution (banking services); a revenue office (**electronic taxation**); another enterprise (**market observation**) and other content providers (**information search**). We can talk about a more developed form of these services when targeted content providing ensures a higher quality level: using various parameters, data can be searched in several data bases, and the resulting information can be downloaded.

Furthermore, it is possible for us to communicate with data providers (**e-mail**, **advertisement and marketing**) or we can provide such services (**after-sales services**, **opportunity of purchasing digital products**).

In 2006, the **potential indicator of interaction and dialogue** reached the developed status with 51%, and its pace of growth stood at 4%. The penetration rate was above 50% mainly because e-mail, **information search**, banking and taxation services were used intensively. Low penetration rate could be observed in the field of buying and selling digital products and after-sales services.

In terms of microenterprises, only 40% of them used information and communication technology at the stage of interaction and dialogue. There was not a single data providing function (banking services, electronic taxation, search for information etc.) where the backlog was not at least 10%.

The pace of growth, however, was 6% between 2006 and 2007, it was the most dynamic increase compared to the other size categories.

55% of small-sized enterprises used information and communication technology at the stage of interaction and dialogue in Hungary in 2006. The main cause of this relatively low penetration rate in comparison to medium-sized enterprises and corporations was the low rate of resorting to education and training and after-sales services. Between 2006 and 2007, the pace of growth was 4.2% in this company size.

The new technology was used by 58% of medium-sized enterprises at the stage of interaction and dialogue. The pace of growth here was only 2.7%, which was only one-third of the rate measured in the case of microenterprises.

The potential indicator of interaction and dialogue stood at 62% in the case of corporations in 2006. This rate was 10% higher than the national average due to the high penetration of **after-sales services** and education and training. The pace of growth was slow in this size category, showing 1.5% between 2006 and 2007.

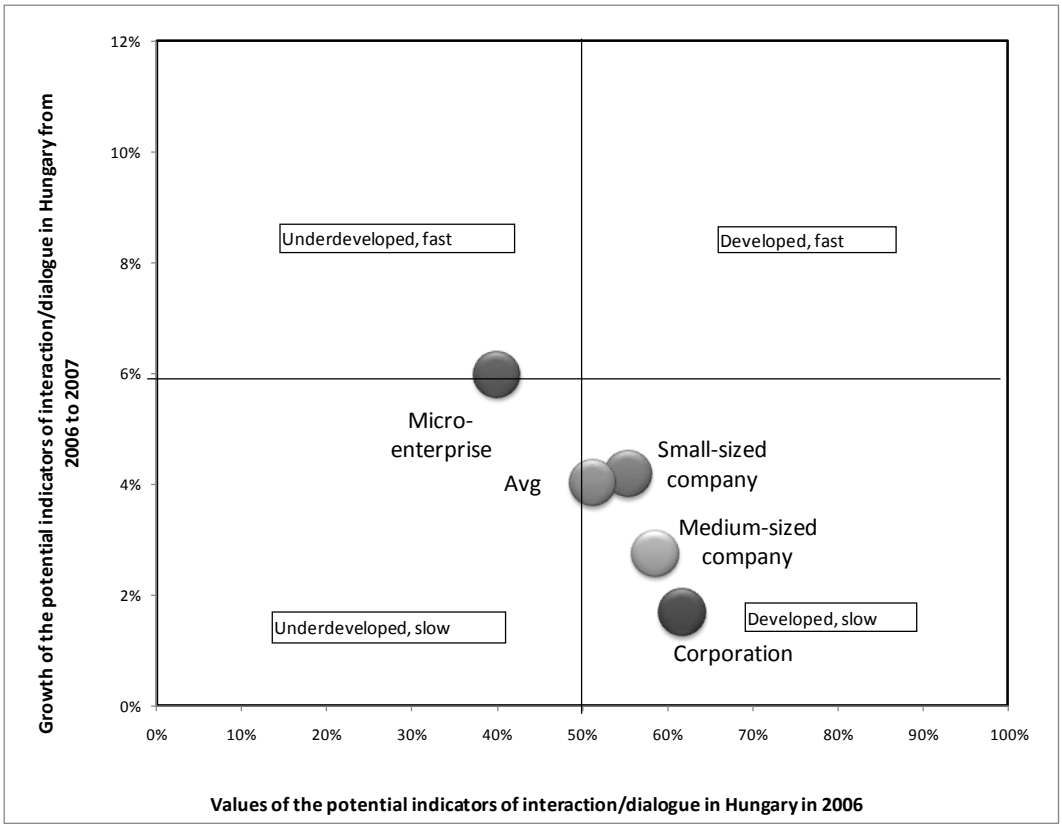


Figure 77 - The frequency and growth of the potential indicator values of interaction/dialogue by company size in Hungary in 2006

Source: Individual primary research

The highest penetration rates at the stage of interaction and dialogue were measured [**Figure 78**] in the sectors 'Financial intermediation' (65%), 'Transport, storage and communication' (62%), 'Manufacturing' (60%) and 'Electricity, gas and water supply' (60%). The other developed (above 50%) sectors were: 'Wholesale and retail trade; repair work' (50%), 'Real estate, renting and business activities' (53%) and 'Education' (55%). The sectors 'Agriculture, hunting and forestry' (45% and 2,5%), 'Mining and quarrying' (49% and 0%), 'Other community, social and personal

service activities' (50% and 2%) were seen as underdeveloped with a very slow pace of growth. The sectors 'Health and social work' (10%), 'Construction' (9%) and 'Hotels and restaurants' (7.4%) were also underdeveloped but performed a rapid pace of growth. There was only one economic sector, 'Real estate, renting and business activities' (65% and 8%) that produced a high penetration rate and a fast pace of growth at the stage of interaction and dialogue.

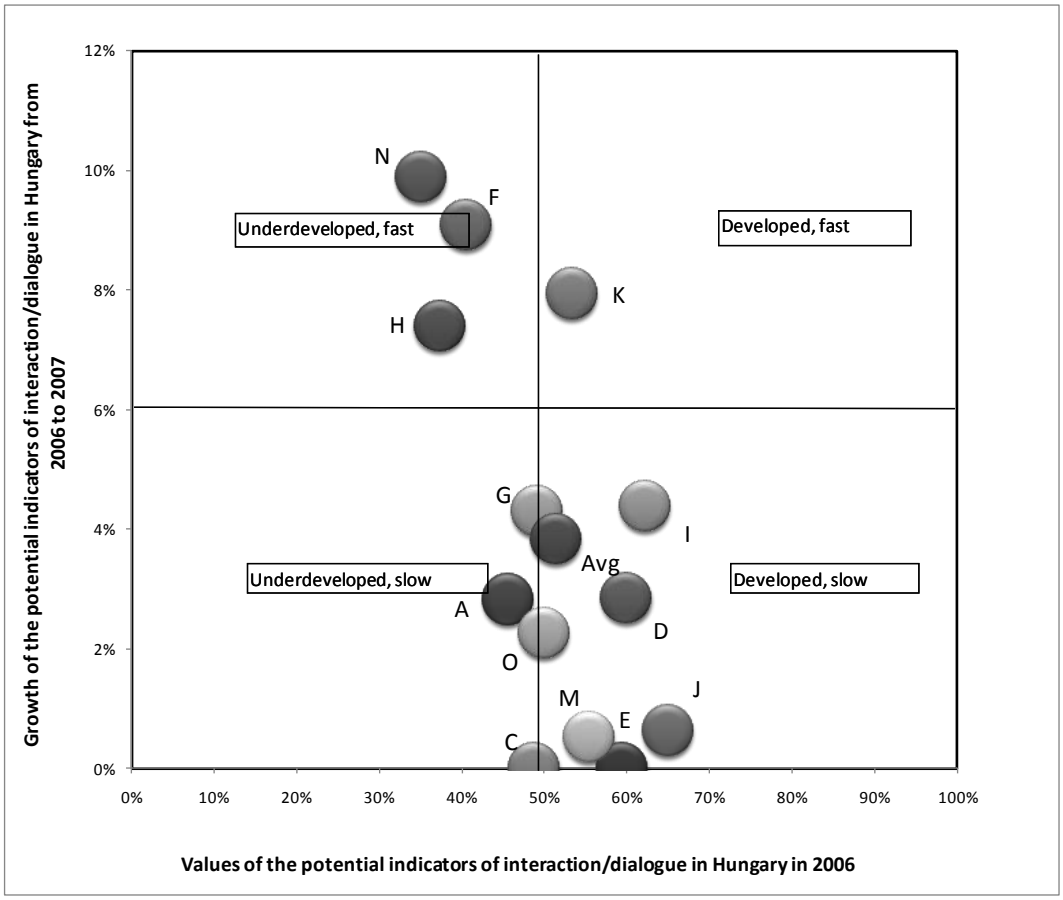


Figure 78 - The frequency and growth of the potential indicator values of interaction/dialogue in connection with economic sectors in Hungary in 2006

Source: Individual primary research

E-shops and e-stores belong to the third phase, which is the **stage of transaction**. It is important for customers that the reliability of the system operated by companies should be guaranteed at a sufficient level. The necessary parts of this system are the following:

- the possibility of ordering a product (**selling products and services**, **providing Internet access through mobile phone**),
- payment for the ordered products either in an electronic (**offering online payment facilities**) or in a traditional way,
- guarantee of safe and secure online payment (**offering security transactions**),
- providing digital and other services for regular customers (**offering personalised content in website for regular visitors**, **online services** and digital products).

Several types of payment have developed and been applied from using cards or mobile phones to other payment facilities. The type of payment is mainly important for individuals because companies use traditional banking transfer systems instead.

Examining the potential indicators of transaction in Hungary in 2006 [**Figure 79**], it can be observed that companies were underdeveloped (13.2%) and had a slow pace of growth (3.3%) between 2006 and 2007. An even more adverse rate was measured in the case of microenterprises (6%). This can be explained with the lack of online payment (2%) and offering or performing security transactions (0.5%). However, the pace of growth was fast with 6.6% between 2006 and 2007.

In terms of small-sized enterprises, the penetration rate of transaction (16%) was almost twice as high as in microenterprises. The rate of selling products and services was two times, the rate of offering personalised content in website for regular visitors was six times higher and the rate of online payment facilities was three times higher than the same rates measured in the former size category. The pace of growth was 4.5% between 2006 and 2007 in the category of small-sized companies. The penetration rate of transaction reached 18.5% in medium-sized enterprises. This can be explained with the highest rate of selling products and services, compared to small-sized enterprises. The pace of growth was 4.3% in this category. The potential indicator of transaction stood at 25.6% in the case of corporations, which was double than the national average, four times higher than the potential indicator measured in microenterprises, 9% higher than the rate in small-sized enterprises and exceeded the rate produced by medium-sized enterprises with 8%. This size category showed the lowest pace of growth among the surveyed company sizes with 0.8%.

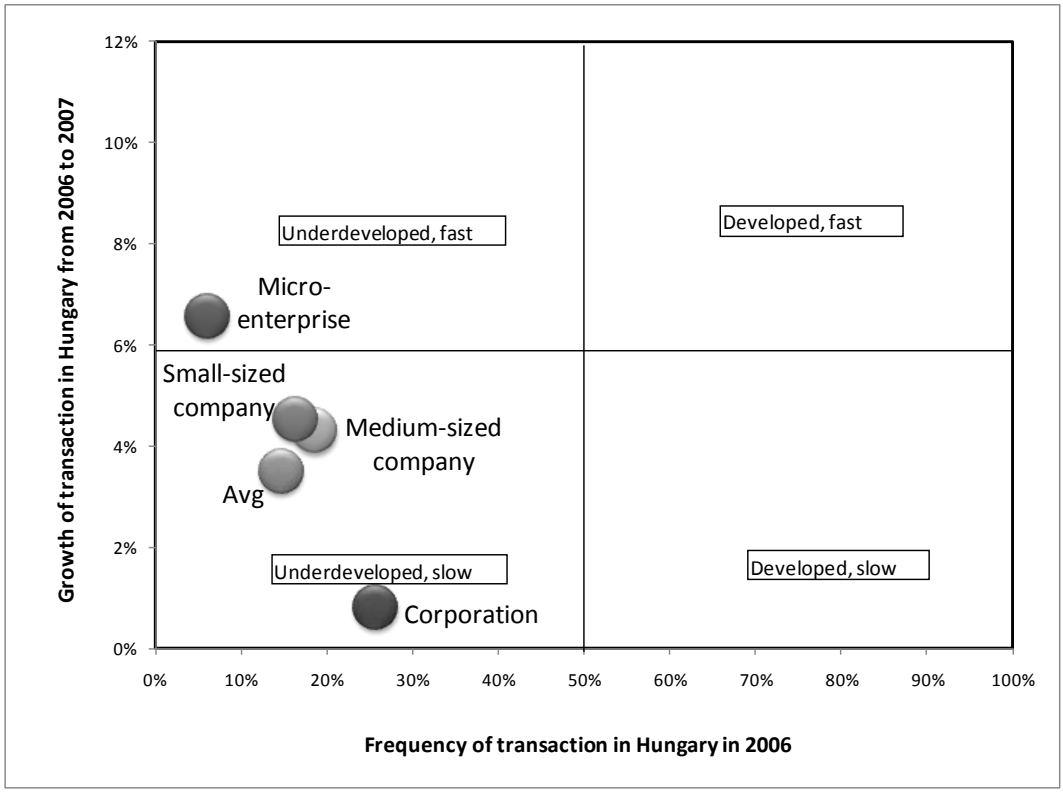


Figure 79 - The frequency and growth of transaction by company size in Hungary in 2006

Source: Individual primary research

Studying the Hungarian economic sectors, it becomes clear that in 2006 the pace of growth was low almost in all sectors with the exception of 'Health and social work' and can be regarded as underdeveloped [**Figure 80**]. A 20% higher penetration rate was performed by the sectors 'Financial intermediation' (23%) and 'Transport, storage and communication' (23%). The lowest rates were

produced by 'Agriculture, hunting and forestry' (6%), 'Construction' (6%) and 'Health and social work' (1.2%) in 2006. The only fast pace of growth was experienced in the 'Health and social work' sector (8.6%). The main reason for this figure was the lack of online payment facilities and offering or performing security transactions.

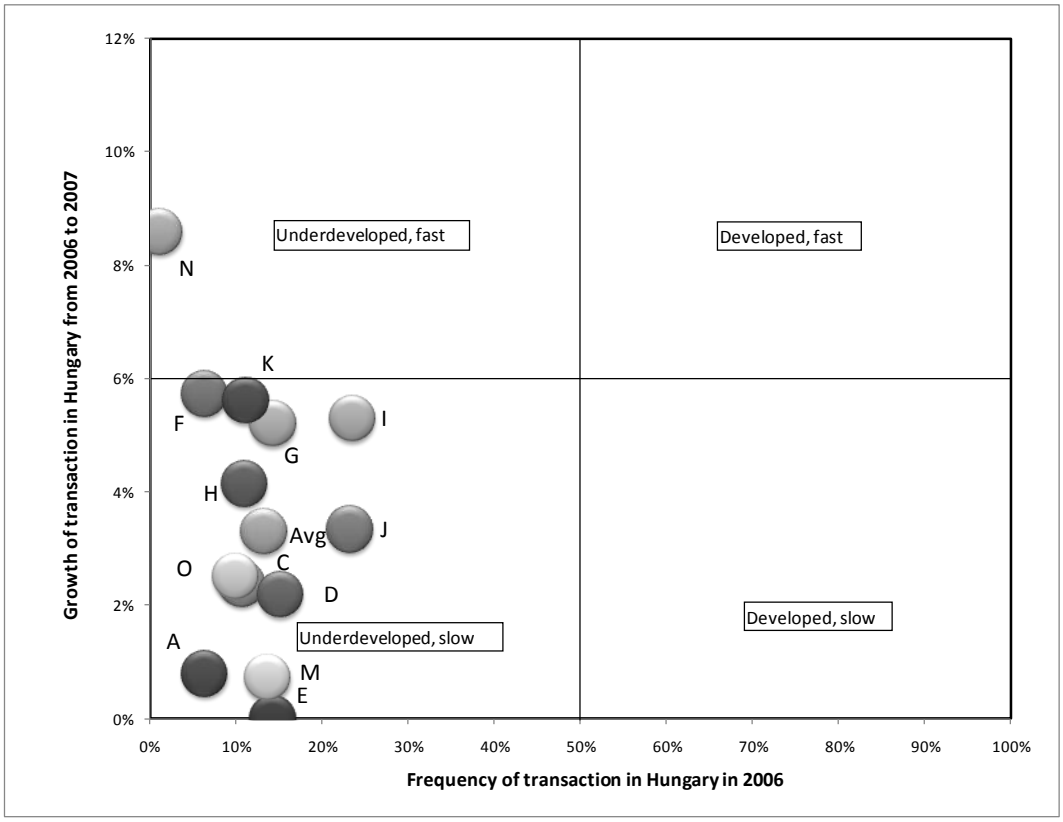


Figure 80 - The frequency and growth of transaction in connection with economic sectors in Hungary in 2006

Source: Individual primary research

5.4.2.2 The environmental system for e-commerce provided by information and communication technology. The purpose, penetration and growth of these services

The decisive change in the services provided by ICT devices is caused by the appearance of real interactivity. In this case, the system does not offer a set of available products for customers; instead it allows enterprises to use various trading techniques. This is called e-marketplace, which is the fourth stage of development. An e-marketplace has to fulfil the following functions:

- it accumulates and provides process-specific or industry-specific content or information;
- it performs business transactions online,
- it allows enterprises to track the state of business transactions online through the largest possible cycle (trading, selection, order, modification, confirmation, delivery, payment)
- it builds up a community and establishes cooperation with the help of information and communication technology. It also facilitates carrying out projects for employees or enterprises not working in the same workplace or location.

