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The Penetration of Business Information Systems in Small and Medium-sized Enterprises in Italy and Hungary: A Comparative Study

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Abstract

Information technology (IT) has become an integral part of an enterprise's organizational life recently and represents an increasingly important factor for all kinds of organizations, since the services it provides have become almost essential by now for all types of enterprises in the European Union. However, company size and differences at country level might still play an important role in hindering IT adoption.

The main reason for writing this article was to analyse IT penetration and usage in Italy and Hungary and find a well-grounded answer to the question of whether IT – in the form of business information systems – is regarded as a source of competitive edge or an essential condition for survival by different enterprises in different countries. To explore this topic, a survey was conducted by submitting an online questionnaire to a sample of Italian and Hungarian enterprises.

The results indicate a noticeable difference in the IT development level of the two countries. In Italy information systems in general and systems for managers decision-making are more widespread, thus IT has already reached the level of an essential condition for survival there, whereas it is still seen as a source of competitive edge in Hungary. However, contrary to our initial assumption, the question of competitive edge versus condition for survival depends more on size categories rather than on individual countries.

Key words: business information systems; information technology; microenterprises; small and medium-sized enterprises; Hungary; Italy; IT penetration

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1. Introduction

Globalisation and increased competition represent recent phenomena that augment organizations' need for better monitoring and enhanced coordination both inside and outside the factory (Cser & Németh 2007). Fragmented and rapidly changing markets are becoming typical, while networks, alliances and virtual organizations are being formed to adopt more flexible solutions and better handle company interconnections with suppliers and customers (Szabó & Hámori 2006). As already predicted by Benjamin and Blunt in 1992, these business trends represent drivers that push organizations to continually refine their responses in terms of business processes and investments in information system applications (Rainer & Cegielski, 2010).

Mentioned business changes can be followed only by improving the efficiency of collecting, monitoring and processing information (Raffai 2003). Traditional cost-cutting efforts do not seem to be enough; robust innovation, developing new business models and exploiting the potential of information technology (IT) are needed (Szabó & Hámori 2006). By now, it has been widely accepted that modern, advanced IT infrastructure belongs to the basic conditions of the successful, flexible, efficient and effective functioning of organizations and can contribute to developing a sustainable competitive advance (Mata et al 1995; Guo et al 2008). In some cases IT investments are needed not only for increasing business success, but for ensuring organizations' survival (Nemeslaki 2012).

Perhaps it would be an exaggeration to say that the strategic significance of IT is equally valid for all industrial sectors and types of enterprises because their structural characteristics, market conditions and the intensity of information require and allow varying degrees of IT applications (Dobay 1997). However, it is undeniable that IT and related communication technologies (ICT) can be found everywhere, including even smaller enterprises where it supports various work processes. When competition raises, smaller firms adopt innovative technology (Link & Bozeman 1991) and thanks to the decreasing costs of hardware and the development of user-friendly systems, an increasing amount of SMEs tends to adopt IT-based information systems (Thong 1999; Levy et al 2001).

Considering the central role played by micro, small and medium-sized enterprises in the European Union (European Commission 2012) (representing nearly 99% of enterprises and being the main sources of entrepreneurial skills and employment), we decided to analyze the diffusion of business information systems relying on IT among microenterprises and SMEs by investigating what factors influence the adoption of the appropriate system, the usage patterns of information systems and, finally, to what extent these systems affect enterprises' competitiveness. In other terms, the aim of our research is to

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explore the penetration of business information systems by Italian and Hungarian enterprises and gain a better understanding on the circumstances influencing the decisions made about the introduction of such systems. In addition, we also wished to determine whether being provided with information technology represents an advantage or an essential condition for survival today.

Our attention was directed to Italy and Hungary as they reached a similar level of ICT penetration, although following a different development path (Dutta & Bilbao-Osorio 2012). Italy is one of the founding members of the European Union belonging to the more developed member states in terms of IT, whereas Hungary is one of the countries of the former Eastern bloc which gained access to the European Union only in 2004 and has been able to lessen the gap in the development level of IT recently. Having the appropriate infrastructure, however, does not say anything about its actual content and its usage patterns. Thus, our research into the use of business information systems also aims to contribute to the investigation of the possible gap in their adoption stages existing between these two countries.

Before conducting the empirical research, national and international literature has been reviewed, which helped formulate some assumptions in relation to the possible differences and similarities in the adoption of business information systems in Italy and Hungary. In particular, the remainder of this article is structured as follows. The next section presents the literate review informing the study. Then, the research methodology is described, followed by the results of the survey, the discussions and conclusions.

2. The ICT development level of Italy and Hungary

Indicators usually employed to describe the ICT development level of a country can be divided into quantitative and integrated indices (Botos, 2010).

The first ones focus on measuring ICT infrastructure and refer for example to the number of subscribers, the number of ICT devices, subscription fees, the number of ICT employees, the rate of ICT revenues, the contribution of ICT to the overall GDP figure and the number of ICT enterprises. While on one hand, these indicators are useful for characterizing the general ICT standards of a country on average and allow comparisons among countries, on the other hand they can provide only a distorted image to a certain extent. In fact they describe an overall situation, but do not quite express the real situation.

On the contrary, integrated indicators take quality issues into account. The two most important integrated indices are the following:

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- *ICT Development Index* (IDI) is an index published by the United Nations International Telecommunication Union (ITU) based on internationally agreed information and communication technologies indicators. It is used to measure the ICT development levels in 155 countries and also to measure digital divide and the changes in digital development in recent years. The index itself, which can be used as an evaluation tool at global, regional and country levels alike, combines 11 indicators grouped into three subindices: ICT access, use and skills.
- *Networked Readiness Index* (NRI), annually published by the World Economic Forum, is used to measure the propensity for countries to benefit from the opportunities offered by information and communication technology. It covers 144 countries worldwide by examining three major dimensions: the general business, regulatory and infrastructure environment for ICT; the readiness of the three key stakeholder groups in a society (i.e. individuals, businesses and governments) to use and benefit from ICT; and the actual usage of the latest information and communication technologies available (Elliott 2009).

According to the ITU's latest available report (Table 1), South Korea and Scandinavian countries (Sweden, Denmark and Finland) are the most developed countries in terms of ICT development as similarly recorded in previous years. A the same time it is also confirmed the predominance of the developed Western European countries (the Netherlands, Luxembourg, Iceland, Switzerland and the United Kingdom) in the top ten positions.

