

EMERGING TRENDS AND APPROACHES IN TECHNOLOGY AND THEIR IMPACT ON SMES

Malgorzata NYCZ¹, Marian NIEDZWIEDZINSKI², Zdzislaw POLKOWSKI³

¹ Wroclaw University of Economics, Wroclaw, Poland, malgorzata.nycz@ue.wroc.pl

² University of Lodz, Lodz, Poland, zie@uni.lodz.pl,

³ The Lower Silesian University of Entrepreneurship and Technology, Polkowice, Poland,
z.polkowski@dwspit.pl

***Abstract:** Globalization, the Knowledge based Economy and Information and Communications Technologies (ICT) have caused major changes in Small Medium Enterprises (SMEs). Currently, the digital economy is driven by modern information systems and new ICT tools which offer employees and employers access to new work opportunities. The purpose of this article is to analyze the emerging trends and approaches in technology, as well as their impact on SMEs. In the first part of the paper, the author presents the influence of globalization on SME's business. The next part of the paper is devoted to significant aspects of using modern ICT in SMEs. Moreover, various aspects regarding changes in the work system with the use of new ICT solutions both by employees and employers have been discussed. Also, virtualization and mobile technologies issues in SMEs are an important element, taken into account by the author of this paper. The resulting recommendations may constitute a spark for positive changes and improvement in the area of knowledge based business activities.*

Key words: ICT, SMEs, globalization, Knowledge Based Economy, innovation, virtualization

JEL Classification Codes: A10, C80, C88.

INTRODUCTION

In recent years, new approaches, techniques, and models have emerged in the field of ICT. Several factors have contributed to this progressive growth. One of them is globalization. Globalization is a process which concerns creating economies across the Earth. The global economy largely uses many kinds of technological solutions that make the borders of countries or economic blocks of no significant relevance. Particularly noteworthy is the phenomenon of the increasing role of modern ICT solutions. They make the removal of barriers to trade and production of goods, services, capital and people flow easier. The main advantages of globalization are the reduction of production costs, distribution of goods and services and better use of the resources available in the world of labour and capital.

The knowledge-based economy has a very powerful technological driving force – the rapid growth of ICT. Every year a new generation of ICT appears. Nowadays, ICT companies are among the largest corporations (United Nations Economic Commission for Europe, 2002).

The analysis on the functioning of business leads to the conclusion that in the future we should expect further dynamic development in many fields of science and the virtualization business along with the creation of a number of solutions that will allow drilling in a remote areas from any location 24/7/365.

1. RESEARCH METHODOLOGY

The purpose of this article is to analyze the emerging trends and approaches in technology, as well as their impact on SMEs. Moreover, the goal of this study is to critically examine the role of the Knowledge-Based Economy which managers of SMEs apply in fields such as ICT, to determine the trends in the implementation and use of ICT, forming relevant recommendations. The results of this research may be used by IT and government leaders and IT specialists as they plan and develop ICTs.

The research described is based on an extensive review to identify relevant studies published in literature recently. Moreover, in this paper, information is analyzed from several specialist representative ICT companies, SMEs, several ICTs and economic papers on the current situation in Poland. Additionally, owners of many Polish SMEs were interviewed. This study contributes to the understanding of the changes in SMEs with the use of new solutions based on knowledge.

While studying literature two research gaps concerning the use of ICT in SMEs were noted:

1. The theoretical - no (especially in the national literature) in-depth analysis of the potential of ICTs to shape a virtual environment.
2. The empirical - an incomplete description of experiences, implementations, experiments and knowledge benefits of business (especially in Polish literature), in the use of ICT to virtualization companies. The description of the research can be acquired and the generalization of empirical knowledge fills, at least partially, this gap.

The problem described above definitely leads to a considerable need to conduct research in this area. The present study has been undertaken with the following objectives:

1. To appropriate the influence of globalization on doing business by SMEs
2. To identify the influence of ICT on SMEs
3. To identify the elements of an innovative company
4. To identify the key trends in technology and their impact on SMEs