In order to create e-marketplaces, companies need to operate certain systems. The most delicate and the most complicated part of building a system is its integration. Nowadays five to ten IT systems

are installed in an average medium-sized enterprise, and these systems are not able to communicate with each-other or they are but only in a specialised way. In the case of e-marketplaces, both inside and outside accesses are needed that are based on authorization.

As a consequence of these observations, I assumed that companies were likely to operate certain systems helping them to have access to e-marketplaces. These can be the following:

- **reordering systems** (stockpiling);
- **invoicing and payment systems**;
- **production, logistics and/or service systems**;
- **purchasing systems**;
- **sales systems**;
- **other computer systems**.

Security has a peculiar significance in e-marketplaces as enterprises open their systems and transmit their business data to the "outside world", depending on the nature of a given application. This is the reason why installing a multilevel security system is essentially required:

- hardware-level protection (firewall, high availability architecture, high performance, log-on devices),
- software level protection (firewall, intrusion detection system, virus protection, **digital signature**, device access management),
- elaboration and application of security procedures.

In 2006, the penetration of the **requirements for using e-marketplaces** [**Figure 81**] was underdeveloped (29%) and its pace of growth was slow (3%). One of the reasons of these poor figures was the low rates of simple indicators (below 50%) formulating the potential indicator (below 50%). Especially low rates were measured in the penetration of sales systems (19%), purchasing systems (23%) and digital signature (22%).

In terms of microenterprises, the penetration of the requirements for using e-marketplaces was below the average by 17% in 2006. The pace of growth was 3.3% between 2006 and 2007 in this company size category. This can be explained with the low penetration levels of sales systems (3.5%), purchasing systems (8.4%) and reordering systems (9%).

The penetration rate measured in the case of small-sized enterprises was 1% higher than the average with a 3% growth between 2006 and 2007. Compared to microenterprises, the penetration of digital signature was two times higher than in microenterprises. There was a fourfold difference in the penetration of reordering systems between small- sized and microenterprises, while the difference was threefold in the penetration of production, logistics and/or service systems between these two size categories.

The penetration rate of the requirements for using e-marketplaces was 33% in medium-sized enterprises in 2006, its pace of growth was 3.2% between 2006 and 2007. The penetration of invoicing systems (56%) was 9% higher, while the usage of other computer systems (38%) was 10% higher than in the case of small-sized enterprises.

In terms of corporations, the potential indicator of the requirements for using e-marketplaces stood at 49% in 2006. The rate of using reordering systems (52%) was 16% higher and the rate of using production, logistics and/or service systems (40%) was 20% higher than the rate measured in

medium-sized enterprises. There was a twofold difference in the penetration of purchasing systems (40%) between these two size categories.

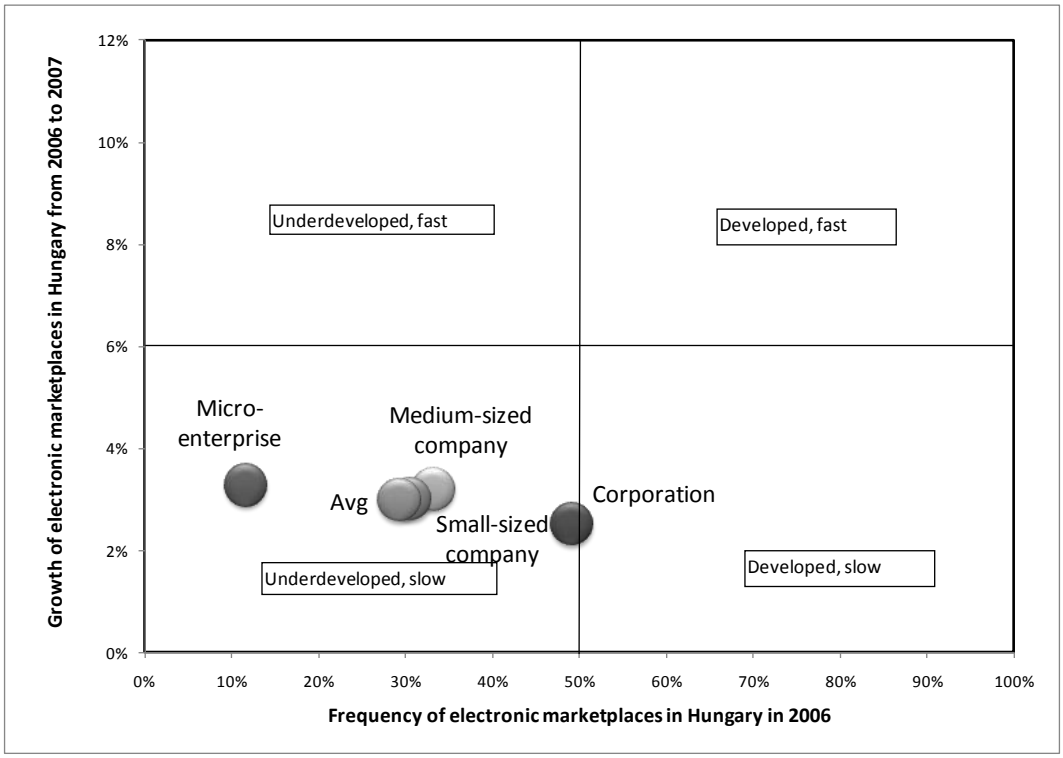


Figure 81 - The frequency and growth of electronic marketplaces by company size in Hungary in 2006

Source: Individual primary research

Examining the penetration of the requirements for using e-marketplaces in consideration of economic sectors, it can be stated that all sectors are underdeveloped [**Figure 82**]. Faster pace of growth can be detected only in the sectors 'Agriculture, hunting and forestry' (7%), 'Health and social work' (6.6%), 'Real estate, renting and business activities' (6.9%) and 'Other community, social and personal service activities' (6.4%). The highest penetration rates were produced by 'Electricity, gas and water supply' (47%), 'Transport, storage and communication' (45%) and 'Mining and quarrying' (41%). The lowest rates were measured in the sectors 'Agriculture, hunting and forestry' (11%) and 'Health and social work' (18%) in 2006.

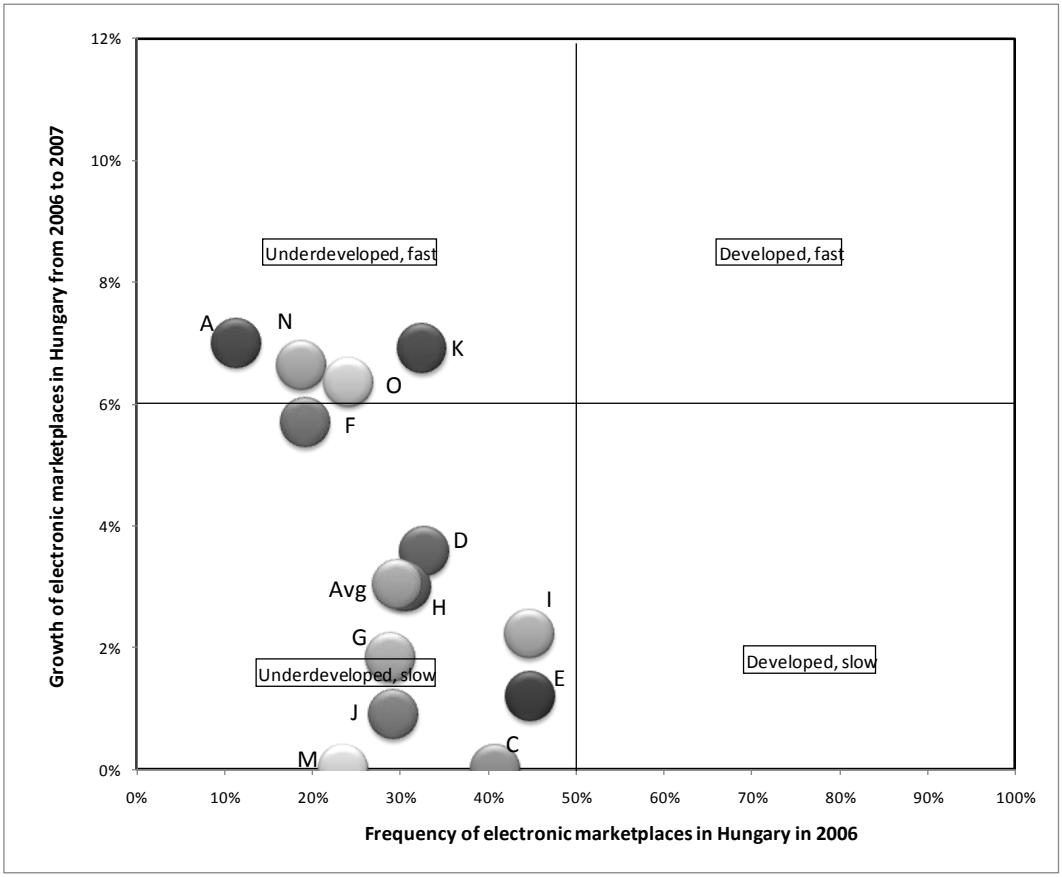


Figure 82 - The frequency and growth of electronic marketplaces in connection with economic sectors in Hungary in 2006

Source: Individual primary research

5.4.3 The evaluation of the separate subhypotheses related to the 'great narratives'

T2C: THE ADAPTATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN SEVERAL ECONOMIC SECTORS TAKE PLACE DIVERSELY BOTH IN TIME AND IN INTENSITY AT THE LEVEL OF THE 'GREAT NARRATIVES', DEPENDING ON THE SIZE OF COMPANIES AND VARIOUS ECONOMIC SECTORS.

Based on size categories, a rapid adoptation pace can be observed in the case of microenterprises [**Figure 83**]. The value of the compound indicator of microenterprises was 27.3% sending them to the category of early majority [**Appendix 1**].

The pace of growth of the compound indicator was 5%, being the highest rate among the surveyed size categories. Small- and medium-sized enterprises produced an average adoptation pace. The annual pace of growth reached 3.8% in small-sized enterprises and 3% in medium-sized enterprises in 2006. The values of their compound indicator were 42.3% and 44.5%, putting these enterprises into the category of **early majority**. Corporations can be regarded as developed from the aspect of using information and communication technology. The value of their compound indicator was 54%, which means that newcomers get into the category of **late majority**. The pace of growth of the compound indicator is 1.2%, which shows a **slow adoptation** pace.

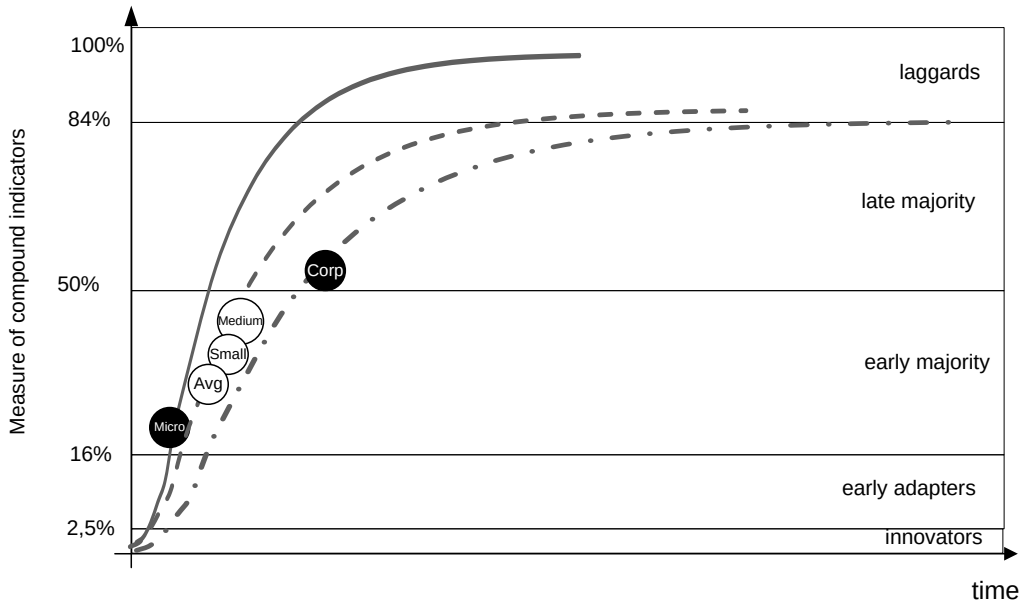


Figure 83 - Grouping size categories based on development stages[5]

Source: Individual research

If we take the penetration and growth of the development stages in the economic sectors into consideration, **rapid adaptation** pace could be established in four of them [**Appendix 3** and **Appendix 4**]. The compound indicator of these four sectors is higher than 16 percent and lower than 50 percent, so every newcomer belongs to the category of **early adapters**. The growth measured in the 'Health and social work' sector was the fastest with 7.4% but its range was the smallest – with only 26.3% – among the studied sectors. It is followed by the sectors 'Construction' (27.1%), 'Hotels and restaurants' (32.8%), 'Real estate, renting and business activities' (37.2%).

[5](Micro)=microenterprises, (Small)=small enterprises, (Medium)=medium-sized enterprises, (Avg)=National average; (Corp)=corporations.

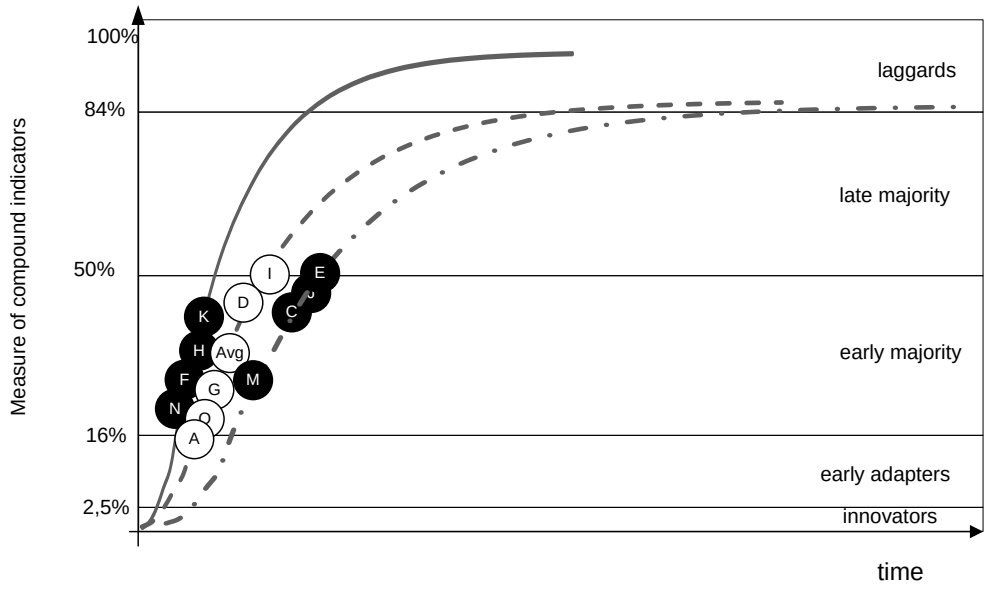


Figure 84 - Grouping economic activities based on development stages[6]

Source: Individual research

Five economic sectors can be found in the **average adaptation** category compared to the national average. Every one of them is at an underdeveloped stage. The compound indicator of the 'Transport, storage and communication' sector is the highest with 49.7%. If its pace of growth remains at 3.7%, it will get into the category of developed sectors in the following year. The sectors 'Agriculture, hunting and forestry' (25.9%), 'Other community, social and personal service activities' (31.6%), 'Wholesale and retail trade' (36.3%) and 'Manufacturing' (42.2%) all belong to the average adoptation category.

Five economic sectors can be categorized as **slow adapters**. The compound indicator of the 'Electricty, gas and water supply' sector exceeds 46.9%. The smallest penetration rate was produced by the 'Education' sector with 35.2%. The sectors 'Financial intermediation' (44.4%) and 'Mining and quarrying' (43%) can be seen as definitely underdeveloped. The lowest growth of penetration was shown by 'Electricity, gas and water supply' with 0.3%.

T3: THE UTILIZATION OF INFORMATION AND COMMUNICATION TECHNOLOGY HAS REACHED A DEVELOPED LEVEL IN THE FOLLOWING ECONOMIC SECTORS: ELECTRICITY, GAS AND WATER SUPPLY, TRANSPORT, STORAGE AND COMMUNICATION AND FINANCIAL INTERMEDIATION.