Table 1 - ICT Development Index (IDI), 2010 and 2011

Rank 2011	Country	Access subindex	Use subindex	Skills subindex
1	Korea	11	1	1
2	Sweden	6	2	14
3	Denmark	9	3	12
4	Iceland	4	8	13
5	Finland	18	4	2
6	Netherlands	10	9	24
7	Luxembourg	3	7	81
8	Japan	17	5	28
9	United Kingdom	7	11	29
10	Switzerland	2	13	
…				
19	Austria	16	21	27
…				
29	Italy	30	34	22
…				

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31	Poland	43	32	17
32	Czech Republic	41	31	39
…				
37	Portugal	32	37	31
…				
39	Slovakia	47	33	46
…				
41	Hungary	42	44	26

Based on the IDI index, Hungary appears to lag far behind Italy's position and also from several Eastern European countries like Poland, the Czech Republic and Slovakia. In particular Hungary emerges as the least developed in terms of ICT usage, holding only the 44th position. Differently, Hungary does not perform bad in terms of the ICT infrastructure, as it holds the 42nd position, overtaking both Poland and Slovakia, while it still falls back to Italy. Interestingly, when skills are examined, the gap between Italy and Hungary is reduced and Hungary succeed in overtaking both Austria (27th), the Czech Republic (39th) and Slovakia (46th) among Central Eastern European countries.

A similar situation is also depicted by the Global Information Technology Report 2013 (Table 2), which provides information on the Networked Readiness Index (NRI). Northern European countries (Finland, Sweden, Norway and Denmark) lead the classification together with Singapore, while the Netherlands, Switzerland and the United Kingdom are the Western countries included in the top ten.

Hungary takes the 44th position in the ranking and it overtakes Poland (49th), Slovakia (61st) and Romania (75th). Surprisingly enough, Hungary also overtakes Italy which is ranked only in the 50th position.

Table 2 - The Networked Readiness Index (NRI) 2013

Rank	**Country**	**Environment subindex (Rank)**	**Readiness subindex (Rank)**	**Usage subindex (Rank)**	**Impact subindex (Rank)**
1	Finland	3	1	2	3
2	Singapore	1	11	3	1
3	Sweden	5	3	1	4
4	Netherlands	4	13	5	2
5	Norway	9	6	7	11
6	Switzerland	7	8	8	9
7	United Kingdom	6	10	11	8
8	Denmark	12	7	6	13
9	United States	16	4	13	10

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10	Taiwan, China	24	17	15	6
18	Austria	22	9	17	24
33	Portugal	38	34	32	35
44	Hungary	47	59	46	42
49	Poland				
50	Italy	83	38	45	60
61	Slovak Republic	62	92	49	57

This different position of Hungary is mainly explained in terms of national environment. In fact, Hungary gains a good position (49th) thanks to its political and regulatory environment and the presence of a favourable business environment. On the contrary, Italy's environment seems to be far more unfavourable (83rd). The readiness subindex demonstrates that Italy is more developed than Hungary in terms of affordability, infrastructure and digital content. At the same, Italy is more advanced in terms of usage, especially when referring to ICT usage at the individual and business level.

3. Literature review

3.1. Definition and classification of business information systems

Information systems are generally defined as a collection of different resources (hardware, software, data, human resources and procedures) organized to perform specific processes like data recording (*input*), conversion of raw data into information valuable for managers (*processing*), data storage *(maintenance*), monitoring of the information system (*control*) and information transmission to users (*output)*.

With reference to business organizations, it is possible to find several additional definitions in the literature, which are designed to explain what a business information system is. For example, according to Burt and Taylor's approach, "business information systems can be regarded as an information source in any combination thereof, or any access to and any recovery of their use or manipulation. Any business information system is designed to link the user to an appropriate source of information that the user actually needs, with the expectation that the user will be able to access the information satisfying their needs" (Burt & Taylor 2003: 52). Davis and Olson define business information systems as

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"an integrated user-machine system for providing information to support the operations, management, analysis, and decision-making functions in an organization. The system utilizes computer hardware and software, manual procedures, models for analysis, planning, control, and decision-making by using a database" (Davis & Olson 1985: 78).

"Information systems are a part of any organization that provides, generates, stores, separates, divides and uses information. They are made up of human, technical, financial and economic components and resources. In fact, they can be regarded as inherently human systems (organizations, manual systems) that may include a computer system, and automatizes certain well-defined parts and selected items of the system. Its aim is to support both the management functions and the daily operation of an organization." (Deák, Bodnár & Gyurkó 2008: 100) .

In synthesis, a business information system is the collection of individuals (the subjects who develop and operate the system as well as the users of information), activities (related to data processing) and technical apparatus (the equipment which nowadays usually consists in a computer system) employed to collect, process and store information related to the company's environment, its internal activities, together with all transactions between the company and its environment (Bocij, Greasley & Hickie, 2008).

Its main goals are providing direct support to operations and sustaining decision-makers with the necessary information during the whole decision-making process. For that reason business information systems have been traditionally classified into a pyramid model (Laudon & Laudon, 2009) which reflects the hierarchy of the organization and the position occupied by information users (i.e. senior managers, middle managers or workers). Of course, as suggested by Gábor (2007), also other classifications are possible, i.e. business information systems can be differentiated according to the organizational structure, the field of application or the type of support. Nevertheless, classifying information systems according to their scope of usage, which indicates the type of activity that they are designed to provide support to, is still very widespread (Ein-Dor and Segev, 1993).

At the same time, it is important to note that today business information systems are characterized by a large use of computers and information technology, which help standardize a significant part of the information and communication system, thus making it easier to produce and use information (Csala et al. 2003). Although not all information systems are computerized, most companies use IT-based information systems which have increased the capabilities of this type of systems (Rainer & Cegielski, 2010).

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The relevant role played by computers is actually undoubutful. After their first appearance, it became clear soon that they could also be used with high efficiency in the business world. The first applications can be dated back to the mid-1950s but even in the 1960s computers were used for only collecting, processing and storing data. The focus was on the data themselves, computers were applied for registration, billing, bookkeeping tasks in daily business operations. These systems were called Electronic Data Processing Systems (EDP). This activity has changed significantly over time, while nowadays core business functions are performed by the so-called Transaction Processing Systems (TPS).

Around the mid-1960s, a new idea was raised: if computers are useful for employees working at lower levels, why cannot it be useful for managers as well? That is how Management Information Systems (MIS) emerged. These systems were designed to make pre-defined reports, and they proved to be really suitable to support decision-making at the level of management (see Table 3).

In the 1970s the first systems appeared that were able to focus on a specific issue, giving way to interactive processes and ad hoc queries as well. These are called Decision Support Systems (DSS) and they were further developed in the 1980's. During this period, Group Decision Support Systems (GDSS) also appeared, helping the shared decision-making process of more stakeholders.

Similarly to Decision Support Systems, Office Automation System (OAS) also emerged in the 1970s, revolutionizing office work and providing new opportunities such as word processing and spreadsheet programs, video conferencing and sending electronic mail.

The 1980s saw the appearance of microcomputers, software packages designed for users and the subsequent spread of networks, bringing users much closer to computer technology. At that time, it became necessary to develop an information system able to satisfy the needs of top management. These systems are called Executive Information Systems (EIS), which provide easy-to-understand, graphic and tabular information for managers.