2. THE INFLUENCE OF GLOBALIZATION ON SME'S BUSINESS

Micro, small and medium-sized enterprises (SMEs) are the driving force of the European economy. They are a major source of work places, they create entrepreneurial spirit and innovation in the EU and they foster competitiveness and employment. Representing 99.8% of all enterprises, SMEs are the backbone of the service-driven economy (Deloitte, 2013). A typical EU enterprise is an SME, or more specifically, a microenterprise, having fewer than 10 employees. Additionally, according to a study analyzing the role that SMEs play in creating more and better jobs, 85% of the net new jobs in the EU between 2002 and 2010 were created by SMEs (Ellis, 2011). Polish SMEs are today operating in increasingly difficult conditions, resulting in severe competition. They face unprecedented pressure to increase profits and service quality while lowering costs. At the same time, they are expected to become more flexible and responsive to customer needs. They face increased scrutiny from legislators, executives and other institutions. Polish SMEs are characterized by a low level of internationalization, mainly due to their relatively low level of development and ICT use. The long-term trends, however, in this area are positive. With the growth of the Polish economy, Polish participation in the international trade of SMEs has been increasing (Łapiński, Nieć, Rzeźnik, Talar, Zakrzewski, 2013). The SME sector in Poland continues to receive disproportionate attention from government institutions (Polkowski, 2015).

SME's contribution to the EU's main economic objectives is reflected and well documented in both the Lisbon strategy and the Europe 2020 strategy. The strategy for Europe 2020 is based mainly on the Small Business Act. The tendency is now to use, to a much greater extent than before, public-private partnerships. The Small Business Act for Europe (SBA)

establishes a comprehensive SME policy framework for the EU. The SME Performance Review represents one of the main tools of the European Commission to monitor the implementation of the SBA. Nowadays, the EU business environment is defined in the ‘Small Business Act’ for Europe (SBA) - a set of 10 principles to guide the conception and implementation of policies both at the level of the EU and in member states. These principles are vital to bring added value, create a level playing field for SMEs and improve the legal and administrative environment all over the EU (Kierzyk & Polkowski, 2011).

3. THE INFLUENCE OF ICT ON SMES

Small and Medium Enterprises (SMEs) do not have large IT or ICT departments and frequently their budget to develop IT is low. For this reason, the structure of ICT systems in SMEs is very simple, usually without sophisticated ICT tools (only workstations, Internet access, sometimes servers) that could improve their functioning and reduce operating costs. Probably all SMEs use e-mail, but not everyone has websites. Most SMEs use landline phones and mobile phones. Not many IT systems work in a public or private cloud. In the CC environment, SMEs do not have to own the infrastructure so they can abstain from any capital expenditure and, instead, they can utilize the resources as a service and pay as per their usage (Polkowski, 2015).

Today ICT systems in EU companies are not capable of supporting longitudinal manager performance, data analysis, and reporting. The data are stored in multiple operational tables, preventing efficient integration and aggregation on demand. The authorities and ICT specialists need ICT tools to support decision-making and improve communications. Digital entrepreneurship embraces all new ventures and the transformation of existing businesses, by creating and using novel digital technologies. Digital enterprises are characterized by a high intensity of utilization of novel digital technologies (particularly social, big data, mobile and cloud solutions) to improve business operations, invent new business models, sharpen business intelligence, and engage with customers and stakeholders. They create workplaces and growth opportunities (European Commission, 2014). An increased use of ICT solutions may solve operational challenges, improve customer service, maximize resources and eliminate fraud, communications problems and waste. ICT definitely can improve the situation of Polish SMEs in international trade, too (Polkowski, 2015).

It is worth noting that ICT can have an influence on the individual elements of the company, table 1.

Table 1. The impact of ICT on the development of individual elements of the company

Source: Own elaboration based on (Brzozowski M. 2010)

Element of company	Possible consequences of the implementation of ICT in the company
Structure	<ul style="list-style-type: none"> • The transition from hierarchical structures to flat and network structures • Increasing the role of self-organization and self-control staff • Redefining the role of the departments - IT outsourcing
Systems	<ul style="list-style-type: none"> • Development of a comprehensive integrated management information system • Redefining the organizational procedures for the needs of the digital environment • Dissemination of telework
Strategy	<ul style="list-style-type: none"> • Replace the strategic role of interest groups in the company's environment • Change the key drivers of competitive advantage • Shortening the product life cycle