The availability of **personal computer**s and **mobile phone**s reached the highest level in the ‘Electricity, gas and water supply’ sector among the studied activities (the second highest level was

[6] (A)=Agriculture, hunting and forestry, (C)=Mining and quarrying, (D)=Manufacturing, (E)=Electricity, gas and water supply, (F)=Construction, (G)=Wholesale and retail trade, repair work, (H)=Hotels and restaurants, (I)=Transport, storage and communication, (J)=Financial intermediation, (K)=Real estate, renting and business activities, (M)=Education, (N)=Health and social work, (O)=Other community, social and personal service activities.

shown by the ‘Financial intermediation’ sector and the third was produced by ‘Transport, storage and communication’.)[**Appendix 7**].

The penetration of **local area network**s was the most significant in the ‘Financial Intermediation’ sector with 84% (the second most frequent usage was detected in ‘Electricity, gas and water supply’ and the third was shown by ‘Transportation, storage and communication’).

The penetration rate of Internet access was 97% in ‘Financial intermediation’, which was closely followed by the ‘Electricity, gas and water supply’ sector with 94%. The ‘Transportation, storage and communication’ sector was only in the fourth place with 83%, coming right after ‘Mining and quarrying’.

The aim of using ICT was **searching for information** and sending and receiving **e-mail** in the above three economic sectors.

Banking and financial services were most frequently used in the ‘Transportation, storage and communication’ sector, while they were converged to the national average in ‘Electricity, gas and water supply’. The penetration of banking and financial services was well below the average in ‘Financial intermediation’.

ICT was most frequently used for **market observation** in ‘Financial intermediation’, in the ‘Transport, storage and communication’ sector this service was used at an average penetration rate, while the same technique was only used by the quarter of enterprises in the ‘Electricity, gas and water supply’ sector.

Advertisements and marketing services were used by almost half of the enterprises in ‘Financial intermediation’, by 40% of enterprises in ‘Transportation, storage and communication’ and barely 30% in the ‘Electricity, gas and water supply’ sector.

ICT was used for **purchasing and selling products and services** by less than 30% of the companies studied in several economic sectors. 20% of the enterprises in the ‘Electricity, gas and water supply’ sector used the Internet to purchase and sell products and services.

The penetration rate of using the Internet for education and training was 30% in ‘Electricity, gas and water supply’, and 29% in the ‘Financial intermediation’ sector. The Internet was used for this purpose by one-fifth of the companies in ‘Transport, storage and communication’.

Using and maintaining web sites was most frequently used in the ‘Electricity, gas and water supply’ sector with 59%, which was the highest rate among the studied economic activities. This rate was higher than the national average and higher than the penetration rate in the ‘Transport, storage and communication’ sector by 12% but 6% lower than the average of the European Union. ‘Financial intermediation’ reached a 2% lower rate than the ‘Transport, storage and communication’ sector.

Companies usually **publish information** on their **products and services** on their web sites. Enterprises in the ‘Financial intermediation’ sector presented the highest rate of penetration among the studied economic activities with 97%. The second highest rate was shown by ‘Transport, storage and communication’. The ‘Electricity, gas and water supply’ sector produced a rate below the national average.

Placing **job advertisements** on the Internet was used by 40% of companies in the ‘Financial intermediation’ sector (with the highest rate among the surveyed Hungarian economic activities). Using this function, the sectors ‘Electricity, gas and water supply’ and ‘Transport, storage and communication’ also presented higher rates than the national average.

Online **customer services** were maintained and operated most frequently by companies in the 'Electricity, gas and water supply' sector. The rate of penetration was also higher than the national average in the sectors 'Financial intermediation' and 'Transport, storage and communication'.
The rate of providing **after-sales services** was twice as high in the 'Financial intermediation' sector as the national average. It was higher than the national average by one and a half in 'Transport, storage and communication', but it wasn't significant in the 'Electricity, gas and water supply sector'.
The rate of providing **online services**, **internet access by mobile** phones, the availability of **online payment** and **performing security transactions** was the highest in the field of 'Financial intermediation'. The sectors 'Electricity, gas and water supply' and 'Transport, storage and communication' were not characterized by these services. The only exception was the possibility of performing security transactions offered in the 'Transport, storage and communication' sector.

1. The development stages in the studied economic activities

All the three studied economic sectors have a higher penetration rate than the national average in the **stage of electronic presence** [**Appendix 8.**].
The highest penetration rate was measured in the 'Electricity, gas and water supply' sector. 'Transport, storage and communication' and 'Financial intermediation' also showed a high penetration rate at this stage. At the **stage of interaction and dialogue** 'Financial intermediation' was the most developed sector among the studied economic activities. The second highest penetration rate was produced by 'Electricity, gas and water supply', while 'Transport, storage and communication' was in the third place in this regard. All these three economic sectors can be seen as developed at this development stage. At the **stage of transaction** or partnership none of the studied Hungarian economic sectors were developed. Comparing these activities to each-other, it can be clearly stated that the highest rate was shown by 'Transport, storage and communication' and 'Financial intermediation'. The 'Electricity, gas and water supply' sector produced quite an average rate. At the **stage of e-commerce**, the best conditions were shown by the sectors 'Transport, storage and communication' and 'Electricity, gas and water supply'. In this regard, 'Financial intermediation' had a penetration rate around the national average.

2. The adoptation of information and communication technology

From the aspect of the adoptation of ICT, the highest compound indicator could be observed in the 'Transport, storage and communication' sector [**Figure 85**].

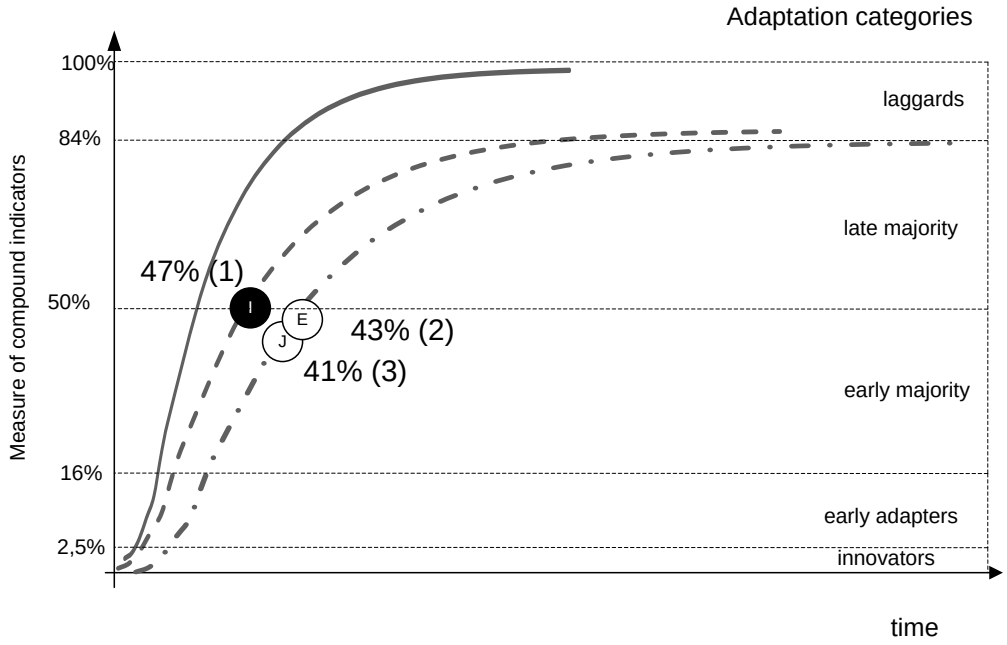


Figure 85 - The development stage of 'Electricity, gas and water supply' (E), 'Transport, storage and communication' (I) and 'Financial intermediation' (J) based on compound indicators

Source: Individual research

'Electricity, gas and water supply' and 'Financial intermediation' produced relatively high rates but in spite of that, they have to be regarded as underdeveloped economic sectors.

3. Clustering the potential indicators of size categories and economic activities

Clustering is the assignment of a set of observations into subsets so that observations in the same cluster are similar in some sense. The clustering process is successful when the subsets are similar to each-other and different from the elements of other subsets at the same time. Based on theoretical considerations, I decided to make groups of economic activities and company size categories from the five previously defined potential indicators.

Cluster analysis is very sensitive to outliers, data that are significantly different from the others. During my analysis, I assumed that the measured data represented the base manifold appropriately.

While carrying out cluster analysis, I used an identical metric scale, so there was no need for standardization.

Distance and proximity matrices constitute the base for data clustering algorithms. Data clustering processes can be hierarchical and non-hierarchical. In the course of my analysis, I used hierarchical agglomerative algorithms. Agglomerative algorithms begin with each element as a separate cluster and merge them into successively larger clusters. As I proceeded in the analysis, I managed to merge initially separate clusters into larger ones.

Within the agglomerative scheme, at first I used the method called single linkage, then I used Ward's Linkage to choose the successive clustering steps so as to minimize the increase in ESS at each step.

Table 16 shows that how many economic activities were accepted as valid cases by the SPSS programme and how many of them were not. In my case, it accepted all the thirteen activities as

valid ones. The proximity matrix is the squared Euclidean distance measuring dissimilarity [**Appendix 9.**].

Table 14 - Number of analysed items

Cases					
Valid		Missing		Total	
N	Percent	N	Percent	N	Percent
13	100,0	0	,0	13	100,0

Source: Individual primary research using SPSS 16.0 statistical package

In the first step of single linkage, I calculated those sets of observation that showed the shortest distance (or were the most similar to each-other). Such sets of observations were 'Education' and 'Other community, social and personal service activities', for instance.

The agglomeration schedule proves that the shortest distance was measured between Case-11 ('Education') and Case-13 ('Other community, social and personal service activities') clusters, so the SPSS programme combined these clusters first.

Table 15 - Cluster combination

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	11[7]	13	,010	0	0	3
2	6	10	,011	0	0	3
3	6	11	,014	2	1	5
4	3	9	,015	0	0	6
5	6	7	,017	3	0	6
6	3	6	,022	4	5	9
7	5	12	,022	0	0	8
8	1	5	,023	0	7	9
9	1	3	,024	8	6	11
10	4	8	,027	0	0	11
11	1	4	,030	9	10	12
12	1	2	,033	11	0	0

Source: Individual primary research using SPSS 16.0 statistical package

The dendrogram can be read from left to right: it shows which economic activities were combined. The great outliers are presented in a graphic form.

[7] 1=(A) Agriculture, hunting and forestry, 2=(C) Mining and quarrying, 3=(D) Manufacturing, 4=(E) Electricity, gas and water supply, 5=(F) Construction, 6=(G) Wholesale and retail trade; repair work, 7=(H) Hotels and restaurants, 8=(I) Transport, storage and communication, 9=(J) Financial intermediation, 10=(K) Real estate, renting and business activities, 11=(M) Education, 12=(N) Health and social work, 13=(O) Other community, social and personal service activities.

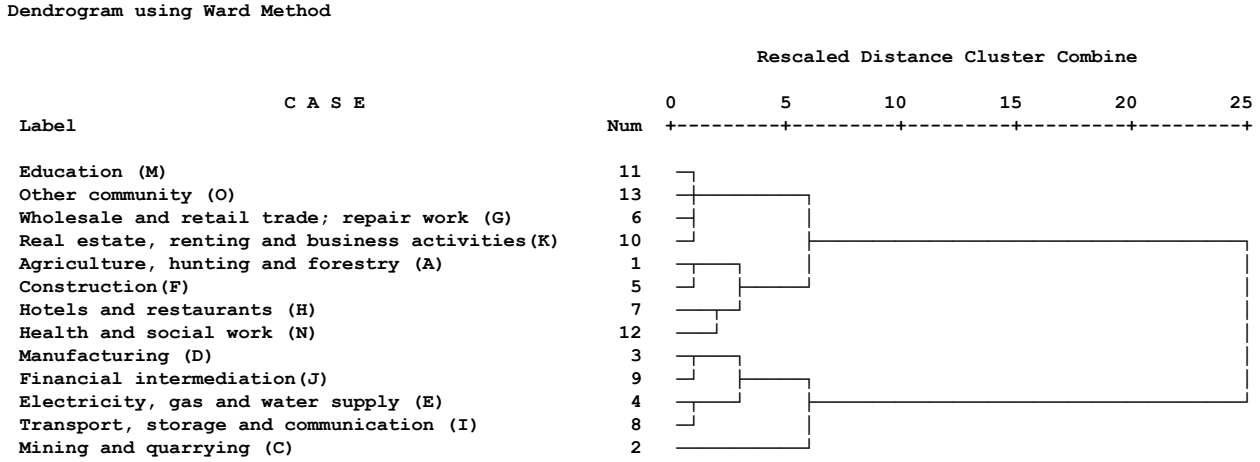


Figure 86 - The dendrogram of the economic sectors

Source: Individual primary research using SPSS 16.0 statistical package

The single linkage method always combine various clusters based on the shortest distance between them, that is the reason why this method is considered ideal for recognizing spectacularly different sets of observations or outliers. The original data set did not contain a significantly different economic sector.

In clustering, I want to know the distance of the sets of observations from one another, the similarities are not important. As the single linkage method combines only the closest groups, in the next step, I used Ward's method, to combine those groups that did not raise the value of the square root of variance. After completing my calculations with Ward's method, the resulting dendrogram was the same as in the case of the single linkage method.

While performing cluster analysis, the most important step is to determine the number of clusters. Based on the coefficients and the dendrogram, it can be appointed that there are two main clusters evolved from the initial potential indicators. Eight economic activities can be found in the first and five activities can be found in the second cluster. The first cluster contains economic sectors using ICT below the average, while the second one includes those developed sectors that use ICT above the average.

In the table below, Total comprises the data applying to all sets of observations. Mean signifies average, N denotes the number of cases and Std. Deviation expresses the variance between the sets of observation. Cluster centroids are made up of mean values, standard deviation gives information on the homogenity of groups.

Table 16 - Cluster centroids and deviations in the case of two-cluster variables

Ward Method		EDI network, closed and cannot be scaled	Electronic presence	Stage of interaction /dialogue	Stage of transaction	Electronic markets
1	Mean	,199650	,480412	,457900	,092350	,23631
	N	8	8	8	8	8
	Std. Deviation	,0351220	,0464122	,0750949	,0436111	,070446
2	Mean	,228460	,660100	,590640	,173800	,38444
	N	5	5	5	5	5
	Std. Deviation	,1083439	,0514881	,0616838	,0572522	,071003

Total	Mean	,210731	,549523	,508954	,123677	,29328
	N	13	13	13	13	13
	Std. Deviation	,0696075	,1020740	,0952669	,0624749	,101002

Source: Individual primary research using SPSS 16.0 statistical package

I continued to expand the database by adding data on the national economy average and company size categories - (Micro) microenterprises, (Small) small-sized enterprises, (Medium) medium-sized enterprises and (Large) corporations.

In the new agglomerative schedule, Stage denotes the individual steps of combination. In the first step, I combined Cluster 6 ('Wholesale and retail trade; repair work') with Cluster 18 (national economy average), as they showed the smallest distance one another.

In the table, Stage Cluster First Appears denotes in which step two combined clusters appear for the first time. After clusters are combined, their "registry number" always stays smaller.

Table 17 - Cluster combinations regarding company size and branches of economy

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	6[8]	18	,001	0	0	4
2	15	16	,002	0	0	11
3	11	13	,004	0	0	9
4	6	10	,008	1	0	9
5	12	14	,013	0	0	10
6	1	5	,020	0	0	10
7	3	9	,026	0	0	13
8	4	8	,037	0	0	13
9	6	11	,049	4	3	12
10	1	12	,066	6	5	15
11	2	15	,083	0	2	14
12	6	7	,102	9	0	15
13	3	4	,131	7	8	16
14	2	17	,181	11	0	16
15	1	6	,263	10	12	17
16	2	3	,357	14	13	17
17	1	2	,760	15	16	0

Source: Individual primary research using SPSS 16.0 statistical package

[8] 1=(A) Agriculture, hunting and forestry, 2=(C) Mining and quarrying, 3=(D) Manufacturing, 4=(E) Electricity, gas and water supply, 5=(F) Construction, 6=(G) Wholesale and retail trade; repair work, 7=(H) Hotels and restaurants, 8=(I) Transport, storage and communication, 9=(J) Financial intermediation, 10=(K) Real estate, renting and business activities, 11=(M) Education, 12=(N) Health and social work, 13=(O) Other community, social and personal service activities, 14=(Micro) Microenterprise, 15=(Small) Small-sized enterprise, 16=(Medium) Medium-sized enterprise, 17=(Corp) Corporation, 18= (Avg) Average.

Based on the expanded database, I came to the conclusion that eventually two clusters should be kept. The number of the first group increased from eight to ten due to microenterprises and the national economy average, while the number of the second group raised from five to eight due to small and medium-sized enterprises and corporations.