Later, the development of business information systems was paved by the use of artificial intelligence in the form of Expert Systems (ES), which are designed to give an expert advice and make decisions, by focusing on a special business issue.

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Table 3 - The history of business information systems

Period	Type of business information systems	Scope of usage
1950s	**Transaction Processing System** (TPS)	It is used for collecting, storing, modifying, and retrieving the daily transactions of a business organization. It usually consists of an advanced database system for such business events as settlement of accounts, sales, rental payments, orders and raw material purchases.
1960s	**Management Information System** (MIS)	It is used to analyze operational activities in the organization. It makes pre-defined reports at regular intervals even when special events occur; it focuses on the information need of managers and gives assistance to solve well-defined problems. It is efficient mainly at an operational or tactical level (Laudon & Laudon 2009).
1970s	**Decision Support System** (DSS)	It is naturally emerged from management information systems, intended to help decision-makers to compile useful information from a combination of raw data, documents, and personal knowledge, or business models to identify and solve problems and make decisions. Its interactivity and the capability of elaborating problem-analysing models makes it especially effective at tactical levels.
1980s	**Executive Information System** (EIS)	It is designed to facilitate and support the information and decision-making needs of senior executives by providing easy access to both internal and external information relevant to achieving the strategic goals of a business organization. It is usually easy to use, offering user-friendly features.
	Expert System (ES)	It is designed to propose a solution to unstructured, specific problems where highly-prepared expertise is needed. It actually stores all the available facts and figures, then it draws conclusions based on them. Actually, the facts and rules are stored, and based on these conclusions. It is a special field of application within the broader area of artificial intelligence.
1990s	**Enterprise Resource Planning System** (ERP)	Its main purpose is to facilitate the flow of information between all business functions inside the boundaries of an organization and manage the relationships with outside stakeholders. It may include customer and supplier relationships and supply chain management as well. According to its most recent interpretation, it provides support to the full operational level by its modular structure.

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	Business Intelligence System (BI)	It is designed to produce large amounts of information with the potential of leading to the development of new opportunities for a business organization. It often includes online analytical processing (OLAP), data mining, process mining, business performance management, benchmarking and predictive analytics. With its complexity, it proves to be one of the most powerful decision support tools.
	Corporate Performance Management (CRM)	It is designed to organize, automate, and synchronize business processes, mainly sales activities, but also those for marketing, customer service, and technical support. It also contributes to product development and the elaboration of marketing strategies.
	Supplier Relationship Management System (SRM)	It is aimed at creating closer, more collaborative relationships with key suppliers in order to maximize the value realized through those interactions. As a cross-functional system, it provides support for decisions especially at operational and tactical levels (Hughes 2010).
	Supply Chain Management System (SCM)	It is designed to facilitate the systematic and strategic coordination of the traditional business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of both individual companies and the supply chain as a whole. Its application is useful for making decisions both in operational and tactical levels (Harland 1996).
2000s	**Enterprise Performance Management** (EPM)	It is a management field of Business Performance Management which considers the visibility of operations in a closed-loop model across all facets of the enterprise. There are several emerging domains in the EPM field which are being driven by corporate initiatives, academic research, and commercial approaches (Newman 2010).
	Business Suite	A business suite is a set of business software functions enabling the core business and business support processes inside and beyond the boundaries of an organization.

It could be seen from the 1990s that the strategic role of business information systems became more and more significant. Together, also the integration among systems and company integration with other business partners through information systems has increased.

Enterprise Resource Planning Systems (ERP) were first used in the 1990s. Other cross-functional systems also started to spread such as Customer Relationship Management Systems (CRM), Supplier Relationship Management Systems (SRM) and Supply Chain Management Systems (SCM). In the same decade, the use of data warehouses became more and more common, which in turn led to the spread of Business Intelligence Systems (BI) as well. Applications based on Business Intelligence took the earlier CRM and SRM systems to a higher level. Finally, after the millennium, a new trend appeared by the use of business performance management (also called EPM - Enterprise Performance Management). In this

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case the integration of various applications is in the forefront as in the case of business suites: industry-specific and size-dependent complex business packages offered by software houses to better support companies to monitor both internal and external processes.

3.2. Factors affecting the implementation of business information systems

When a business organization makes a decision about introducing any business information system, its determination can be explained in terms of the following reasons (Kacsukné & Kiss 2007: 245):

- Technical reasons: companies applying fragmented and outdated business information systems need to introduce new tools and systems to perform operations and other data processing activities.
- Strategic reasons: business systems (like ERP) may play a role in maintaining and enhancing competitiveness. For example, they may establish the technical background to apply e-commerce solutions.
- Business reasons: among others, cost reduction and profit increase objectives, job cuts, stock reduction, reducing IT costs, improving productivity and more rapid turnaround of orders may belong to this group of considerations.

However, the evaluation process leading to the decision of introducing a business information system is quite complex and it takes a large number of factors into consideration (Bacon, 1992). The most important step during this process is to select the key relevant aspects, then, after weighing them carefully, the management of a company can choose the best offer available.

As suggested by Keil & Tiwana (2006) not all factors or decision criteria have the same importance. For example, in their study on ERP software selection process, results show that functionality and reliability are the most heavily weighted decisive factors among managers working in large corporation (with an average turnover of about US $ 50 millions). Also cost, ease of use and ease of customization are judged to be important criteria, while, ease of implementation and vendor reputation were not found to be significant. Moreover, differences in ranking emerge when focusing on other countries and companies of different size.

According to Kacsukné and Kiss (2007), selection criteria can be divided into general and specific aspects. General aspects refer to common selection criteria identified by past researches (see Keil & Tiwana, 2006 for a review of the literature) like the following ones listed in alphabetical order**:**

- Availability of documentation: it is important for a company to investigate the availability of user guides, manuals and other system support documents.

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- Compatibility: a newly-introduced system should fit the existing hardware and software assets and it also should be compatible with the hardware and software devices available on the market.
- Costs: in the process of introducing a business information system, a business organization not only has to pay the price of a software product but it also has to pay attention to the additional costs related to its introduction such as education, professional and license fees, not to mention some incurring costs during its usage (telecommunications, maintenance and repair costs). In order to make an optimal decision, it is recommended to consider some other indirect effects of the introduction as well.
- Ergonomy: the user-friendly nature of a system or an application is monitored here, with a special emphasis on its effects on the human nervous system, the eyes and hands.
- Modularity: in the market of business applications, companies generally purchase the modules of various business information systems that are necessary to perform certain functions, maintaining the possibility of adding more modules to the purchased system in the future.
- Network access: it also should be considered whether the newly-implemented system can be integrated into the existing network. In the case of hardware, it is a question of physical interface, whereas in the case of software the real question to be considered is whether the new application can run in a network environment.
- Performance: a decision can be deeply affected by the expected performance associated to the business information system such as speed and capacity features.
- Reliability: it is important to determine whether there is a risk of system failure and the extent to which occasional errors may result in damage. There are available systems that already have built-in self-monitoring and error diagnostic functions. The criterion of reliability is particularly important in those areas where human life is at stake or the occurrence of a failure may end up in causing huge financial losses (in hospitals, air traffic control, banks, etc.).
- Support service: it may also be an important factor to what extent the manufacturer provides the installation, maintenance and repair of the newly-introduced system.
- Technology: as in the case of products, product life cycle is a crucial factor in business information systems. A business organization has to decide whether to take the risk of experimenting with a brand-new technology or to resort to using more proven but less modern systems.