	<ul style="list-style-type: none"> • New forms of economic cooperation • New variants of competitive strategies
Styles of action	<ul style="list-style-type: none"> • Change the nature of intellectual work • A new model of communication • Dispersion of the decision-making process • Increase the utilization of digital tools to support decision-making
Personnel	<ul style="list-style-type: none"> • Extension of the time of working • Increased psychological stress associated with work • The use of the Internet in the recruitment of staff • Reduce the importance of staff unions
The values	<ul style="list-style-type: none"> • Facilitate the formation of the desired image and dissemination of the value of the company • Promoting a culture of tasks within the company • Increasing the role of trust as a tool of control and coordination • Decreasing the threat to data security • Construction of universal value systems
Skills	<ul style="list-style-type: none"> • The need for continuous improvement of employees • Treating the Internet as a source of organizational knowledge • Change the nature of managerial work as a result of the acquisition of new competencies by the company

In order to develop an ICT investment strategy, the user of IT has to follow three steps, figure 1.:

Step 1 – Model: In the modelling phase, the organization applies the Process Landscaping Module to capture its Business Processes

Step 2 – Measure: In the measurement phase, the organization applies the Impact Measurement Module to calculate the ICT impact on its Business Processes

Step 3 – Analyse: In the analysis phase, the results can be analysed to derive a sound ICT strategy (Niedzwiedzinski & Ziemecka, 2010)

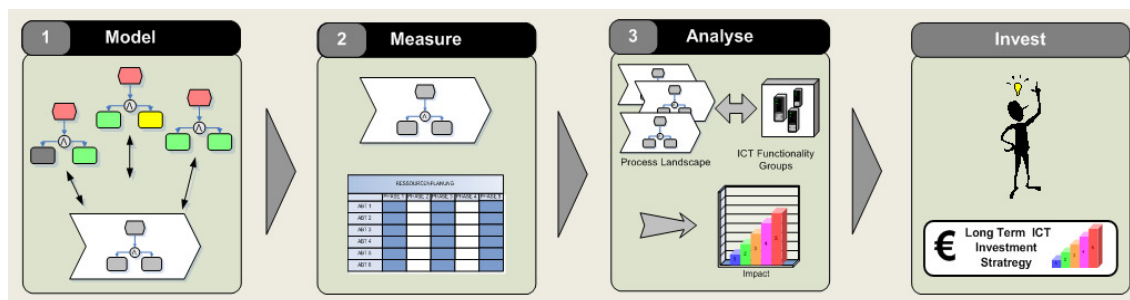


Figure 1. A steps of an ICT strategy

Source: Own elaboration based on: M. Niedzwiedzinski & M. Ziemecka, The „PICTURE” Project, Journal of Internet Banking and Commerce, December 2010, vol. 15, no.3

4. THE ELEMENTS OF AN INNOVATIVE COMPANY

Based on table 1. it is obvious that to build an effective and modern ICT system you should take into account tools, concepts, techniques, methods, and sub-models such as:

- Cloud Computing (Długosz, 2010), (Serafinowicz, 2011)
- Business Intelligence (Choiński, 2011), (Twardowski, 2015),

- E-learning,
- Data Warehouse (Datawarehouse4u, 2009),
- Mobile technologies,
- E-business,
- Product Lifecycle Management,
- Search Engine Marketing (Brzozowska-Woś, 2011),
- Decision Support Systems and Group Decision Support Systems,
- Web 2.0, 3.0, 4.0 ... (Aghaei, Nematbakhsh, Farsani, 2015),
- Virtual Reality,
- Customer Relationship Management (Turban, 2010),
- Supply Chain Management,
- Telecommunication Technologies (VoIP),
- Videoconferences,
- Webinars,
- Business Games.

ICT technologies and innovative tools are powerful and they have multiple, direct impacts on the condition of a company. They reduce barriers for the company to international markets and open doors for a new generation of entrepreneurs and innovators. Currently, using digital technologies can lead to cutting the costs of doing business, and improve communication inside and outside a company.

Successful companies now depend more and more on their sensitivity to changes in innovation which is becoming a decisive factor not only for their development and expansion but, above all, survival. The main reasons for introducing innovation include the following: reducing costs, competition, increasing the potential of the company, as well as an increase in profit market needs. Also, one of the important sources of competitive advantage in the market is the transfer of technology, understood as a process of the adaptation of research, patents and original ideas, into practical use. Taking into account all these factors will make a large contribution to modern technology. These factors include in particular the use of new ICT techniques and technologies in logistics and export-import activity as well. It is important to be global SMEs in global markets- an Innovative Virtual SME Company (Kierzkowski, 2012), figure 2.