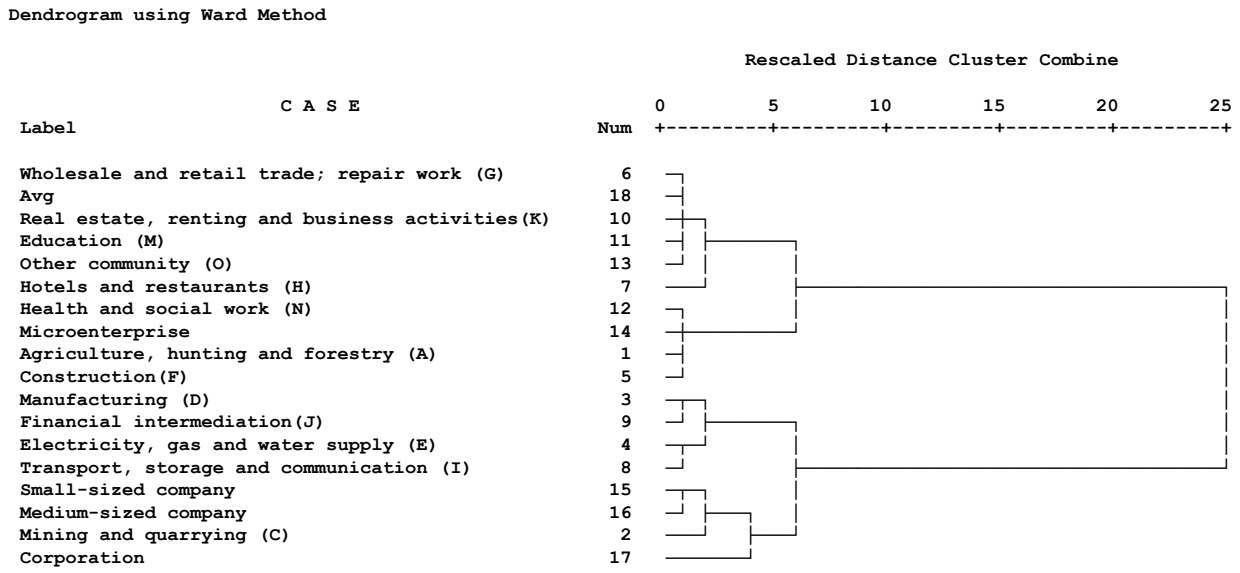


Figure 87 - The dendrogram of company size and the economic sectors

Source: Individual primary research using SPSS 16.0 statistical package

As a summary of the results of the cluster analysis, it can be stated that the sectors 'Electricity, gas and water supply', 'Transport, storage and communication' and 'Financial intermediation' belong to the second cluster.

As it can be seen on **Figure 87** the two final clusters can be broken down further into four clusters altogether. After dividing the cluster that contains developed economic activities, 'Electricity, gas and water supply', 'Transport, storage and communication' and 'Financial intermediation' shifted to the other cluster that can be characterized by better average values.

T4: THE DIRECT MICRO- AND MACROECONOMIC EFFECT OF THE INFORMATION AND COMMUNICATION TECHNOLOGY CANNOT BE MEASURED UNAMBIGUOUSLY.

ICT devices contribute to the improvement of productivity, the economic growth or the acceleration of the economy in several areas. As far as macroeconomic effects are concerned, the technological development is very rapid alongside with the **productivity** and the **total factor productivity** (TFP) in the economic sectors producing ICT devices. On the one hand, this process increases the national average in itself, especially when its share tends to grow in the GDP; on the other hand it makes other economic sectors more dynamic by the technological and economic connections throughout the whole economic system.

(D) Manufacturing	(G) Wholesale and retail trade; repair work	(I) Transport, storage and communication	(K) Real estate, renting and business activities
Manufacture of business machines 3001 Manufacture of computers 3002 Manufacture of industrial electronics 3220 Manufacture of consumer electronics 3230	Wholesale trade of softwares and computers 5164	Telecommunication 6420	Software publishing services 7221, Other software consultation services 7222, Lending office machinery and computers 7133, Hardware consultancy services 7210, Data processing services 7230, Data bank services 7240, Office machinery and computer repair services 7250, Other computer related services 7260

Figure 88 - Economic activities classified as ICT activities according to TEÁOR-NACE

*Source: KSfZ, **GKIeNET** Ltd., 2005*

Profits gained with the help of the rapid technological development and the improvement of productivity was eroded by the drop in ICT prices. Countries producing ICT devices lost a part of their profits realized from production because of the deteriorating swap ration.

The source of productivity and growth benefits is **capital deepening** (it describes an economy where the amount of capital per worker is increasing), that is the growing rate of using **ICT** devices, which is stimulated by the huge drop in ICT prices. These benefits appear in the form of the increased output of existing products and services, manufacturing new products or providing new services, fulfilling customer needs more efficiently and decreasing transition costs etc. The effect of ICT devices on the increased productivity and more dynamic growth was connected to capital deepening. The countries and businesses using these new technologies have benefited more from the revolution of information technology, than the countries producing them.

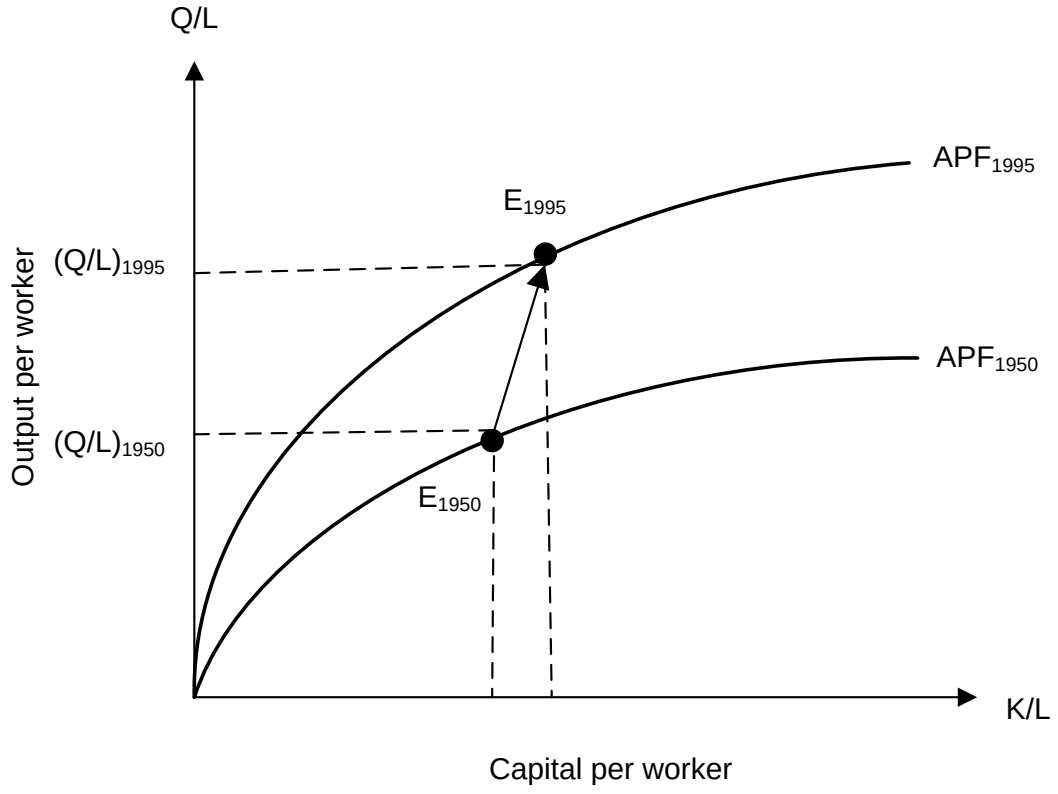


Figure 89 - Technological development elongates the production curve

*Source: **Samuelson P. A.-Nordhaus W.**: Economics, 2000*

ICT devices increase the total factor productivity, that is they improve the degree of utilization of capital and labour force. The total factor productivity (**TFP**) expresses the overall effect on the savings of economies of scale, management skills, **production externalities** and other, non-traditional factors influencing productivity. The significance of the growing total factor productivity is that it accelerates the pace economic growth without additional costs and without having to increase the quantity input. Capital deepening is a necessary but not sufficient condition for improving productivity. It unfolds in its fullest form when the potential efficiency surplus of ICT devices is exploited. A more dynamic TFP automatically accelerates the pace of labour productivity, thus it helps to boost economic performance.

Using ICT devices also improves productivity and makes economic growth more dynamic because information technology cannot be regarded as capital goods in the traditional sense of the word. The instalment of a new information technology device raises the value of other existing devices as well. Network effects may occur within companies, moreover they may appear between industrial branches, and they may necessitate to shape new forms of cooperation (outsourcing).

ICT devices increase productivity and output by capital deepening, improved total factor productivity and network externalities at the microeconomic level. The advantages of using ICT devices at the macroeconomic level come from all the advantages of the companies' improved productivity and from the network advantages based on the feature of reducing transition costs and accelerating innovation. The network advantage does not depend on the operation of a given company and its business strategy.

The effects of ICT devices on the productivity of companies cannot be measured unequivocally at the microeconomic level because of certain statistical and methodological imperfections, the difficulties in measuring network effect at a business level and the lack of data enabling to make international comparisons. Furthermore, the effects of ICT devices on productivity appear at a **later time**, as they are preceded by a longer or shorter learning process. The productivity paradox has started to vanish by now. It has become clear that statistics cannot or just partially show the secondary effects of using ICT devices in the economy (faster information processing, improvement of productivity in producing knowledge, for instance).

In those countries where the competition is fierce in the market, companies using ICT devices are not necessarily the main winners of capital deepening. They are the customers who can benefit from it in the form of lower prices, better quality or more convenience.

In countries where competition is weak, companies are able to realize a greater part of benefits coming from capital deepening. But it has its own price as the secondary effects of using ICT devices are more limited in the economy.

With the help of the compound indicator and the financial data of the studied economic sectors, I made an attempt to find a connection between the development level of ICT and their profitability. Profitability and productivity are influenced by a lot of other factors as well. As I could not measure and show the effect of those other factors, the results are not full but informative.

Based on the statistical connection between the compound indicator and the increment of the Gross Value Added per worker, the correlation coefficient is 0.13, while the gradient of the regression trend line is 0.17. Both numbers show a positive connection between the compound indicator and the profitability.

Then, using a coordinate system, I illustrated [**Figure 90**] the connection between the changes of the specific indicators of the studied economic sectors and the development level of those sectors. The Y axis shows the growth pace of Gross Value Added per capita in the economic activities between 2003 and 2006. The X axis shows the compound indicator that I created for measurement. The points defined by the two values show clearly where a given economic sector can be found in the coordinate system, what groups can be constituted and what tendency can be observed.

The highest increment of specific **Gross Value Added** was produced by the sectors 'Manufacturing', 'Electricity, gas and water supply', 'Transport, storage and communication' and 'Financial intermediation'. With the exception of 'Electricity, gas and water supply', all of these economic activities belong to the group of underdeveloped sectors (below 50%).

High (but not reaching the developed status) compound indicators were shown by the sectors 'Mining and quarrying' and 'Wholesale and retail trade; repair work', as they produced an increment of Gross Value Added below the average, these economic sectors can be found in the lower right part of the coordinate system.

The sectors 'Construction', 'Health and social work' and 'Hotels and restaurants' can be seen as laggards, so they got into the lower left part of the coordinate system.

The 'Agriculture, hunting and forestry' sector can also be classified as a laggard economic activity, but as the effect of the compound indicator on the increment of Gross Value Added was less significant, it can be found in the upper left part of the coordinate system.

Drawing a trend line on the points, it is clear that the line shows a positive gradient, that is, the higher the usage of ICT devices, the higher improvement can be detected in the specific Gross Value Added.

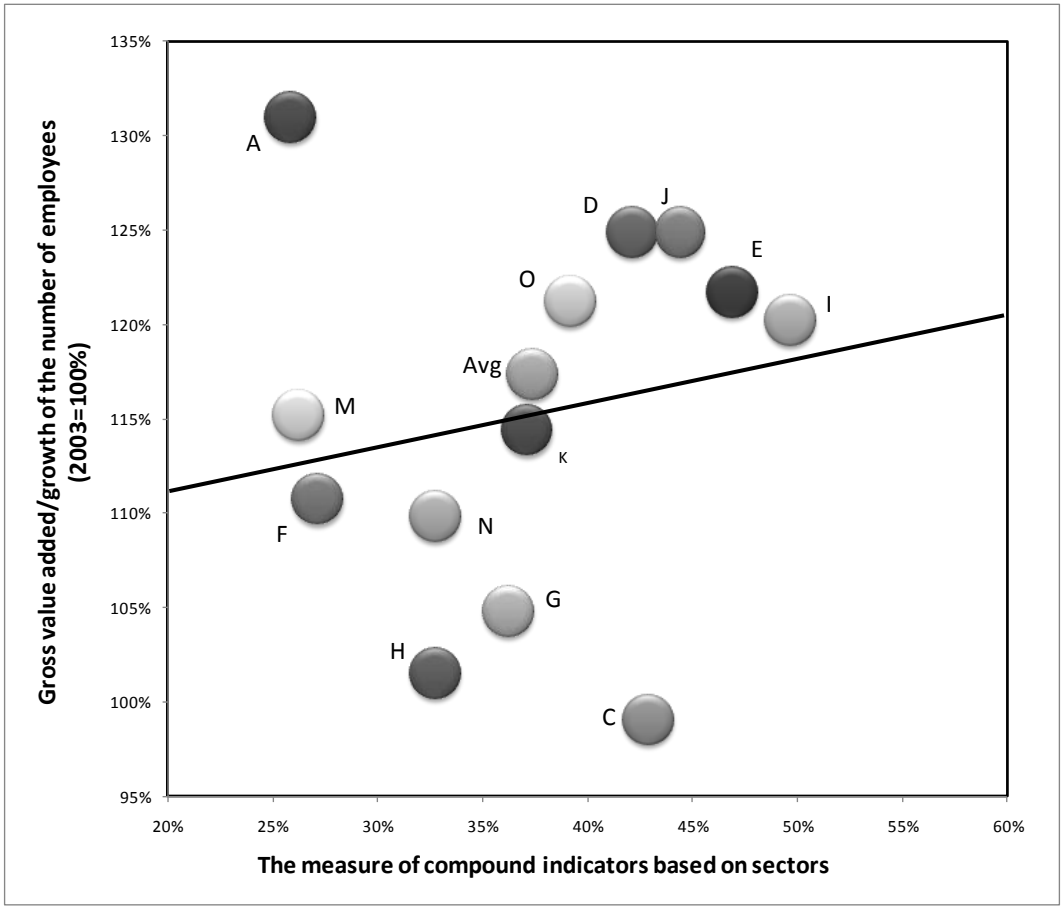


Figure 90 - Connection between the growth of gross value added and the development level of information and communication technology in several economic activities

Source: Individual research

4. Determining the net income of enterprises by using multiple linear regression including the other variables

The connection between several socioeconomic phenomena is so complicated that the change of a given variable cannot be characterized sufficiently in each case with the help of another variable related to the former one. The analysis has to be extended to many criteria even when the aim of the analysis is only to understand the connection between two criteria, as it is very rare in the economy when the link between two phenomena can be studied separate from other essential effects.

The specific methods of studying **multiple connections** are correlation analysis and multiple regression analysis. The former method measures the strength of the arithmetic relationship between two variables, while the aim of the latter method is to find a standard pattern in stochastic relationships.

Correlation analysis describes the strength and direction of a linear relationship between two or more variables. In the correlation analysis presented below, I used metric variables.

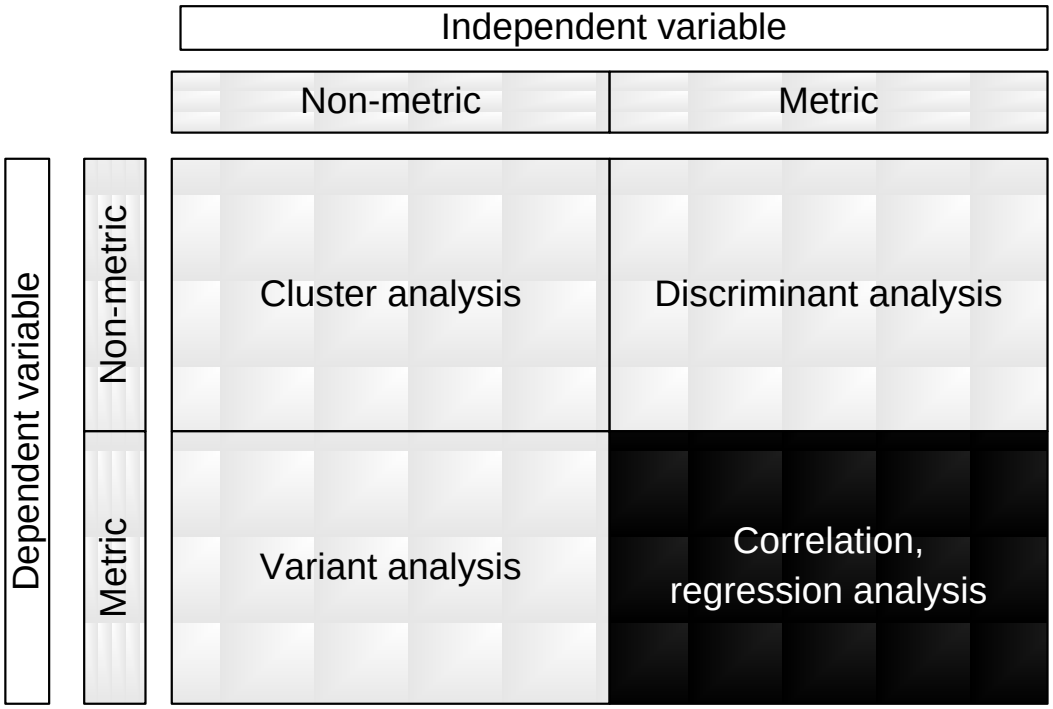


Figure 91 - Summary of the methods used for studying structures, correlation and regression analysis

Source: ***Sajtos L.****– **Mitev A.**: SPSS kutatási és adatelemzési kézikönyv (The handbook of SPSS research and data analysis), Alinea, 2007*

In my primary research, I expressed the variable of the net income of enterprises with the linear combination of the following continuous variables: headcount data that are further divided into the number of IT specialists employed, the total number of employees, the number of regular personal computer users, the number of employees using computers connected to the Internet; and the e-commerce financial data such as the value of purchases via the Internet, the sales revenues via the Internet, the value of purchases through computer networks and the sales revenues through computer networks expressed in thousand forints **[Figure 92]**.