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- The manufacturer's reputation: although this aspect is not included in the referenced literature, it is possible that some companies prefer to ask for an offer from a larger, more respected service provider, ignoring smaller companies that may provide the same services with the same quality.
- Usability: first, a business organization has to consider whether the applicable system is suitable for the tasks it is required to perform. If it turns out that the selected system is only partially able to fulfil the requirements, decision-makers will have to make compromises in terms of their needs, after taking other aspects into account.
- Warranty: this includes the evaluation of the warranty services and conditions provided by the manufacturer.

In addition, also specific aspects related to additional services offered by software vendors can be important (Kacsukné & Kiss, 2007). These refers to the availability of new software versions (when selecting a business information system, companies are interested to know if there will be any new versions available for the selected system, how quickly possible upgrades will be done and what additional costs will be incurred), customer support during and after introduction, customization (the manufacturer should be able to serve unique customer needs), free trial period and security (the protection offered against the possibility of causing intentional or accidental damage to a company's existing network system).

3.3. Business information systems in SMEs

When moving to the realm of microenterprises and SMEs, some specific considerations have to be made.

First, different levels of business information systems penetration might be recorded when observing organizations with different size. Microenterprises are expected to adopt only a limited amount of IT-related instruments because of their traditional lack of financial resources and simple organizational structure and processes that can be monitored directly by the owner-entrepreneur. In this context, the cost for technology acquisition can be relevant and when present IT adoption usually includes e-mail usage, internet access and the implementation of simple information systems designed to improve few operational processes (Wymer & Regan 2005; Cioppi & Savelli 2006).

Similarly also small-sized enterprises should rank lower in IT adoption than their larger counterparts. Since SMEs do not usually have a managerial structure, they do not need business information systems for managerial decision-making processes like MIS, DSS or EIS (Kagan et al 1990). In Italy, past

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researches indicate that small enterprises do not have middle-level managers and the management of the organization is still mainly informal. Thus, IT investments for improving management's decision making have been rare (Marchi 2003; DelBaldo, 2008).

Second, it is possible that SMEs do not take into account all the aspects mentioned in section 3.2. when deciding to adopt a new or additional business information system. As suggested by Caldeira and Ward (2002), smaller organizations might have scarce internal capabilities and expertise to fully understand business or strategic implications related to IT-based information systems' adoption. Contrary to this position, Levy and Powell (2000) and Lesjak and Lynn (2000) suggest the existence of some SMEs that are increasingly aware of the strategic benefits related to business information systems. Also in Italy there are companies that consider IT-based systems as an integral part of the business strategy and deploy them through projects that involve all organization members (DelBaldo 2008). According to Yetton et al. (1994) and Levy et al. (2001), these SMEs do not usually conceive business information system only as a means of cost reduction (therefore investing merely in operational information systems that automate transaction processes), but they also employ them to add value to their products or services.

4. Applied methodology

During the review of the relevant literature on the subject some key general concepts were outlined. On one hand, size is usually considered an important factor in explaining differences in the penetration of business information systems, while on the other hand, also country differences might be significant as they impact on ICT adoption level. Size and country actually represent two important elements capable to influence the decision on introducing information systems and their usage patterns among enterprises.

However, it is also possible to argue that size is becoming a less relevant aspect thanks to decreasing costs of IT (Benjamin & Blunt, 1992) and that even small enterprises can become aware of strategic relevance of the business information systems as suggested by more recent literature on SMEs mentioned in section 3.3.

With these notions in mind, we decided to analyse size and country differences with reference to the factors influencing the decisions leading to the introduction of business information systems, the usage patterns of these systems and the connection between the use of business information systems and the achievement of operational effectiveness and competitiveness.

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In details, national and international literature helped formulate the following assumptions in relation to the possible differences and similarities between the two surveyed countries:

- The selection criteria for choosing a business information system are similar for the enterprises belonging to the same size category. In this case the assumption is based on the strong similarities of internal conditions (smaller firms do not have professionals to evaluate information systems) and external influences. As a result it is possible to expect that enterprises of the same dimension tend to choose information systems by taking similar considerations into account.
- In Italy and Hungary, the reasons for the introduction of business information systems are similar in every size category. This is based on the fact that enterprises of both countries are located and trade in the common EU market. As a consequence, enterprises come across similar problems and respond to them in similar ways.
- The degree to which business information systems are used is higher in Italy than it is in Hungary and this is true for all size categories. This assumption is supported by the information provided by international ICT development indices and is underpinned by the fact that Italian enterprises produce higher gross added value than their Hungarian counterparts.
- Business information systems have the same effects on the operation of enterprises in both countries regardless of their business size categories.

Our primary research extended to Italy and Hungary. The results of data collected in the two countries were combined. By using a simple random sampling technique, we collected data from enterprises in different economic sectors and company size categories. The comparison was based on almost the same sample size as 94 enterprises in Hungary and 98 companies in Italy completed the questionnaire. The majority of the Italian respondents represented the manufacturing sector, while in Hungary enterprises come mostly from the sectors of trade and repair of motor vehicles. Corporations were left out of the analysis since our focus was on microenterprises and SMEs. Filling in the questionnaire was helped by the application 'EvaSys', while the possibility of taking part in the survey both online or using a paper-based format was given at the same time. The sample of the respondent enterprises cannot be considered representative so the results of the survey can only be interpreted within the range of the responding companies.

The focus was given on the differences in company size because the economic sectors represented in the sample were too varied. For the evaluation of data and the presentation of results, the SPSS software package was used and all figures and tables presented in this article are based on our own compilation. Enterprises were asked to evaluate their agreement or disagreement with sentences and to

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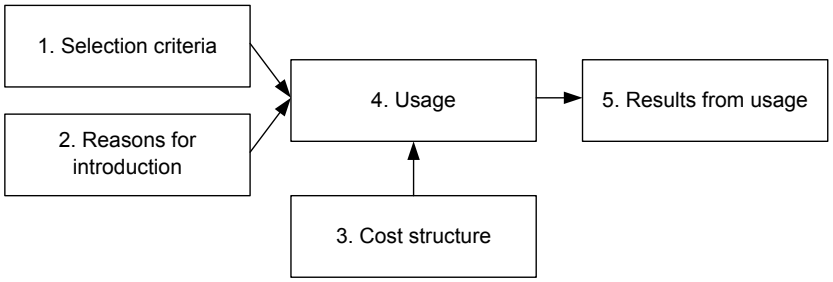
assess their opinion (i.e. with reference to criteria that drive IT adoption) on a typical five-level Likert scale where 1 represented the lowest and 5 represented the highest score.