Independent variables	Regression analysis	Dependent variable
1. Headcount data: 1.1. The number of IT specialists employed 1.2. The total number of employed 1.3. The number of regular personal computer users 1. 4. The number of employees using computers connected to the Internet **2. E-commerce financial data:** 2.1. The value of purchases via the Internet 2.2. Sales revenues via the Internet 2.3. The value of purchases through computer networks 2.4. Sales revenues through computer networks	Multiple linear regression	Net sales income of enterprises

Figure 92 - Net income of enterprises expressed with multiple linear regression

Source: Individual primary research

The table below shows that seven independent variables got into the multiple regression model with the exception of the sales revenues via the Internet.

Table 18 – Identification of variables entered or removed involved in the research

Model	Variables Entered	Variables Removed	Method
1	1.1. The number of IT specialists employed 1.2. The total number of employed 1.3. The number of regular personal computer users 1.4. The number of employees using computers connected to the Internet 2.1. The value of purchases via the Internet 2.3. The value of purchases through computer networks 2.4. Sales revenues through computer networks		Enter

Source: Individual primary research using SPSS 16.0 statistical package

Performing a multiple linear regression analysis makes sense only when the stochastic relationship can be demonstrated between the independent variables and the dependent variable. It can be seen in the table that the resulting multiple linear regression model is good because the value of R2 statistics is 0.999 which means that the given model explains 99.9% of all variances.

Table 19 - Summary of multiple linear regression analysis (Model Summary)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1,000	,999	,998	34069,514

Source: Individual primary research using SPSS 16.0 statistical package

The analysis of variance shows the significance of the part explained by the applied linear model. In other words it shows whether a model has an explanatory power or not. The second column represents the sum of squares. Total row of the table presents the total sum of squares. The Residual row of the table refers to the partial sum of squares. The third column shows the degrees of freedom. The F-test in the analysis of variance is used to assess whether the expected values of a quantitative variable within several pre-defined groups differ from each other. It serves as a measure of the statistical importance or significance of the differences among the group means. Mean square is the quotient of the sum of squares and degrees of freedom, the values of mean squares are shown in the fourth column. The F-test can be found in the next column, its value determines the value of significance shown in the sixth column. If the value of significance is low (less than 0.005), I have to leave the null hypothesis according to which the independent variables and the dependent variable have no relationship with one another.

Table 20 - Sample deviation analysis (ANOVA[9])

Model		Sum of Squares	df	Mean Square	F	Sig.
1	**Regression**	5,406E12	7	7,723E11	665,384	,000
	Residual	3,482E9	3	1,161E9		
	Total	5,410E12	10			

Source: Individual primary research using SPSS 16.0 statistical package

It can be proven that the independent variable explains a significant part of the dependent variable, so it is worth studying the strength of their relationship, in other words, the size of the explained part.

[9] Analysis Of Variance

As the null hypothesis proved to be true, the result of the following t-test shows that the variable "the number of IT specialists employed" has no significance in the model because its significance level is high.

Table 21 - Regression coefficients in the case of using Enter method (Coefficients)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-74879,473	15734,469		-4,759	,018
	1.3. The number of regular personal computer users	76222,832	6852,531	4,650	11,123	,002
	2.1. The value of purchases via the Internet	1,108	,120	,363	9,229	,003
	2.3. The value of purchases through computer networks	43,727	6,157	1,813	7,101	,006
	2.4. Sales revenues through computer networks	-111,127	8,872	-2,973	-12,526	,001
	1.1. The number of IT specialists employed	88415,088	67336,688	,402	1,313	,281
	1.2. The total number of employed	13672,860	2183,621	1,514	6,262	,008
	1. 4. The number of employees using computers connected to the Internet	-67251,951	4075,924	-4,124	-16,500	,000

Source: Individual primary research using SPSS 16.0 statistical package

Using the **backward method**, the removal of the independent variables from the model continues until the partial explanation of all remaining variables has significance.

Table 22 - Regression coefficients in the case of Backward method (Coefficients)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-74879,473	15734,469		-4,759	,018
	1.3. The number of regular personal computer users	76222,832	6852,531	4,650	11,123	,002
	2.1. The value of purchases via the Internet	1,108	,120	,363	9,229	,003
	2.3. The value of purchases through computer networks	43,727	6,157	1,813	7,101	,006
	2.4. Sales revenues through computer networks	-111,127	8,872	-2,973	-12,526	,001
	1.1. The number of IT specialists employed	88415,088	67336,688	,402	1,313	,281
	1.2. The total number of employed	13672,860	2183,621	1,514	6,262	,008
	1. 4. The number of employees using computers connected to the Internet	-67251,951	4075,924	-4,124	-16,500	,000
2	(Constant)	-79497,031	16666,773		-4,770	,009
	1.3. The number of regular personal computer users	73207,649	7016,353	4,466	10,434	,000
	2.1. The value of purchases via the Internet	1,239	,072	,406	17,198	,000
	2.3. The value of purchases through computer networks	50,181	4,030	2,080	12,451	,000
	2.4. Sales revenues through computer networks	-106,470	8,838	-2,848	-12,047	,000
	1.2. The total number of employed	16249,950	1040,094	1,799	15,624	,000
	1. 4. The number of employees using computers connected to the Internet	-67639,066	4417,881	-4,147	-15,310	,000

Source: Individual primary research using SPSS 16.0 statistical package

At first, every independent variable appears in the model, however, it can be seen that one of them does not have a significance in the explanation of the net income of enterprises. In the first step, the variable „the number of IT specialists employed" was left out of the model as it produced the smallest t-value in absolute terms. The six remaining variables in the final model proved to be significant.

The next step is the interpretation of Beta values. Its constant value is -79.497. This value denotes where the axis of the net income of enterprises is cut by the hyperplane containing the six remaining variables.

This hyperplane cuts the axis of the main income only if the value of the six remaining variables is 0. The strongest effect may be caused by the increase of the number of regular personal computer users on enterprises. If the value of the purchases on the Internet and through computer networks increases by 1000 forints, the net income of enterprises will rise by 51,000 forints (2.1. and 2.3.). Another interesting feature is that the variable 'sales revenues through computer networks' has a negative effect on the net income of enterprises. The calculation of beta values all variables are

entered into the model in a standardized form with 0 mean and with unit square. Beta values indicate which independent variable has a stronger effect or higher significance, in the case of my model the beta value of the variable 'the number of regular personal computer users' has the strongest effect (4.466). It also turned out that the variables 'the number of employees using computers connected to the Internet' and 'sales revenues through computer networks' did not increase the net income of enterprises.
The table below contains the variables excluded from the model.

Table 23 - Excluded variables

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	2.2. Sales revenues via the Internet	,053	,024	,983	,017	6,621E-5
2	2.2. Sales revenues via the Internet	,918	1,149	,334	,553	,000
	1.1. The number of IT specialists employed	,402	1,313	,281	,604	,002

Source: Individual primary research using SPSS 16.0 statistical package

5. Determining the net income of enterprises by the multiple linear regression of the potential indicators

Regression analysis determines how one variable depends on another variable. It is a vital question for businesses what factors contribute to the amount of their net income. I took the potential indicators related to the economic sectors and the number of employees as independent variables, then I compared them to the amount of the net income of companies in several economic sectors, which was the target variable in this part of my analysis.
When examining all six explanatory variables (EDI network, closed and cannot be scaled; electronic presence; stage of interaction/dialogue; stage of transaction; electronic markets; the number of employees), I could not find any correlation. Then, I excluded the inadequate variables by using the stepwise method.
It can be seen in Table 25 that five explanatory variables were excluded from the model because of their high significance levels computed by t-tests.

Table 24 - Excluded variables

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	EDI network, closed and cannot be scaled	-,071	-,267	,795	-,084	,903
	Electronic presence	,028	,042	,967	,013	,142
	Stage of interaction/dialogue	,170	,571	,581	,178	,689
	Stage of transaction	-,139	-,434	,673	-,136	,607
	Electronic markets	-,089	-,311	,762	-,098	,763

Source: Individual primary research using SPSS 16.0 statistical package

The only remaining independent variable was 'electronic markets'.

Table 25 - The potential indicator of electronic markets in the research

Model	Variables Entered	Variables Removed	Method
1	The potential indicator of electronic markets	.	Stepwise (Criteria: Probability-of-F-to-enter <= ,050, Probability-of-F-to-remove >= ,100).

Source: Individual primary research using SPSS 16.0 statistical package

The regression model summary below shows Pearson's correlation coefficient (r=0.605). I examined the strength of the correlation with the coefficient of determination (r2=0.366). In this case, the correlation was medium positive. The regression line explained 37% of the total variance that is the influence of the growth of electronic markets on the net income of enterprises stood at 37%.

Table 26 - Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,605	,366	,308	1,81229170730249E7

Source: Individual primary research using SPSS 16.0 statistical package

In the **ANOVA** table the dissociation is similar to the analysis of variance; it is based on the mean square explained (2.08*1015) and on the mean square not explained by the regression line (3.61*1015). The significance of the F-test proved that the correlation existed (Sig.< 0.050).

Table 27 - The ANOVA table of the regression analysis

Model		Sum of Squares	df	Mean Square	f	Sig.
1	Regression	2,086E15	1	2,086E15	6,350	,028
	Residual	3,613E15	11	3,284E14		
	Total	5,698E15	12			

Source: Individual primary research using SPSS 16.0 statistical package

In addition, it can also be seen that the significance of the variable determining steepness is less than 5%, which proves that the penetration of electronic markets positively influence the net income of enterprises.

Table 28 - The table of regression coefficients using Enter method

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2,823E7	1,600E7		-1,764	,105
	The potential indicator of electronic markets	1,305E8	5,180E7	,605	2,520	,028

Source: Individual primary research using SPSS 16.0 statistical package

Based on the ANOVA table, it can be ascertained that a growth of 0.01 in the value of the potential indicator of electronic markets caused an average increase of 1.300 million forints in net incomes. The constant value points at the limitations of the regression line as well. In theory, there is a potential indicator of electronic markets that shows a negative average net income. Naturally, this

outcome could not be construable but it also points out that we need to pay a special attention when predicting data not included in the database (as the regression line is fitted to only the existing set of points and it can only be assumed that the regression line continues to expand in both directions).

6. Path model of the potential indicators

Correlation does not prove a causal link; it gives information only on the strength of the relationships. It is not able to inform us on the direction of a relationship, either. I used the **path model** to study how the potential indicators influence one another and what direct or indirect effect they have on the average net income of the individual economic sectors (thousand HUF/enterprise).

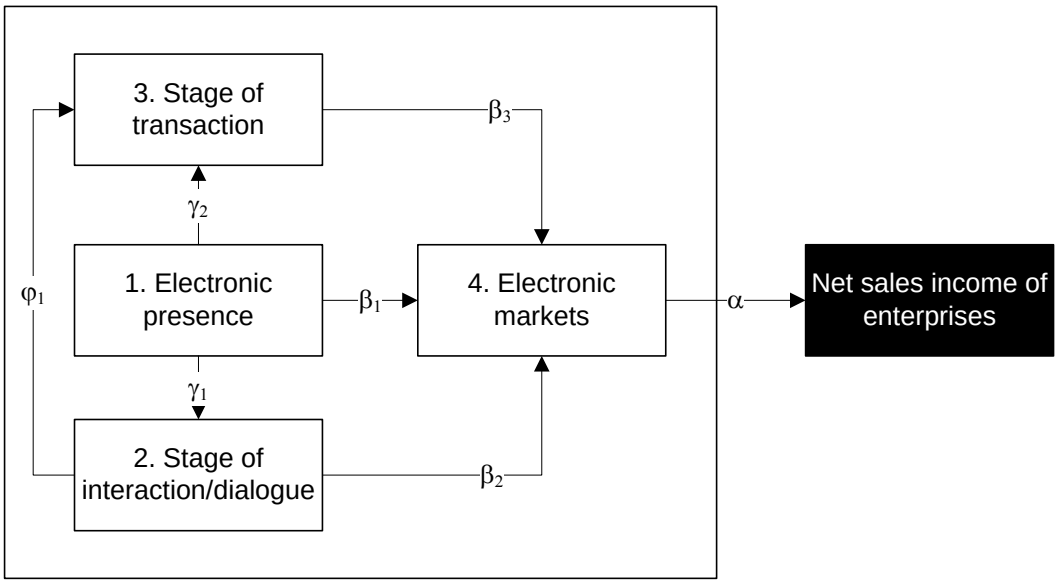


Figure 93 - The scheme of the path model of the potential indicators

Source: Individual primary research

The variables presented in the path model are linked with arrows to one another showing the direction of their relationships. I assumed in my causal model that the potential indicator of electronic presence is the **exogenous variable**. Based on the arrows starting from it, the potential indicator of electronic presence has an effect on the other potential indicators, also having an indirect effect on the average net income of enterprises in several economic sectors. These paths are called indirect paths by the literature and in my model they show how the effect of the potential indicator of electronic presence is taken place through the potential indicators of interaction/dialogue, transaction and electronic markets. The potential indicators of interaction/dialogue and transaction became endogenous variables. Endogenous variables are variables with causal links leading to them from other variables in the model. In other words, endogenous variables have explicit causes within the model. The dependent variable in my model is the average net income of enterprises in economic sectors, the arrows starting from the other variables point at this one but it has no arrow or link pointing back at the other variables.

The aim of setting up a path model was to divide the zero linear correlation between the independent and the dependent variables into two parts. The first part is the effect that the independent variable directly has on the dependent variable, while the second part shows the effect

being had on the dependent variable by the independent variable through another endogenous variables.

As it is shown in **Figure 93**, there are actually six regression models in my path analysis. The first regression model predicts the effect of electronic markets on the average net income of enterprises in the individual economic sectors.

$$\textit{Average net income of enterprises} = \alpha * \textit{Electronic markets} + \text{Resid}_1$$

Equation 1

where α is the regression coefficient and Resid_1 is the error of regression estimate.

The second regression model estimates the effect of the potential indicator of transaction on the potential indicator of electronic markets.

$$\textit{Electronic markets} = \beta_3 * \textit{Transaction} + \text{Resid}_3$$

Equation 2

where β_3 is the partial regression coefficient and Resid_3 is the error of regression estimate.

The third regression model estimates the effect of the potential indicator of interaction/dialogue on the potential indicator of electronic markets.

$$\textit{Electronic markets} = \beta_2 * \textit{Interaction/dialogue} + \text{Resid}_2$$

Equation 3

where β_2 is the partial regression coefficient and Resid_2 is the error of regression estimate.

The fourth regression model predicts the effect of the potential indicator of interaction/dialogue on the potential indicator of transaction.

$$\textit{Transaction} = \varphi_1 * \textit{Interaction/dialogue} + \text{Resid}_4$$

Equation 4

where φ_1 is the partial regression coefficient and Resid_4 is the error of regression estimate.

Finally, in the fifth and the sixth regression models, the effect of the potential indicator of electronic presence is shown on the potential indicators of interaction/dialogue and transaction. That is:

$$\textit{Interaction/dialogue} = \gamma_1 * \textit{Electronic presence} + \text{Resid}_5$$

Equation 5

$$\textit{Transaction} = \gamma_2 * \textit{Electronic presence} + \text{Resid}_6$$

Equation 6

$$\textit{Electronic markets} = \beta_1 * \textit{Electronic presence} + \text{Resid}_7$$

Equation 7

where, γ_1, γ_2 and $\beta_1$are the partial regression coefficients, Resid_5, Resid_6 and $\text{Resid}_7$are the errors of regression estimate.

It can be clearly seen in the table that the value of α is 0.605 which shows the strength of path leading from the potential indicator of electronic markets to the average net income of enterprises in the individual economic sectors.

31% of the standard deviation in the average net income of enterprises in the individual economic sectors can be explained by the potential indicator of electronic presence [**Table 27.**]. The beta value of electronic presence was 0.605. The other potential indicators did not show a direct effect.

Table 29 - The table of regression coefficients of electronic markets, using Enter method

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,169	,131		-1,284	,220
	Electronic presence	,698	,175	,722	3,986	,001
	Interaction/dialogue	,052	,304	,044	,173	,865
	Transaction	,278	,472	,169	,588	,566

Source: Individual primary research using SPSS 16.0 statistical package

The strength of the effect of electronic presence on electronic markets was 0.874. The significance level of the other variables was higher than 0.05. In order to calculate these values, I used the stepwise method.

Table 30 - Regression model between e-presence and electronic markets

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,874	,764	,749	,053582

Source: Individual primary research using SPSS 16.0 statistical package

In the next regression model, I took transaction as a dependent variable, while electronic presence and interaction/dialogue became independent models. The standardized regression coefficient are shown in the table below.

Table 31 - Regression coefficients between transaction and e-presence, using Enter method

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
1	(Constant)	-,219	,044		-4,932	,000
	Electronic presence	,166	,086	,282	1,938	,072
	Interaction/ dialogue	,500	,105	,695	4,779	,000

Source: Individual primary research using SPSS 16.0 statistical package

The variable of interaction/dialogue had a significant effect on the variable of transaction, while the significant effect of electronic presence on the variable of transaction could not be detected. As a result of the stepwise method, the strength of the effect of interaction/dialogue on transaction was 0.876.

Studying the correlation between the variable of interaction/dialogue and the variable of electronic presence, I copied the R-value indicating the strength of the relationship of two variables. By doing so, I intended to show that the regression beta value equalled to the value of the Pearson product-moment correlation coefficient between these two variables.

Table 32 - Regression coefficients between interaction/dialogue and e-presence, using Enter method

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,643	,414	,377	,0715539

Source: Individual primary research using SPSS 16.0 statistical package

Table 33 - Regression coefficients between interaction/dialogue and e-presence, using Enter method

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,213	,092		2,316	,034
	Electronic presence	,527	,157	,643	3,362	,004

Source: Individual primary research using SPSS 16.0 statistical package

Only the potential indicator of electronic markets has a direct effect on the average net income of enterprises [**Figure 94**]. However, the effect of the potential indicator of electronic presence is significant as it influences the potential indicator of electronic markets to a great extent. The value of the indirect effect of electronic presence ($\beta 1 * \alpha$) was 0.562. In the table below, a new arrow also appears with a value of 0.7, showing the effect of non-specified variables from outside the model on the average net income of enterprises.

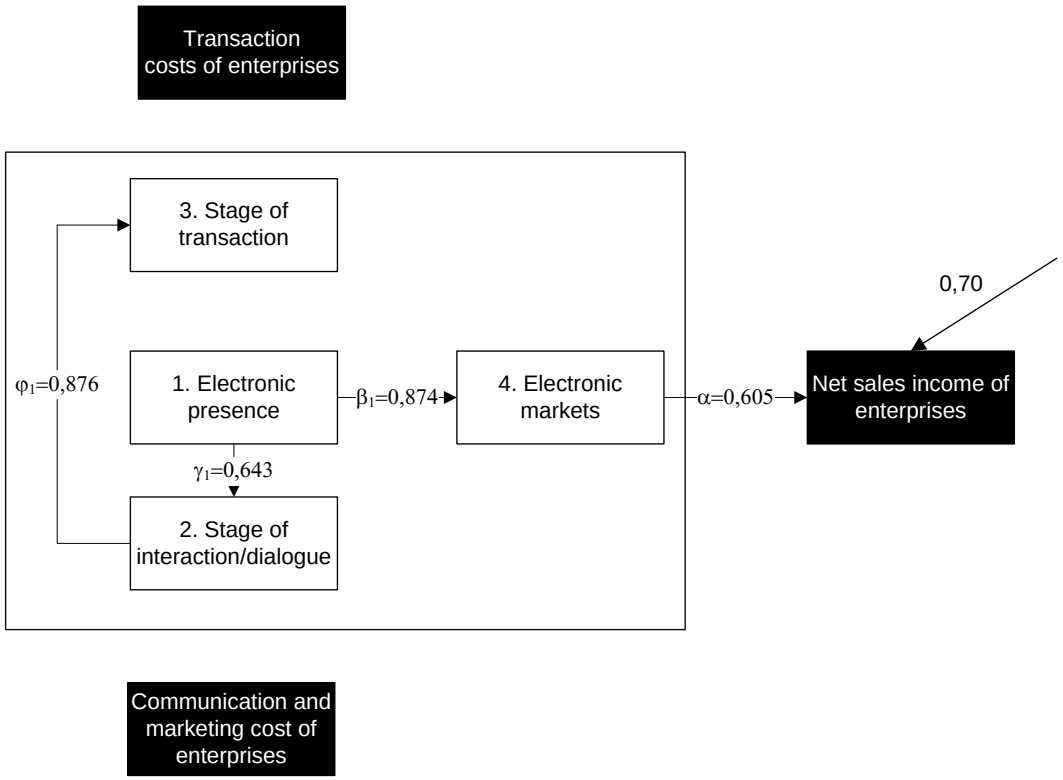


Figure 94 - The final path model of the potential indicators

Source: Individual primary research

Electronic presence has no direct effect on the potential indicator of transaction. The value of the strength of its indirect effect ($\gamma_1 * \varphi_1$) was 0.563, according to my computation. The model verified the hypothesis that electronic presence largely determined interaction/dialogue, it had an indirect

effect on transaction and it had the strongest correlation with electronic markets. Before creating the model, I assumed a direct correlation between transaction and electronic markets but I could not verify the existence of the relationship between them. However, the new result of my research was that there was a direct correlation between electronic markets and the average net income of enterprises.

I came to the conclusion from the direct correlation between the growth of the net income of enterprises and the potential indicator of electronic markets that I continued my research with looking for a direct link between the potential indicator of interaction/dialogue and the communication and marketing cost of enterprises together with a possible correlation between the potential indicator of transaction and the transaction costs of enterprises.

7. Discriminant analysis between the four clusters and the factors affecting them

In the early phase of my research, I encountered the problem that there were no explanatory variables in the typology created by cluster analysis. Typologies, differerent clusters are of a low measurement level so the explanation of their development status is impossible with the formerly used techniques. **Discriminant analysis** is a useful method to explain a low measurement level variable with another variable of high measurement level. Discriminant analysis is a technique where dependent variables are not metric and are classified between two or more categories whereas independent variables (predictors) are measured on a metric scale [**Figure 95**].

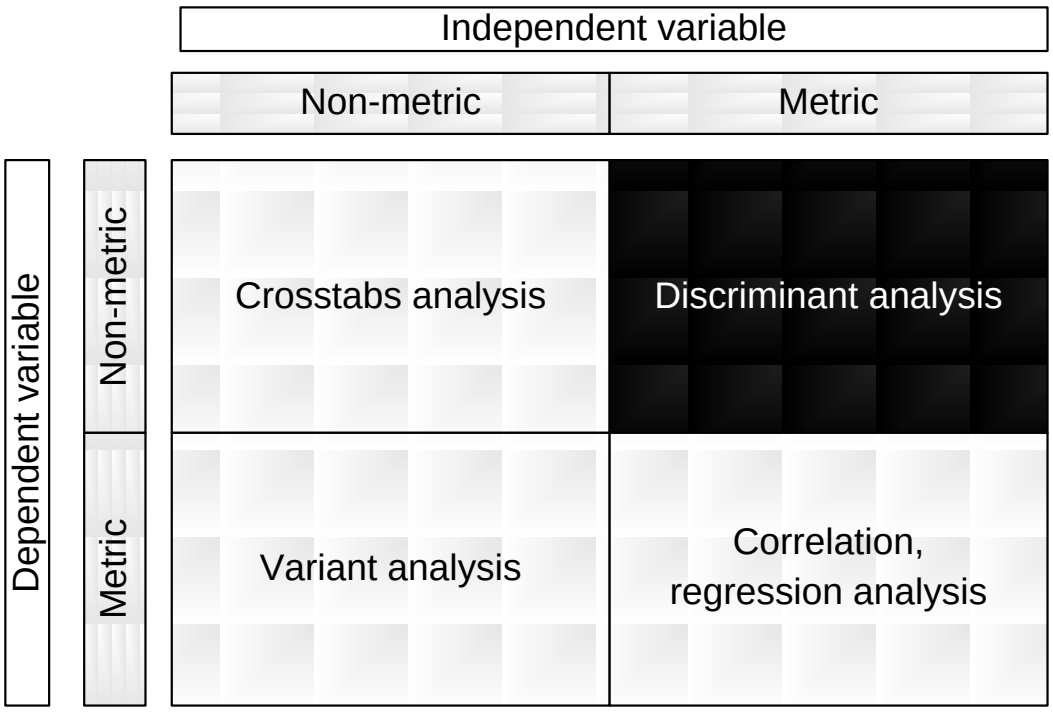


Figure 95 - Partial summary of the methods used for structure analysis, along with discriminant analysis

Source: L. Sajtos – A. Mitev: SPSS kutatási és adatelemzési kézikönyv (The handbook of SPSS research and data analysis), Alinea, 2007

After completing the cluster analysis, I found that the surveyed economic sectors could be classified into two, then four ICT development levels or clusters [**Figure 96**].

4th cluster	**3rd cluster**
(G) Wholesale and retail trade; repair work (K) Real estate, renting and business activities (M) Education	(D) Manufacturing (E) Electricity, gas and water supply (I) Transport, storage and communication (J) Financial intermediation
1st cluster	**2nd cluster**
(A) Agriculture, hunting and forestry (F) Construction (H) Hotels and restaurants (N) Health and social work	(C) Mining and quarrying
Underdeveloped	**Developed**
relative	

Figure 96 - Four-cluster model of the national economic sectors

Source: Individual primary research using SPSS 16.0 statistical package

The following four economic sectors got into the first cluster: 'Agriculture, hunting and forestry', 'Construction', 'Hotels and restaurants' and 'Health and social work'. The average of the potential indicators to electronic presence, interaction/dialogue, transaction and electronic markets was the lowest in the four clusters [**Appendix 10**].

Only the 'Mining and quarrying' sector was classified into the second cluster. In terms of electronic presence and electronic markets, this sector was the most developed compared to the other sectors. This cluster produced the second highest ICT values based on the values of the other potential indicators.

'Manufacturing', 'Electricity, gas and water supply', 'Transport, storage and communication' and 'Financial intermediation' could be found in the third cluster. The values of interaction/dialogue and transaction were the highest in this cluster comparing to the other ones.

Four economic sectors were classified into the fourth cluster as well: 'Wholesale and retail trade; repair work', 'Real estate, renting and business activities', 'Education' and 'Other community, social and personal service activities'. Examining the data of this cluster, it could be observed that its average values were higher than those of the first cluster but were lower than the average values of the other two clusters.

My aim was to get to know the human resource demand of enterprises (the number of the employees regularly using computers), the cost of ICT services or availability (cost of computer-related services) and the amount spent on professional training (the total expenditure on professional training).

These three explanatory variables jointly indicate the different ICT development stages, in this case discriminant analysis predicts whether an enterprise belongs to a specific development stage or not.

The next two tables provide the basic statistical data of the **discriminant analysis**. The first one present the valid and missing cases together with the total number of cases. In my primary research, I examined 431 sets of observations, the total data record was 180. The second table presents the means and standard deviations of the individual variables according to clusters.

Table 34 - Basic statistics of the discriminant analysis

Unweighted Cases		N	Percent
Valid		180	41,8
Excluded	Missing or out-of-range group codes	0	,0
	At least one missing discriminating variable	251	58,2
	Both missing or out-of-range group codes and at least one missing discriminating variable	0	,0
	Total	251	58,2
Total		431	100,0

Cluster		Mean	Std. Deviation
1	1. Number of computer users (head)	16,97	39,083
	2. Professional training (thousand HUF)	11427,39	66617,636
	3. Computer technology (thousand HUF)	53980,53	316475,849
2	1. Number of computer users (head)	214,25	331,116
	2. Professional training (thousand HUF)	2500750,00	4999500,067
	3. Computer technology (thousand HUF)	1001828,75	1998781,772
3	1. Number of computer users (head)	379,17	1569,004
	2. Professional training (thousand HUF)	13960,24	70208,420
	3. Computer technology (thousand HUF)	440355,25	1876642,721
4	1. Number of computer users (head)	36,20	187,148
	2. Professional training (thousand HUF)	28737,89	205559,193
	3. Computer technology (thousand HUF)	18678,57	108489,219
Total	1. Number of computer users (head)	146,82	910,216
	2. Professional training (thousand HUF)	75447,71	758261,832
	3. Computer technology (thousand HUF)	183460,34	1124940,368

Source: Individual primary research using SPSS 16.0 statistical package

The **ANOVA** table represents the significance of different variables. Beside the f-test, I also used **Wilks' lambda** test statistic in my comparative research. Wilks' lambda is presented in the f-test of the analysis of variance and is used to test whether there are differences between the means of identified groups of subjects on a combination of dependent variables, in other words, to what extent an independent variable contributes to the discriminant function. The value of Wilks' lambda varies from 0 to 1, the less its value, the more significance is presented by the independent variable in the discriminant function.

Based on the table below, it can be stated that according to the values of Wilks' lambda, the number of the employed regularly using computers and the computer-related costs had little, while the expenditure on professional training had high significance.

Table 35 - ANOVA table

	Wilks' Lambda	F	df1	df2	Sig.
1. Number of computer users (head)	,968	1,945	3	176	,124
2. Professional training (thousand HUF)	,766	17,913	3	176	,000
3. Computer technology (thousand HUF)	,959	2,522	3	176	,049

Source: Individual primary research using SPSS 16.0 statistical package

It can also be seen in the table that the second and the third variables are significant, while the variable of the number of the employed regularly using computers has no significance.

On the whole, although the last two variables had a significant effect, only the expenditure on professional training had a more significant effect on the classification into clusters.

Table 36 - Pooled Within-Groups Matrices

		1. Number of computer users (head)	2. Professional training (thousand HUF)	3. Computer technology (thousand HUF)
Correlation	**1. Number of computer users (head)**	1,000	,005	,916
	2. Professional training (thousand HUF)	,005	1,000	,256
	3. Computer technology (thousand HUF)	,916	,256	1,000

Source: Individual primary research using SPSS 16.0 statistical package

The problem of multicollinearity, the high correlation between two or more independent or predictor variables may arise in the course of analysis. In our case, individual variables were highly correlated. **Table 38** was the first table in the analysis that presented the discriminant functions. In our case there are three discriminant functions.

Discriminant functions are latent variables, the linear combinations of the independent variables:

$$Z=a+W_1X_1+ W_2X_2+ W_3X_3$$

Equation 8

Where a is the constant, W is the discriminant coefficient, X is the independent variable and Z is the discriminant value.

Every discriminant function has eigenvalues that show the relative importance of each discriminant function in the classification of the cases of the independent variables. The table below shows the discriminant functions in the order of their explanatory force, that is the first discriminant function is the most important with the highest eigenvalue, the subsequent function is the second most important with the second highest eigenvalue et cetera. Based on the eigenvalues and the explained percentage of variance, it is clear that the first discriminant function is far more important than the other two functions.

Table 37 - Eigenvalues, explained variance and canonical correlation

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	,320	89,3	89,3	,493
2	,034	9,4	98,8	,181
3	,004	1,2	100,0	,066

Source: Individual primary research using SPSS 16.0 statistical package

The last column of the table shows the values of the canonical correlation which present the ratio between the variance of individual groups and the total variance. The value of the canonic correlation range from 0 to 1, so the value of 0.493 presents a medium correlation. The square of canonical correlation means that how much of the variance of the dependent variable is explained by a group of independent variables. The result is shown in percentage. Based on this, the first discriminant function accounts for (0.493*0.493=) 24.3% of variance of the dependent variable.

Wilks' lambda is a test statistic that measures the significance of the discriminant function. It can be observed in the table below that the significance of the first function is higher (the value of Wilks' lambda is lower), while the second and the third function are not significant.

Table 38 - Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 3	,729	55,394	9	,000
2 through 3	,963	6,615	4	,158
3	,996	,775	1	,379

Source: Individual primary research using SPSS 16.0 statistical package

In summary, the first discriminant function is significant on the score of its eigenvalue and the percentage of variance it explains, while the effect of the other two discriminant functions is weak, the cases explained by them are not numerous and not significant, either.

Discriminant coefficients are divided into standardized and non-standardized coefficients. The standardized discriminant coefficient is a partial coefficient, it shows the value of variance explained by the individual independent variables but it does not contain the value of variance explained by all independent variables. It means that using standardized coefficients, it is simple to determine which independent variable is the most important, that is which one of them contributes to the classification of clusters to the highest extent. However, in our case this method could not be applied because in our case there were more than two groups or clusters. Consequently, the standardized coefficient could not provide reliable information.

Table 39 - Standardized Canonical Discriminant Function Coefficients

	Function		
	1	2	3
1. Number of computer users (head)	,651	,527	2,986
2. Professional training (thousand HUF)	1,152	-,106	,562
3. Computer technology (thousand HUF)	-,701	,503	-3,091

Source: Individual primary research using SPSS 16.0 statistical package

Pearson's correlation coefficient matrix indicates the correlation between the values of the independent variables and the discriminant functions, which is not identical to the previously presented canonical correlation.

The table below represents the three discriminant functions separately, I analysed the variables within the individual dimensions, where the correlation coefficients can be regarded as the factor score coefficients of the factor analysis.

Table 40 - Pearson's correlation coefficient matrix (structure matrix)

	Function		
	1	**2**	**3**
2. Professional training (thousand HUF)	,976	,025	-,217
1. Number of computer users (head)	,014	,987	,157
3. Computer technology (thousand HUF)	,191	,959	-,211

Source: Individual primary research using SPSS 16.0 statistical package

It can be observed that the first discriminant function represents the expenditure on professional training; the second function shows the amount of headcount and costs related to ICT, while the third one contains only the amount of headcount related to ICT.