In details, microenterprises and SMEs are examined by five aspects which help answer our explorative goals. These aspects refer to:

1. the ranking of the selection criteria for business information systems,
2. the possible reasons for the introduction of business information systems,
3. the structure of expenses related to business information systems,
4. the usage of business information systems involved in the survey,
5. the most important effects of the usage of business information systems.

Figure 1 - The logical scheme of the empirical analysis of business information systems



5. The empirical analysis of business information systems' introduction

A preliminary relevant information obtained thanks to the field research refers to the penetration of ICT in the companies surveyed, measured in terms of physical items. In particular, empirical data indicate that Hungarian companies are characterized by a scarce adoption of computers when compared to Italian ones. On average middle-sized companies in Italy count over 200 computers while in Hungary the same category of companies record only 55 computers. A similar gap exists between Italian and Hungarian small-sized organizations, with almost 30 computers on average for the first ones and only 7 computers in Hungarian companies. These differences disappear when looking at micro-enterprises which have less than 5 computers in both countries.

Another interesting indicator for ICT penetration is presented in Table 4, which confirms the existence of a technological gap between Hungary and Italy as already suggested by international ICT development

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level indicators. Only when focusing on larger organizations like middle-sized enterprises, the technological gap decreases.

Tab. 4. – Presence of a server-based network

Does your company operate a server-based network?	Micro-enterprise		Small-sized enterprise		Middle-sized enterprise	
	Italy	Hungary	Italy	Hungary	Italy	Hungary
Yes	51.85%	30.00%	93.55%	51.85%	94.12%	92.59%
No	48.15%	70.00%	6.45%	48.15%	5.88%	7.41%

5.1. Criteria for selecting business information systems

Results indicate that there are both country and size differences in decision criteria.

For example, Table 5 shows that Italian and Hungarian microenterprises attribute a different emphasis on customer support (ranked very important for Italian businesses and not important for Hungarian companies), while they equally evaluate customization and erogonomy. Similar considerations can be done also with reference to the category of small-sized enterprises which all attribute a scarce importance to elements such as security, availability of documentations and technology in both countries, but are characterized by different decision criteria when discussing about the most influencing factors (i.e. customization and network access for Italian small-sized firms and compatibility and usability for Hungarian companies of the same size). In other terms, priority orders differ from country to country, thus indicating a different approach in the selection process.

At the same time, it can be said that enterprises in different size categories have different priority orders. For example, focusing only on Italian companies, results indicate that the most important selection criterion (the one achieving the highest score) for microenterprises is compatibility, while small businesses pay more attention to flexibility and middle-sized enterprises rank network access as number one.

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Table 5 - The criteria affecting the introduction of business information systems

Rank	Microenterprise		Small-sized enterprise		Middle-sized enterprise	
	Italy	Hungary	Italy	Hungary	Italy	Hungary
1	Compatibility	Usability	Customization	Compatibility	Network access	Reliability
2	Customization	Costs	Network access	Usability	Reliability	Usability
3	Reliability	Customization	Compliance with information strategy	Reliability	Compliance with information strategy	Network access
4	Customer support in the phase of introduction	Network access	Usability	Performance	Security	Security
5	Customer support after introduction	Free trial period	Security	Security	Support service	Support service
...						
16	Security	Technology	Warranty	Ergonomy	Performance	Availability of new versions
17	Ergonomy	Ergonomy	Technology	Customer support after introduction	Warranty	Availability of documents
18	Support service	Customer support in the phase of introduction	Free trial period	Technology	Availability of documents	Free trial period
19	Performance	Customer support after introduction	Availability of documents	Availability of documents	Free trial period	Ergonomy
20	Availability of documents	Manufacturer's reputation	Ergonomy	Manufacturer's reputation	Ergonomy	Manufacturer's reputation

The same phenomenon can be observed among the Hungarian companies. For example, microenterprises give more emphasis to usability: this criterion reached the maximum possible point (see the Appendix 1 for more details), while Hungarian small businesses ranked compatibility first.

5.2. Reasons for applying business information systems

Stronger country differences have emerged when companies were asked to explain the reasons for introducing their existing information systems. As described in Table 6 and in the Appendix (second

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table), Italian enterprises of all size categories strongly expect organizational improvements when adopting IT- based information systems, which means being successful in organizational efficiency and decision-making processes, but the implementation of systems is also driven by the necessity to obtain a quick information flow, especially for small and medium-sized enterprises.

In Hungary, similar reasons emerged although being much less relevant. Moreover, when asked to explain if strategic, business or technical considerations have been evaluated, Hungarian micro and small-sized companies seem to be less interested in estimating all these aspects when compared with their Italian counterparts. Only among medium-sized companies some similarities can be found.

At the same time, it is important to note that enterprise dimension is related to different reasons for introducing business information systems. In particular, microenterprises do not seem to be aware of the strategic benefits related to business information systems.

Table 6 - Reasons for introducing the existing information systems(s) (rank)

Size	**Microenterprise**		**Small-sized enterprise**		**Middle-sized enterprise**	
Country	**Italy**	**Hungary**	**Italy**	**Hungary**	**Italy**	**Hungary**
Organizational reasons	1	4	1	1	1	2
The company's activities require very quick information flow.	2	1	2	2	2	1
The company has to meet the challenge of its competitors. as they already use information systems.	4	2	6	5	6	5
Technological reasons	3	5	4	4	4	3
Strategic reasons	6	6	5	3	5	4
Business considerations	5	3	3	6	3	6

5.3. The structure of expenses related to business information systems

Today, more and more enterprises tend to pay attention to various costs. Although there should be a decrease in IT-related expenses thanks to technological advance, it is possible to find expenses linked to investments, maintenance, personnel and training. The details of IT-related expenses in both countries are shown in Figure 2 and 3.