The table below presents the mean values of the individual clusters. It can be determined that the second and the third cluster showed higher and positive values in the second dimension (the amount of headcount and costs related to ICT.

Table 41 - Pearson's correlation coefficient matrix (structure matrix)

Cluster	**Function**		
	1	**2**	**3**
1	-,122	-,124	-,123
2	3,708	,025	-,019
3	-,100	,262	,002
4	-,056	-,132	,053

Source: Individual primary research using SPSS 16.0 statistical package

As the aim of the discriminant analysis is the classification of cases into groups, the classification table is one of the most important results of the analysis.

The table below consists of two parts: the first presents the scores before the grouping took place. The chance of being classified into a cluster is 25% in each group and each cluster weight was different.

Table 42 - Classification Results

Cluster	**Prior**	**Cases Used in Analysis**	
		Unweighted	**Weighted**
1	,250	36	36,000
2	,250	4	4,000
3	,250	58	58,000
4	,250	82	82,000
Total	1,000	180	180,000

		Cluster	Predicted Group Membership				
			1	2	3	4	Total
Original	Count	1	19	0	0	17	36
		2	2	1	0	1	4
		3	24	0	4	30	58
		4	30	1	0	51	82
	%	1	52,8	,0	,0	47,2	100,0
		2	50,0	25,0	,0	25,0	100,0
		3	41,4	,0	6,9	51,7	100,0
		4	36,6	1,2	,0	62,2	100,0
Cross-validateda	Count	1	16	0	1	19	36
		2	2	0	0	2	4
		3	24	1	3	30	58
		4	32	1	1	48	82
	%	1	44,4	,0	2,8	52,8	100,0
		2	50,0	,0	,0	50,0	100,0
		3	41,4	1,7	5,2	51,7	100,0
		4	39,0	1,2	1,2	58,5	100,0

a. Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

b. 41.7% of original grouped cases correctly classified.

c. 37.2% of cross-validated grouped cases correctly classified.

Source: Individual primary research using SPSS 16.0 statistical package

The actual hit ratio can be seen in the second part, it is given in percentage, its value ranges from 0 to 100. Instead of the lowest possible value, it needs to be compared to the expected hit ratio. The expected hit ration means the hit ratio resulted from random categorization; its value is 25% in the case of four groups.

The classification table is suitable for the evaluation of the results of the discriminant analysis as it shows the ratio of the adequately categorized group membership. The rows make up the categories of the dependent variables and their initially observed values, while the columns of the table constitute the values predicted by the independent variables.

The table can be divided into two parts: the upper part of it shows the initial analysis, while its lower part presents the cross validation values. The data are presented in the same way in both parts of the table; they are expressed either in absolute value or in percentage. Analysing the absolute values of the table, it can be observed that only 19 cases got into the first cluster from its original 36 cases, while 17 of them got into the fourth cluster (fourth row). Expressing this data in percentage it means that the rate of the adequately categorized cases is 52.8% in the first cluster, 25% in the second, 6.9% in the third and 62.2% in the fourth cluster. Consequently, the procedure was successful only in the cases of the first and the fourth clusters.

SPSS identifies values as adequate hit ratio on the diagonal: if the prediction equals the value of the initial sets of observations then the prediction is perfect and every value is situated on the diagonal.

Enterprises were adequately categorized in 41.7% of cases and 37.2% of predictions based on the given variables.
In summary, it can be stated that the first and the fourth clusters are significantly different from the other two clusters, as their hit ratio is above 50% in the case of three independent variables. Examining the results, it can also be observed that these two clusters can hardly be divided in the case of three independent variables.

5.5 The utilization of the research results

I could not find a reassuring mathematical and statistical method for studying the effect of the information communication technology on businesses in the literature, that is why I proposed a new research and analysis method that I also used to study the Hungarian economic branches.
The primary possibility of utilizing the proposed method appears in situation report. I managed to measure the relative (economic branches correlated to each other) and the absolute (economic branches correlated to the same ones in a different country) development level of the information communication technology with the help of creating development stages, quality categories and the adoptation willingness belonging to the given development stages.
The secondary possibility for utilization lies in **following patterns**. The development of ICT is different in several countries, regions and economic branches. The European Union proposed a strategic framework for its member countries. The main aims of establishing a strategic framework are:

- a single European information space,
- boosting investment and innovation in ICT researches,
- establishing a receptive European information society.

The economy of the United States is regarded as a model economy where two-third of the employees were dealing with information process during working hours in 2000. One of the causes of the massive economic performance in the United States is the highly-developed information processing. If we manage to measure this level of development, a strategy can be formulated in the European Union and in the individual member states in order to catch up with the most developed countries.
The object of the study is generally the national economy of a given country. With the help of the method I have worked out, it is possible to analyse and assess the **sections**, **subsections**, **divisions**, **groups** and **classes** of a given national economy. Beside the economic branches, company sizes and organization forms can also be studied.
After the positive reception of the results of my research, previous publications and presentations, I endeavour to build the results into the material of the subjects of Economic Informatics and E-business that are being taught at the **University of Miskolc**.

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Index of words and expressions

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Appendices

Appendix 1

Category size	Pace of adap-tation	Pace of adaptation (by newly joined enterprises)	Compound indicator	Development stage	Potential indicator
Microenterprises (Micro)	Fast	Early majority	Under-developed, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Underdeveloped, slow
				3. Transaction	Underdeveloped, fast
				4. Electronic marketplaces	Underdeveloped, slow
Small enterprises (Small)	Aver-age	Early majority	Under-developed, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
Medium-sized enterprises (Medium)	Aver-age	Early majority	Under-developed, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
Corporation (Corp)	Slow	Late majority	Developed, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow

Appendix 2

Category size	Compound indicator (extent, growth)	Development stage	Potential indicator (extent, growth)
Microenterprises (Micro)	27,28%, 4,80%	0. EDI network, closed and cannot be scaled	26,00%, 2,80%
		1. Electronic presence	51,32%, 3,40%
		2. Interaction/dialogue	40,00%, 5,97%
		3. Transaction	6,10%, 6,56%
		4. Electronic marketplaces	11,69%, 3,27%
Small enterprises (Small)	42,30%, 3,78%	0. EDI network, closed and cannot be scaled	32,0%, 1,80%
		1. Electronic presence	66,76%, 3,40%
		2. Interaction/dialogue	55,43%, 4,17%
		3. Transaction	16,37%, 4,53%
		4. Electronic marketplaces	30,63%, 3,00%
Medium-sized enterprises (Medium)	44,53%, 2,97%	0. EDI network, closed and cannot be scaled	33,00%, 1,20%
		1. Electronic presence	67,69%, 1,62%
		2. Interaction/dialogue	58,60%, 2,74%
		3. Transaction	18,55%, 4,31%
		4. Electronic marketplaces	33,27%, 3,19%
Corporation (Corp)	54,23%, 1,34%	0. EDI network, closed and cannot be scaled	48,00%, 0,80%
		1. Electronic presence	80,22%, 0,39%
		2. Interaction/dialogue	61,80%, 1,68%
		3. Transaction	25,67%, 0,79%
		4. Electronic marketplaces	49,24%, 2,50%

Appendix 3

Economic sector	Pace of adap-tation	Pace of adaptation (by newly joined enterprises)	Compound indicator	Development stage	Potential indicator
(A) Agriculture, hunting and forestry	Average	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Underdeveloped, slow
				2. Interaction/dialogue	Underdeveloped, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, fast
(C) Mining and quarrying	Slow	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Underdeveloped, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
(D) Manufac-turing	Average	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
(E) Electricity, gas and water supply	Slow	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
(F) Construction	Fast	Early majority	Underdeveloped, fast	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Underdeveloped, fast
				2. Interaction/dialogue	Underdeveloped, fast
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, fast

Economic sector	Pace of adap-tation	Pace of adaptation (by newly joined enterprises)	Compound indicator	Development stage	Potential indicator
(G) Wholesale and retail trade; repair work	Average	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Underdeveloped, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
(H) Hotels and restaurants	Fast	Early majority	Underdeveloped, fast	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Underdeveloped, fast
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
(I) Transport, storage and communi-cation	Average	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
(J) Financial inter-mediation	Slow	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow

Appendix 4

Economic sector	Pace of adaptation	Pace of adaptation (by newly joined enterprises)	Compound indicator	Development stage	Potential indicator
(K) Real estate, renting and business activities	Fast	Early majority	Underdeveloped, fast	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, fast
				2. Interaction/dialogue	Developed, fast
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
(M) Education	Slow	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Underdeveloped, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow
(N) Health and social work	Fast	Early majority	Underdeveloped, fast	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Underdeveloped, fast
				3. Transaction	Underdeveloped, fast
				4. Electronic marketplaces	Underdeveloped, fast
(O) Other community, social and personal service activities	Slow	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Underdeveloped, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, fast
National economy average	Average	Early majority	Underdeveloped, slow	0. EDI network, closed and cannot be scaled	Underdeveloped, slow
				1. Electronic presence	Developed, slow
				2. Interaction/dialogue	Developed, slow
				3. Transaction	Underdeveloped, slow
				4. Electronic marketplaces	Underdeveloped, slow

Appendix 5

Economic sector	Compound indicator (extent, growth)	Development stage	Potential indicator (extent, growth)
(A) Agriculture, hunting and forestry	18,95%, 2,65%	0. EDI network, closed and cannot be scaled	22,22%, 0,00%
		1. Electronic presence	40,28%, 1,39%
		2. Interaction/dialogue	45,56%, 2,81%
		3. Transaction	6,35%, 0,79%
		4. Electronic marketplaces	11,40%, 6,99%
(C) Mining and quarrying	36,79%, 0,60%	0. EDI network, closed and cannot be scaled	40,00%, 0,00%
		1. Electronic presence	71,43%, 0,00%
		2. Interaction/dialogue	48,75%, 0,00%
		3. Transaction	10,71%, 2,38%
		4. Electronic marketplaces	40,82%, 0,00%
(D) Manufacturing	38,60%, 2,52%	0. EDI network, closed and cannot be scaled	18,60%, 0,00%
		1. Electronic presence	60,69%, 0,50%
		2. Interaction/dialogue	60,00%, 2,84%
		3. Transaction	15,14%, 2,19%
		4. Electronic marketplaces	32,77%, 3,56%
(E) Electricity, gas and water supply	42,86%, 0,30%	0. EDI network, closed and cannot be scaled	26,67%, 0,00%
		1. Electronic presence	69,12%, 0,00%
		2. Interaction/dialogue	59,41%, 0,00%
		3. Transaction	14,29%, 0,00%
		4. Electronic marketplaces	44,82%, 1,19%
(F) Construction	21,53%, 6,66%	0. EDI network, closed and cannot be scaled	15,91%, 2,27%
		1. Electronic presence	42,28%, 6,57%
		2. Interaction/dialogue	40,61%, 9,09%
		3. Transaction	6,41%, 5,73%
		4. Electronic marketplaces	19,20%, 5,68%
(G) Wholesale and retail trade; repair work	31,93%, 3,96%	0. EDI network, closed and cannot be scaled	20,39%, 0,97%
		1. Electronic presence	52,82%, 3,98%
		2. Interaction/dialogue	49,10%, 4,30%
		3. Transaction	14,29%, 5,19%
		4. Electronic marketplaces	28,83%, 1,84%
(H) Hotels and restaurants	26,57%, 3,91%	0. EDI network, closed and cannot be scaled	20,00%, 0,00%
		1. Electronic presence	52,09%, 4,90%
		2. Interaction/dialogue	37,27%, 7,39%
		3. Transaction	11,04%, 4,13%
		4. Electronic marketplaces	30,71%, 2,99%
(I) Transport, storage and communication	46,77%, 3,48%	0. EDI network, closed and cannot be scaled	15,63%, 0,00%
		1. Electronic presence	68,50%, 2,80%
		2. Interaction/dialogue	62,16%, 4,39%
		3. Transaction	23,55%, 5,28%
		4. Electronic marketplaces	44,60%, 2,22%
(J) Financial intermediation	41,47%, 1,21%	0. EDI network, closed and cannot be scaled	13,33%, 0,00%
		1. Electronic presence	60,31%, 1,92%
		2. Interaction/dialogue	65,00%, 0,63%
		3. Transaction	23,21%, 3,33%
		4. Electronic marketplaces	29,21%, 0,89%

Appendix 6

Economic sector	Compound indicator (extent, growth)	Development stage	Potential indicator (extent, growth)
(K) Real estate, renting and business activities	31,17%, 7,89%	0. EDI network, closed and cannot be scaled	23,53%, 0,00%
		1. Electronic presence	51,70%, 0,00%
		2. Interaction/dialogue	53,33%, 7,94%
		3. Transaction	11,11%, 5,60%
		4. Electronic marketplaces	32,45%, 6,92%
(M) Education	29,42%, 0,31%	0. EDI network, closed and cannot be scaled	16,67%, 0,00%
		1. Electronic presence	48,07%, 2,63%
		2. Interaction/dialogue	55,45%, 0,53%
		3. Transaction	13,64%, 0,71%
		4. Electronic marketplaces	23,57%, 0,00%
(N) Health and social work	19,48%, 7,31%	0. EDI network, closed and cannot be scaled	25,00%, 0,00%
		1. Electronic presence	50,00%, 4,36%
		2. Interaction/dialogue	35,00%, 9,88%
		3. Transaction	1,19%, 8,57%
		4. Electronic marketplaces	18,83%, 6,62%
(O) Other community, social and personal service activities	29,81%, 3,21%	0. EDI network, closed and cannot be scaled	16,00%, 0,00%
		1. Electronic presence	47,09%, 0,96%
		2. Interaction/dialogue	50,00%, 2,26%
		3. Transaction	9,85%, 2,50%
		4. Electronic marketplaces	24,06%, 6,36%
National economy average	32,98%, 3,42%	0. EDI network, closed and cannot be scaled	18,63%, 1,28%
		1. Electronic presence	55,45%, 3,18%
		2. Interaction/dialogue	51,26%, 4,02%
		3. Transaction	14,78%, 3,50%
		4. Electronic marketplaces	29,30%, 2,96%

Appendix 7

Designation	Electricity, gas and water supply	Transport, storage and communication	Financial intermediation
	penetration in percentage (relative place)		
Electronic presence	69 (2)	69 (3)	60 (4)
Stage of Interaction/dialogue	59 (3)	62 (2)	65 (1)
Stage of transaction	14 (5)	24 (1)	23 (2)
Electronic marketplaces	45 (2)	45 (1)	29 (5)

Appendix 8

Designation	Electricity, gas and water supply	Transport, storage and communication	Financial intermediation
Infrastructure	penetration in percentage (relative place)		
Personal computer, workstation	97 (2)	92 (5)	99 (1)
Mobile phone	98 (2)	99 (1)	96 (3)
Local Area Network (LAN)	82 (2)	60 (3)	84 (1)
Wireless Local Area Network (WLAN)	17 (1)	10 (5)	14 (3)
Wide Area Network (WAN)	30 (2)	16 (3)	55 (1)
Intranet	49 (2)	26 (4)	76 (1)
Extranet	19 (1)	7 (3)	13 (2)
E-mail (electronic mail)	95 (2)	77 (4)	96 (1)
Internet-based EDI	56 (2)	36 (4)	13 (-)
Non-Internet EDI	27 (2)	16 (-)	13 (-)
Uses of ICT	penetration in percentage (relative place)		
Searching for information	99 (1)	98 (2)	96 (6)
E-mail	97 (1)	90 (6)	93 (5)
Using banking and financial services	63 (4)	73 (1)	47 (-)
Market tracking	25 (-)	57 (2)	70 (1)
Advertising and marketing	30 (-)	42 (6)	49 (3)
Buying and selling products and services	22 (-)	29 (5)	26 (-)
Education and training	31 (3)	18 (-)	29 (4)
Access to after sales services	19 (2)	14 (4)	19 (3)
Providing services	penetration in percentage (relative place)		
Corporate information	95 (4)	92 (6)	99 (2)
Job advertisements	19 (4)	24 (3)	40 (1)
Information on products and services	74 (4)	71 (6)	97 (1)
Product marketing	35 (-)	45 (4)	79 (1)
Offering personalized content in website for regular visitors	3 (-)	4 (-)	8 (3)
Online services and digital products	7 (-)	12 (3)	16 (1)
Selling products and services	6 (-)	31 (3)	29 (4)
Customer service	27 (1)	20 (4)	19 (6)
Offering online payment facilities	1 (-)	2 (-)	8 (1)
Offering security transactions	3 (6)	6 (2)	18 (1)
After sales services	9 (6)	19 (2)	25 (1)
Providing Internet access through mobile phone	3 (3)	4 (2)	10 (1)
Computerized sales facilities	penetration in percentage (relative place)		
Invoicing and payment systems	83 (1)	60 (2)	43 (5)
Production, logistics and/or service systems	42 (4)	64 (1)	29 (-)
Reordering systems (stockpilling)	33 (3)	41 (2)	14 (-)
Other computer systems	58 (1)	47 (3)	50 (2)
Purchasing systems	25 (5)	33 (1)	29 (3)
Sales systems	25 (3)	34 (1)	21 (5)

Appendix 9

Case	Squared Euclidean Distance												
	1:(A)	2:(C)	3:(D)	4:(E)	5:(F)	6:(G)	7:(H)	8:(I)	9:(J)	10:(K)	11:(M)	12:(N)	13:(O)
1:(A)	,000	,224	,119	,227	,023	,060	,067	,256	,151	,071	,045	,042	,028
2:(C)	,224	,000	,081	,033	,216	,093	,110	,100	,140	,087	,145	,165	,150
3:(D)	,119	,081	,000	,030	,108	,023	,066	,030	,015	,022	,030	,128	,040
4:(E)	,227	,033	,030	,000	,209	,073	,113	,027	,063	,064	,102	,203	,118
5:(F)	,023	,216	,108	,209	,000	,040	,030	,214	,144	,056	,048	,022	,024
6:(G)	,060	,093	,023	,073	,040	,000	,017	,078	,046	,011	,015	,057	,014
7:(H)	,067	,110	,066	,113	,030	,017	,000	,127	,109	,032	,049	,031	,030
8:(I)	,256	,100	,030	,027	,214	,078	,127	,000	,034	,077	,104	,239	,125
9:(J)	,151	,140	,015	,063	,144	,046	,109	,034	,000	,057	,038	,189	,065
10:(K)	,071	,087	,022	,064	,056	,011	,032	,077	,057	,000	,028	,066	,020
11:(M)	,045	,145	,030	,102	,048	,015	,049	,104	,038	,028	,000	,086	,010
12:(N)	,042	,165	,128	,203	,022	,057	,031	,239	,189	,066	,086	,000	,052
13:(O)	,028	,150	,040	,118	,024	,014	,030	,125	,065	,020	,010	,052	,000

Appendix 10

Ward Method		EDI network, closed and cannot be scaled	Electronic presence	Interaction /dialogue	Transaction	Electronic marketplaces
1	Mean	,222825	,459700	,402925	,050125	,15280
	N	4	4	4	4	4
	Std. Deviation	,0453936	,0550320	,0431831	,0255187	,043171
2	Mean	,382500	,715250	,561450	,178250	,38490
	N	4	4	4	4	4
	Std. Deviation	,0741058	,0613798	,0557385	,0618627	,083670
3	Mean	,185575	,646550	,616425	,190475	,37850
	N	4	4	4	4	4
	Std. Deviation	,0582270	,0480696	,0253130	,0501668	,080540
4	Mean	,192033	,512033	,494017	,124517	,28153
	N	6	6	6	6	6
	Std. Deviation	,0274848	,0311185	,0637329	,0203835	,035926
Total	Mean	,239767	,575456	,515961	,134583	,29744
	N	18	18	18	18	18
	Std. Deviation	,0922471	,1106880	,0906815	,0652261	,106987

Appendix 11

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Introduction

Quality and quantity data of using information technology in small and medium-sized enterprises

The aim of the survey:

- Analysing the use and the penetration of information technology,
- Determining the growth rate of e-commerce via the Internet or through other computer networks.

If your company does not have or use any personal computers, then please fill in only the part of this questionnaire that is related to the size and the main profile of your company (Module 5).
Because of the complexity of this survey, the cooperation of several departments of your company may be needed. If your company does not employ any financial and/or IT professionals, then we ask you to get one of the managers to fill in the questionnaire.
We expect you to fill in the questionnaire with data for 2006 in the case of economy-related questions. In terms of questions aimed at information technology, we would like you to fill in the questionnaire with data both for 2006 and 2007.
This questionnaire will be used for research purposes only and will not be handed out to any third party.
Filling in the questionnaire takes only about 20 minutes.

Survey's project leader:

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Module 1

1. The use of information technologies

	2006		2007	
1. Which of the following technologies were used by your company? Please tick the appropriate boxes.	**Used**	**Not used**	**Used**	**Not used**
1.1. Mobile phone	☐	☐	☐	☐
1.2. Mobile phone with connection to the Internet (WAP)	☐	☐	☐	☐
1.3. Personal computer(s), workstation(s)	☐	☐	☐	☐
(If you answered 'yes' to question 1, please continue with question 2, if your answer 'no', jump to the questions of Part 5)				
2. Number of employees using computers on a regular basis (at least once a week)	……..	head	……..	head
3. Which of the following information and communication technologies were at your company's disposal?	**Yes**	**No**	**Yes**	**No**
3.1. Wireless Local Network	☐	☐	☐	☐
3.2. Local Area Network (LAN)	☐	☐	☐	☐
3.3. Intranet	☐	☐	☐	☐
3.4. Extranet	☐	☐	☐	☐
3.5. Wide Area Network (WAN)	☐	☐	☐	☐
3.6. E-mail (electronic mail)	☐	☐	☐	☐
3.7. Internet-based EDI (Electronic Data Interchange)	☐	☐	☐	☐
3.8. Non-Internet based EDI	☐	☐	☐	☐
4. Has your company used software applications for receiving, handling and/or sending orders?	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
5. Was the software application used for handling orders connected automatically to the following systems?	**Yes**	**No**	**Yes**	**No**
5.1. Reordering systems (stockpiling)	☐	☐	☐	☐
5.2. Invoicing and payment systems	☐	☐	☐	☐
5.3. Production, logistics (including electronic delivery as well) and/or service systems	☐	☐	☐	☐
5.4. Computer systems of the company's suppliers	☐	☐	☐	☐
5.5. Computer systems of the company's customers	☐	☐	☐	☐
5.6. Other computer systems	☐	☐	☐	☐
6. Has your company used ERP software package for sharing sales and purchase information between different functional areas of your business? **(e.g. finance, planning, marketing etc.)?**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐

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Module 1

	2006		2007	
7. Has your company used CRM software applications that enabled your company to do the following business activities:	**Yes**	**No**	**Yes**	**No**
7.1. Collecting and storing customer information, making it available for other business processes	☐	☐	☐	☐
7.2. Analysing customer information for marketing purposes **(e.g. establishing prices, making sales advertisements, choosing distribution channels etc.)**	☐	☐	☐	☐
8. Has your company sent digital invoices that can be processed automatically?	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
9. Has your company received digital invoices that can be processed automatically?	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
10. Has your company used digital signature in any of its sent messages, or another encryption method that secured the authenticity and the soundness of the message?	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
11. Has your company used IT assistance in the following areas:	**Yes**	**No**	**Yes**	**No**
11.1. Incoming logistics **(receiving, storing and forwarding raw materials)**	☐	☐	☐	☐
11.2. Operations **(processes during which the enterprise transforms inputs into finished goods or services)**	☐	☐	☐	☐
11.3. Outgoing logistics **(storage and distribution of finished goods to wholesale and retail traders or directly to customers)**	☐	☐	☐	☐
11.4. Marketing and sales **(identifying customer needs, working out competitive offers, marketing communication, promotion, sales activities)**	☐	☐	☐	☐
11.5. Service **(installment, after-sales services, handling complaints, trainings)**	☐	☐	☐	☐

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Module 2

2. Internet usage

	2006		2007	
1. Did your enterprise have an Internet connection? **(If your answer is 'yes', please continue to answer question 2, in case of 'no' answer, please jump to the questions of the 4th part)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
2. Number of employees using personal computers having access to the Internet at least once a week: **(If you cannot give an exact number, please give us the closest estimate.)**	…….. **head**		…….. **head**	
3. Type of your company's Internet connection:	**Yes**	**No**	**Yes**	**No**
3.1. Dial-up modem connection	☐	☐	☐	☐
3.2. ISDN	☐	☐	☐	☐
3.3. DSL (e.g. xDSL, ADSL, SDSL etc.)	☐	☐	☐	☐
3.4. Cable television	☐	☐	☐	☐
3.5. Leased line	☐	☐	☐	☐
3.6. Other local (wired or wireless) connection	☐	☐	☐	☐
3.7. Mobile connection **(e. g. UMTS, EDGE, CDMA2000 1xEVDO, analogue mobile phone, GSM, GPRS etc.)**	☐	☐	☐	☐
4. The purpose of using the Internet:	**Yes**	**No**	**Yes**	**No**
4.1. Using banking and financial services	☐	☐	☐	☐
4.2. Education and training (access to interactive education material)	☐	☐	☐	☐
4.3. Market tracking (market monitoring)	☐	☐	☐	☐
4.4. Searching for information	☐	☐	☐	☐
4.5. E-mail	☐	☐	☐	☐
4.6. Advertising and marketing	☐	☐	☐	☐
4.7. Buying and selling products and services	☐	☐	☐	☐
4.8. Purchasing digital products and services	☐	☐	☐	☐
4.9. Access to after sales services	☐	☐	☐	☐
4.10. Using tax services	☐	☐	☐	☐
5. Have you used the Internet for public administration? **(If your answer is 'yes', please continue to answer question 6, in case of 'no' answer, please jump to question 7.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
6. Using public administration services, which of the following features has your company chosen on the Internet?	**Yes**	**No**	**Yes**	**No**
6.1. Obtaining information	☐	☐	☐	☐
6.2. Downloading application forms	☐	☐	☐	☐
6.3. Sending back filled in application forms	☐	☐	☐	☐
6.4. Sending bids in an electronic tender system	☐	☐	☐	☐

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Module 2

	2006		2007	
7. Has your company had a website? **(If your answer is 'yes', please continue to answer to the questions of Module 8 , in case of 'no' answer, please jump to the questions of Module 3.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
8. Which of the following features were available on your company's website? Please tick the appropriate boxes.	**Yes**	**No**	**Yes**	**No**
8.1. Product marketing	☐	☐	☐	☐
8.2. Information on products and services (product catalogue, service and price list)	☐	☐	☐	☐
8.3. After sales services	☐	☐	☐	☐
8.4. Corporate information	☐	☐	☐	☐
8.5. Job advertisements	☐	☐	☐	☐
8.6. Offering personalised content on website for regular customers	☐	☐	☐	☐
8.7. Online services and digital products **(e.g. online help, games, music, software etc..)**	☐	☐	☐	☐
8.8. Selling products and services	☐	☐	☐	☐
8.9. Customer service	☐	☐	☐	☐
8.10. Offering online payment facilities	☐	☐	☐	☐
8.11. Offering security transactions	☐	☐	☐	☐
8.12. Providing Internet access through mobile phone	☐	☐	☐	☐

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Module 3

3. E-commerce

	2006		2007	
1. Has your company ordered products and/or services on the Internet? **(Orders written and sent by email in a traditional way do not belong to this category.)** **(If your answer is 'yes', please continue to answer question 2, in case of 'no' answer, please jump to question 3.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
2. Net value of purchases via the Internet: **(If you cannot give the exact figure, please give us the closest estimate.)**	.....	**thousand HUF per year**	.....	**thousand HUF per year**
3. Has your company's products and/or services been ordered on the Internet? **(Orders written and sent by email in a traditional way do not belong to this category.)** **(If your answer is 'yes', please continue to answer question 4, in case of 'no' answer, please jump to question 6.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
4. Net revenues from sales on the Internet: **(Without reference to whether the payment was done online or in any other form.)** **(If you cannot give the exact figure, please give us the closest estimate.)**	.....	**thousand HUF per year**	.....	**thousand HUF per year (estimate)**
5. When receiving online orders, has your company used security protocols such as SSL and TLS?	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
6. Does your company have or use digital signature? **(If your answer is 'yes', please continue to answer question 6.1, in case of 'no' answer, please jump to question 7.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
6.1. Does your digital signature have enhanced security features?	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
6.2. Is your digital signature a certified digital signature?	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
7. Has your company ordered products and/or services using non-Internet based computer networks? **(If your answer is 'yes', please continue to answer question 8, in case of 'no' answer, please jump to question 9.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
8. Net value of purchase orders through non-Internet based computer networks: **(If you cannot give the exact figure, please give us the closest estimate.)**	.....	**thousand HUF per year**	.....	**thousand HUF per year (estimate)**
9. Has your company's products and/or services been ordered through non-Internet based computer networks? **(If your answer is 'yes', please continue to answer question 10, in case of 'no' answer, please jump to question 1 in Module 4.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
10. Net revenues from sales through non-Internet based computer networks: **(Without reference to whether the payment was done online or in any other form.)** **(If you cannot give the exact figure, please give us the closest estimate.)**	.....	**thousand HUF per year**	.....	**thousand HUF per year (estimate)**

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Module 4

4. E-proficiency – qualifications in information technlogy and demand for employees having degrees in information technology

	2006		2007	
1. Has your company employed any IT professionals? **Definition of IT professional: an IT professional is a person who has qualification for the standardization, planning, development, installation, operation, support, maintenance, handling and evaluation of information technology systems. (If your answer is 'yes', please continue to answer question 2, in case of 'no' answer, please jump to question 3.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
2. Number of employed IT professionals:	**……**	**head**	**……**	**head**
3. Has your company recruited or tried to recruit employees to jobs that require IT professionals? **(If your answer is 'yes', please continue to answer question 4, in case of 'no' answer, please jump to question 6.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
4. Did your company have problems with filling job vacancies in 2006 that required IT professionals? **(If your answer is 'yes', please continue to answer question 5, in case of 'no' answer, please jump to question 1 in Module 5.)**	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
5. What were the main causes that your company had problems with filling job vacancies requiring IT professionals in 2006?	**Yes**	**No**	**Yes**	**No**
5.1. Shortage of applicants with an appropriate degree in IT	☐	☐	☐	☐
5.2. Lack of education providing high quality IT degrees	☐	☐	☐	☐
5.3. Lack of work experience in the field of Information Technology	☐	☐	☐	☐
5.4. Excessive salary demands	☐	☐	☐	☐
5.5. Other	☐	☐	☐	☐

5. Background information

1. Company size			
1.1. Microenterprise (self-employment, or less than 10 employees)			☐
1.2. Small-sized enterprise (less than 50 employees)			☐
1.3. Medium-sized enterprise (less than 100 employees)			☐
1.4 Corporation			☐
2. Legal form of business			
2.1. Limited partnership	☐	**2.6. Limited liability company**	☐
2.2. General partnership	☐	**2.7. Joint Stock limited liability company**	☐
2.3. Joint enterprise	☐		☐
2.4. Public benefit organization (Non-profit limited company)	☐	**2.8. Co-operative**	☐
2.5. Foundation	☐	**2.9. Sole proprietor**	☐
		2.10. Other:……	
3. The company's main profile:			
3.1. Agriculture, hunting and forestry (A)	☐	**3.9. Transport, storage and communication (I)**	☐
3.2. Fishing (B)	☐	**3.10. Financial intermediation (J)**	☐
3.3. Mining and quarrying (C)	☐	**3.11. Real estate, renting and business activities (K)**	☐
3.4. Manufacturing (D)	☐	**3.12. Education (M)**	☐
3.5. Electricity, gas and water supply (E)	☐	**3.13. Health and social work (N)**	☐
3.6. Construction (F)	☐	**3.14. Other community, social and personal service activities (O)**	☐
3.7.Wholesale and retail trade, repair work (G)	☐	**3.15. Other:……**	☐
3.8. Hotels and restaurants (H)	☐		☐
4. Annual average number of employees in 2006:		…..	**head**
5. Net revenues in 2006:		…..	**thousand HUF**
6. Total value of purchases in 2006:		…..	**thousand HUF**

6. The costs of using information technology together with the number of computers used by the company in 2006

1. Cost of information technology services **/It includes the costs of the following services: hardware and software consultancy services, data processing, online database services, ordering customized software applications, repair of office machines and personal computers, other non-categorized information technology services./**	
……	**thousand HUF**
2. The annual cost of access to the Internet **(Total sum of the bills issued by your Internet access provider for a year)**……..……	**thousand HUF**
3. The annual cost of using other computer networks ……..……	**eFt**
4. The number of computers used by the company:	**(piece)**
4.1. Desktop computers and work stations **(PCs, Apple Macintosh computers etc.)**	……...
4.2. Portable personal computers **(Laptop, notebook)**	……...
4.3. Handheld computers **(Palmtop)**	……...
4.4 Server computers	……...
4.5. Other computers **(This category primarily includes traditional mainframe computers with high-speed data transmitting and processing capacity as well as non-PC based servers)**	……...

7. Data of employees

	2006		2007	
1. Total number of employees with degree(s) in IT:	……..	**head**	…… …..	**head**
2. Number of other employees not having degree(s) in IT:	……..	**head**	…… …..	**head**
3. Number of employees having access to the Internet:	……..	**head**	…… …..	**head**
3.1. Number of employees using the Internet for their work (at least once a week):	……..	**head**	…… …..	**head**
4. Number of employees working outside the premise of the company:	……..	**head**	…… …..	**head**
4.1. Number of employees using the Internet for communicating with the company:	……..	**head**	…… …..	**head**
5. Number of employees having access to the company's IT system:	……..	**head**	…… …..	**head**
6. Total expenses on education and training:	……..	**thousand HUF**	…… …..	**thousand HUF (estimate)**

8. Questioner's data

1. Student's name:	……
2. Full-time / correspondent /postgraduate …… year (Please underline the appropriate status.)	
3. Phone number:	……
4. E-mail address:	……

Thank you for taking part in this survey. Please send the filled-in questionnaire back to the Institute of Business Sciences, University of Miskolc by fax or mail, or if you choose to use the Internet, send it directly to Péter Sasvári's email address: iitsasi@uni-miskolc.hu.

List of Figures

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