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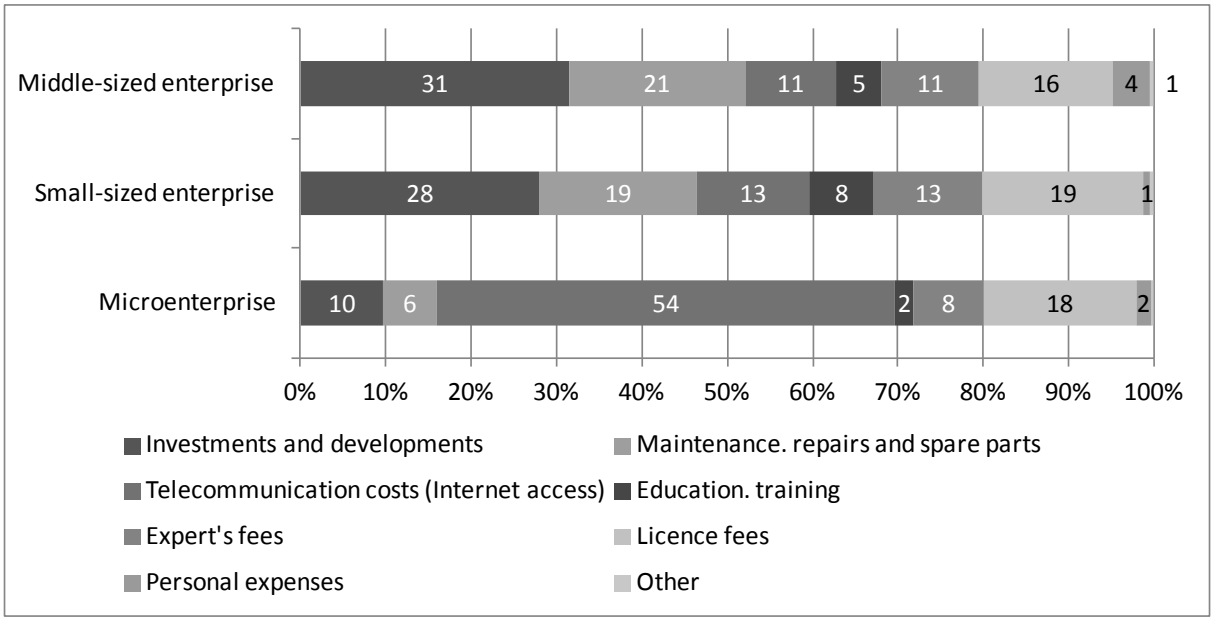
Figure 2 – The structure of annual IT expenses among Italian enterprises



Results indicate that a significant part of the structure of IT-related expenses refers to investments and maintenance in both countries and especially with reference to medium and small-sized organization. However, while more than a third of the total expenditure on IT infrastructure was related to investments and maintenance in Italy, the same expenditure items were close to half of the total expenditure among the Hungarian enterprises. This indicates that in a developed country like Italy, technology acquisition is less costly.

During our analysis, it was also revealed that Italian enterprises spent 15% more on license fees than their Hungarian counterparts. Thus, it could be argued that Italian companies prefer to licence software instead of making investments for developing solutions internally. Moreover, telecommunication costs are significantly higher than in Hungary for microenterprises who probably do not have sufficient bargain power with service providers.

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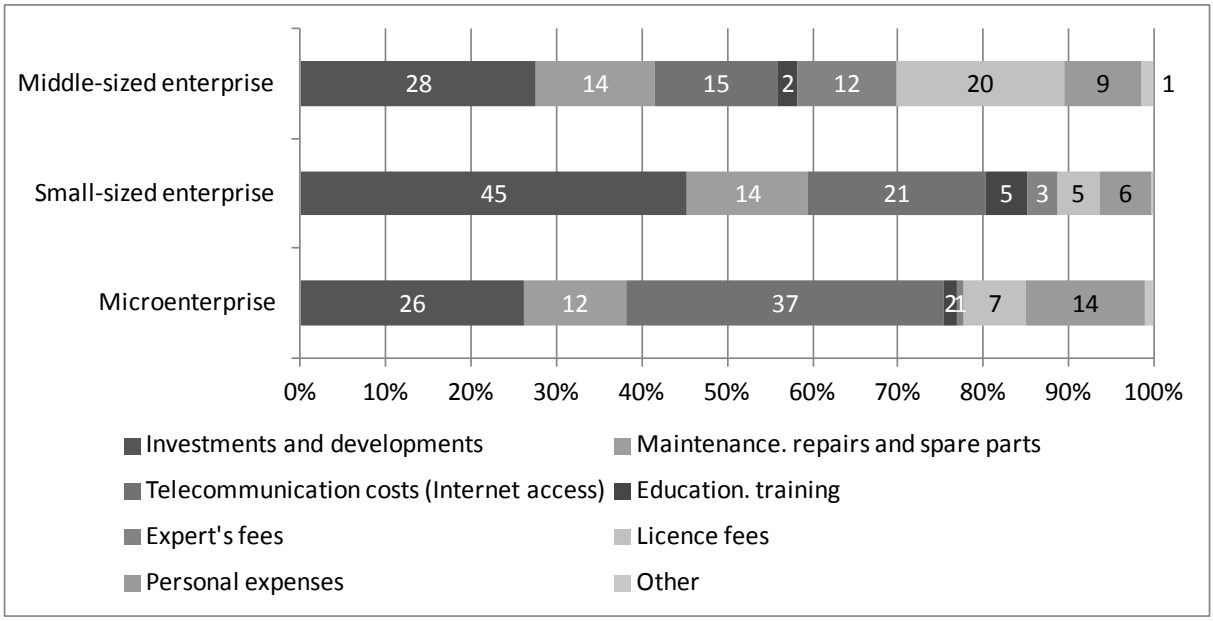
Figure 3 – The structure of annual IT expenses among Hungarian enterprises



5.4. The usage of business information systems

Looking at the information systems usage and in particular at the type of systems adopted, results indicate that the use of TPS systems is the most typical in Italy (Table 7). More than 90% of medium-sized enterprises, nearly 90% of small-sized enterprises and nearly half of microenterprises use this type of systems. In this regard, the second most widely used system is ERP, MIS is the third one. Based on the received responses, it can be stated that more than 80% of the Italian medium-sized enterprises use ERP systems. The use of this system is the least typical of micro-enterprises since nearly a quarter of them reported on using it. 60% of small-sized enterprises said that they operated such a system. The fourth most commonly used system is BI. More than 60% of the Italian medium-sized enterprises use this system; however, the majority of non-users do not have a plan to install such systems in the future, either. The least-used systems were ES and DSS systems. It can be observed in all company sizes, that most of the enterprises use TPS and MIS systems. SCM and DSS systems are barely used by the Italian microenterprises, however, a quarter of the Italian small-sized enterprises use CRM and ES systems as well.

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Table 7 - Distribution of using business information systems by company size

	Types of Information Systems	Microenterprise		Small-sized enterprise		Middle-sized enterprise	
		Italy	Hungary	Italy	Hungary	Italy	Hungary
1	Transaction Processing System (TPS)	46,15%	5,00%	87,10%	29,63%	91,43%	51,85%
2	Management Information System (MIS)	28,00%	0,00%	60,00%	7,41%	85,29%	40,74%
3	Decision Support System (DSS)	12,00%	0,00%	16,13%	0,00%	27,27%	18,52%
4	Executive Information System (EIS)	11,54%	0,00%	6,67%	3,70%	23,53%	25,93%
5	Expert Systems (ES)	20,83%	0,00%	24,14%	7,41%	21,88%	3,70%
6	Enterprise Resource Planning System (ERP)	24,00%	0,00%	61,29%	14,81%	82,35%	40,74%
7	Business Intelligence System (BI)	3,85%	0,00%	26,67%	7,41%	61,76%	7,41%
8	Customer Relationship Management System (CRM)	15,38%	5,00%	23,33%	14,81%	39,39%	44,44%
9	Supplier Relationship Management System (SRM)	12,50%	5,00%	24,14%	14,81%	39,39%	37,04%
10	Supply Chain Management System (SCM)	4,00%	5,00%	17,24%	11,11%	34,38%	25,93%

In Hungary, the use of TPS systems is prevalent for a wide range of businesses (40%). The two least-used systems are BI and DSS systems as they are applied by less than 10% of the enterprises. Many systems are not used by the Hungarian microenterprises at all. Such systems are ERP, MIS, DSS, EIS, ES and BI systems. Unlike their Italian counterparts (with a usage rate of more than 30%), the Hungarian small-sized enterprises do not use DSS. The Hungarian medium-sized enterprises operate all business information systems. Considerable differences can be observed between the information system supply of micro- and medium-sized enterprises. Comparing the Italian and Hungarian enterprises to each-other in the provision of information systems, significant differences can be seen. In the case of both samples, the average percentage of using a given information system is more than twice as high among the Italian enterprises compared to their Hungarian peers.

In both countries, a significant relationship can be detected between the size of the company and the applied information systems (see Table 8). With the exception of EIS, BI and ES systems in Hungary and with the exception of SRM, DSS and ES systems in Italy, the presence of each system is associated with company size. This correlation can be explained by the fact that the vast majority of these information systems are designed to perform too complex and difficult tasks, so their use among smaller enterprises such as microenterprises is negligible, especially in Hungary.

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Table 8 - Cross-table analysis of the use information systems by company size

	Types of Information Systems	Italy	Hungary
1	Transaction Processing System (TPS)	significant	significant
2	Management Information System (MIS)	significant	significant
3	Decision Support System (DSS)	**not significant**	significant
4	Executive Information System (EIS)	significant	**not significant**
5	Expert Systems (ES)	**not significant**	**not significant**
6	Enterprise Resource Planning System (ERP)	significant	significant
7	Business Intelligence System (BI)	significant	**not significant**
8	Customer Relationship Management System (CRM)	significant	significant
9	Supplier Relationship Management System (SRM)	**not significant**	significant
10	Supply Chain Management System (SCM)	significant	significant

Business information systems are used by enterprises to gain advantages, make their operation more efficient and conduct business processes more quickly.

5.5. The effect of using business information systems

It is clear from the experience of the Italian respondents that the use of business information systems improves the information supply of decision-makers (see Table 8 and the forth table in the Appendix for additional details). Regardless of company size, they also think that competitiveness can be improved by using such systems as these systems has become an essential condition for remaining in the market. Medium-sized enterprises gave higher scores to every statement than small-sized ones did. These enterprises possess the highest level of information system supply, so it is understandable that they are more sensitive to the positive effects delivered by information systems. Based on their responses, the microenterprises are given less opportunities. They are less sensitive to the fact that the operation of such systems contributes to the development of a qualitatively new relationship with their suppliers and customers.

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Table - 9 - The perception of applying business information systems (rank)

Size	Microenterprise		Small-sized enterprise		Middle-sized enterprise	
The applied business information system… (Average)	**Italy**	**Hungary**	**Italy**	**Hungary**	**Italy**	**Hungary**
… improves the availability of information for decision-makers.	1	1	1	1	1	1
… may help to improve competitiveness.	3	2	2	2	2	3
… can fulfill the condition of remaining competitive.	2	6	3	6	3	4
…improves internal communication.	5	3	4	3	6	5
…reduces the time needed for making decisions.	4	4	5	4	4	2
… a new standard of connection can be established with suppliers and customers.	6	5	7	5	7	6
…can reduce costs.	7	7	6	7	5	7

The Hungarian enterprises share similar views about the capacity of information systems to improve the information supply of decision-makers. In connection with the potential to improve competitiveness, the ratings of medium-sized enterprises overcome the responses of others (see Appendix 4). Microenterprises agreed the least with the statement that information systems lessened the time for preparing decisions, while the evaluation of corporations was different from that of microenterprises by almost one score. Regardless of company size, the statement of information systems reducing costs was given very low scores.

Comparing the data from the two countries, it is noticeable that in Hungary there is not a big difference between the assessment of medium-sized and microenterprises. The Hungarian enterprises seem to discover the same opportunities as their Italian peers. The Hungarian enterprises think that reducing costs is the least likely when applying an information system, while according to the Italian enterprises, it is very unlikely that they could establish new business relationships with the help of an information system. The average of the respondents experiencing the benefits of an information system is at a higher level in Italy than in Hungary.

6. Discussions and Conclusions

During our research, we examined and compared the progress the Italian and Hungarian enterprises made on the way of getting the fullest possible benefits from the usage of the applied business information systems. By the evaluation of the questionnaire, which also provided the basis for our primary research, we were able to prove or disprove the assumptions initially formulated.

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After processing the results, it can be stated that our initial assumptions proved to be partially correct. In the case of the Italian enterprises taking part in the survey, the expected higher level of adoption of information systems was decisively confirmed. The Hungarian microenterprises seldom use any type of business information systems (5% or even less) or do not use any of them at all. Nearly half of their Italian counterparts use TPS, almost a quarter of them use MIS, ES and ERP systems during their daily operation. Nine small-sized enterprises out of ten apply TPS systems in Italy. It is almost three times higher than the use of TPS among the Hungarian small-sized enterprises. The use of ERP and BI systems is also significant in Italy while their penetration rate in Hungary does not reach 15%. Nearly half of the Hungarian medium-sized enterprises already apply TPS, MIS and ERP systems, however, it is still only half of what can be observed in Italy. A similar development level can only be found in the case of CRM, SRM and EIS systems in this size category.

All in all, the Italian enterprises of our sample use business information systems at a higher rate on average and in some cases the difference is two- or threefold. Based on these findings, it was possible to confirm that business information systems usage is higher in the Italian companies investigated than in the Hungarian ones. However no indications can be drawn to understand whether enterprises belonging to the same size category but operating in different countries apply business information systems in a similar way.

This country difference in systems usage appears to be strictly related to differences in the reasons for introducing existing information systems. In fact, enterprises operating in countries at different development stages tend to select their business information systems according to different criteria. Compatibility, flexibility and reliability were the most important aspects for the Italian microenterprises, while usability, cost and flexibility were regarded as the most important ones by their Hungarian peers. Similarities were not found in the case of small-sized enterprises, either. In Italy, flexibility, network access and compliance with information strategy were seen as the most important criteria. In contrast to this, the selection criteria were dominated by compatibility, usability and reliability for the Hungarian small-sized enterprises. In the category of medium-sized enterprises, some similarities could be detected: the three most important aspects were network access, reliability and compliance with information strategy for the Italian companies while the three key factors were reliability, usability and network access in Hungary. Consequently, we did not find confirmation for our first assumption on similarity in business information selection criteria among enterprises.

After observing the large amount of differences, it was surprising to see that the Italian and Hungarian enterprises, regardless of their size, adopt business information systems for similar reasons. With the

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exception of the Hungarian microenterprises, the adoption of such systems can be traced back to organizational reasons and business considerations.

When the expenses related to business information systems are examined, it can be stated that both Hungarian and Italian microenterprises barely spend on investments and developments. More than half of the IT expenses is composed of telecommunication costs. Regardless of their size, Italian enterprises spend nearly fifth of their IT budget on licence fees. Expressed in percentage, this is three times higher than in the case of the Hungarian micro- and small-sized enterprises. Apart from this remarkable difference, the structure of the IT expenses is very similar for both the Italian and Hungarian companies.

Finally, if the effects of introducing business information systems are compared, it can be seen that they show strong similarities in both countries. The most significant effect is improving competitiveness and the availability of information for decision-makers in each of the two countries.

In conclusions it can be stated that both country and size are relevant factors that can influence on information systems' adoption among businesses. Future research are needed to validate this result. However, our findings suggest that research on information systems adoption among SMEs should always try to consider environmental circumstances related to the national context.

As it could be expected, our sample indicates that there is a noticeable difference in the IT development level of the two countries and information systems for managers decision-making are more widespread in Italy than in Hungary. Thus it can be asserted that IT has already reached the level of an essential condition for survival in the Italian companies here investigated, whereas Hungarian companies still see it as a source of competitive edge. However, when asked about positive effects reached through information systems, respondents of the two different countries show similar answers. This means that contrary to our initial assumption, the question of competitive edge versus condition for survival depends more on size categories rather than on individual countries.

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APPENDIX

1. Criteria for selecting a business information system

If you decided to introduce any of the above-mentioned information systems, rate on a scale of 5, how much importance you attributed to the following aspects while choosing between competing information systems.

Aspect (Average)	Microenterprise		Small-sized enterprise		Middle-sized enterprise	
Country	**Italy**	**Hungary**	**Italy**	**Hungary**	**Italy**	**Hungary**
Usability	3.83	5.00	4.03	4.46	4.03	4.60
Performance	3.42	3.88	3.76	4.38	3.71	4.32
Reliability	4.00	4.13	3.72	4.46	4.37	4.60
Costs	3.75	4.63	3.63	4.23	3.90	4.12
Compatibility	4.17	3.75	3.69	4.54	4.06	4.38
Modularity	3.75	4.13	3.52	4.08	3.81	4.04
Technology	3.58	3.25	3.41	3.62	3.87	4.00
Network access	3.83	4.38	4.07	4.23	4.38	4.50
Ergonomy	3.50	3.25	3.07	3.69	3.06	3.58
Availability of documentation	3.25	3.63	3.21	3.42	3.23	3.92
Warranty	3.67	3.63	3.45	3.69	3.55	4.20
Support service	3.45	3.75	3.72	3.92	4.13	4.40
Manufacturer's reputation	3.83	2.75	3.66	3.31	3.90	3.29
Flexibility, customization	4.08	4.38	4.18	4.15	4.07	4.28
Free trial period	3.67	4.38	3.24	3.85	3.19	3.64
Availability of new software versions	3.58	3.50	3.97	3.92	4.06	3.92
Security	3.55	4.38	4.03	4.31	4.16	4.40
Compliance with information strategy	3.92	3.63	4.07	3.77	4.19	4.04
Customer support in the phase of introduction	4.00	2.88	3.90	4.08	4.10	4.16
Customer support after introduction	4.00	2.86	3.71	3.67	3.87	4.04

2. Reasons for applying a business information system

What were the reasons for introducing your existing information system(s)?	Microenterprise		Small-sized enterprise		Middle-sized enterprise	
Country	**Italy**	**Hungary**	**Italy**	**Hungary**	**Italy**	**Hungary**
Organizational reasons	51,85%	5,00%	83,87%	40,74%	82,86%	44,44%
The company's activities require very quick information flow	33,33%	20,00%	74,19%	37,04%	77,14%	51,85%
The company has to meet the challenge of its competitors, as they already use information systems	7,41%	10,00%	16,13%	11,11%	20,00%	25,93%
Technological reasons	25,93%	5,00%	38,71%	14,81%	40,00%	40,74%

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Strategic reasons	3,70%	0,00%	22,58%	18,52%	20,00%	25,93%
Business considerations	7,41%	10,00%	48,39%	7,41%	42,86%	25,93%

3. The structure of expenses related to business information systems

Please estimate the rate of the above-mentioned expenses in terms of the total sum of IT-related expenses (Average)	**Microenterprise**		**Small-sized enterprise**		**Middle-sized enterprise**	
Country	**Italy**	**Hungary**	**Italy**	**Hungary**	**Italy**	**Hungary**
Investments and developments	9.64%	26.15%	27.92%	45.31%	31.39%	27.63%
Maintenance. repairs and spare parts	6.29%	12.00%	18.50%	14.19%	20.67%	13.81%
Telecommunication costs (Internet access)	53.71%	37.23%	13.17%	20.69%	10.67%	14.50%
Education. training	2.14%	1.54%	7.58%	5.00%	5.39%	2.31%
Expert's fees	8.21%	0.77%	12.75%	3.44%	11.33%	11.50%
Licence fees	17.86%	7.31%	18.83%	4.94%	15.78%	19.69%
Personal expenses	1.79%	13.85%	0.83%	6.13%	4.22%	9.19%
Other	0.36%	1.15%	0.42%	0.31%	0.56%	1.38%

4. The effect of business information systems

The applied business information system… (Average)	**Microenterprise**		**Small-sized enterprise**		**Middle-sized enterprise**	
Country	**Italy**	**Hungary**	**Italy**	**Hungary**	**Italy**	**Hungary**
… improves the availability of information for decision-makers.	3.86	4.25	4.13	4.30	4.47	4.22
… may help to improve competitiveness.	3.73	3.92	3.97	3.90	4.12	3.96
… can fulfill the condition of remaining competitive.	3.77	3.33	3.90	3.65	4.09	3.93
…improves internal communication.	3.64	3.58	3.87	3.85	3.88	3.93
…reduces the time needed for making decisions.	3.73	3.42	3.87	3.90	3.97	4.04
… a new standard of connection can be established with suppliers and customers.	3.41	3.42	3.45	3.70	3.79	3.74
…can reduce costs.	3.41	3.33	3.87	3.55	3.97	3.52

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