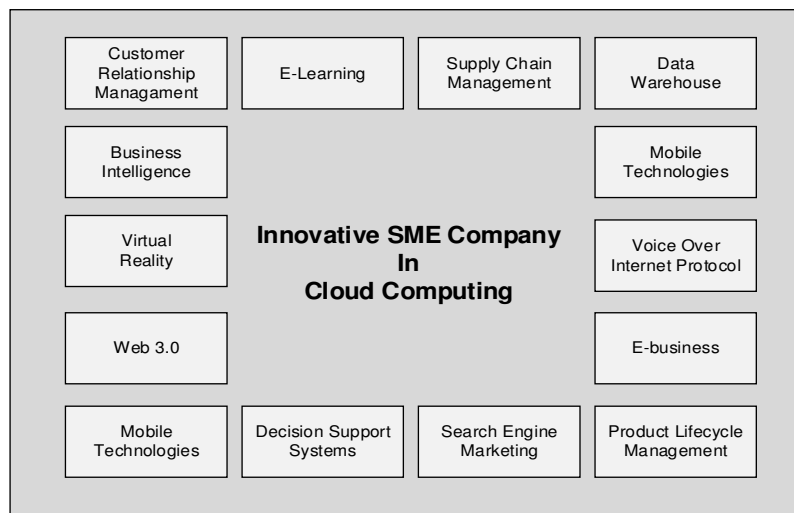


Figure 2. A key elements of an Innovative Company

Source: Own elaboration

Figure 2 shows the recommended tools, concepts, techniques and methods for SMEs in the future. It may be seen that information and telecommunications systems in SMEs will not require a lot of hardware, such as file servers, faxes or landline phones. Workstations and smartphones may function as terminals. Very important will be the application of CC models, figure 3.

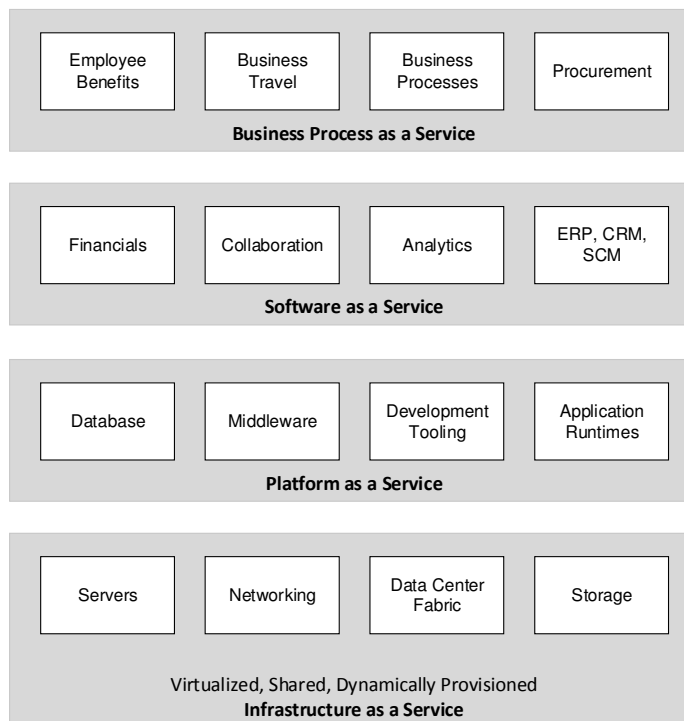


Figure 3. Cloud services models- opportunities to save. Prioritizing possibilities for SMEs

Source: Elaboration based on: (Porell J. 2011)

5. THE KEY TRENDS IN TECHNOLOGY AND THEIR IMPACT ON SMES

Virtualization and its impact on SMEs

“Classically, virtualization means the virtualization of ICT infrastructure. This model, which assumes independence of the server and client software from the hardware. Virtualization allows to use in your production environment all applications, regardless of the computer.. In addition, virtualization makes it easy to outsource all back-end systems and make them independent of the geographical location of the office. Virtualization of the IT infrastructure has begun “virtualization business.” Traditional business – it is an office, where people sit and work (with computers). If the IT infrastructure becomes independent of the geographic location of the office and accessible via the Internet, it becomes possible to make maximum use of outsourcing, remote workers, and a geographically-distributed business structure. (Procrastination Definition, 2015). See table 2 below.

Table 2. Conventional vs. Virtual Enterprise

Source: (Koivisto, 2001)

Conventional Enterprise	Virtual (Networked) Enterprise
Inputs acquired from suppliers, outputs marketed to customers	Inputs, processes and outputs through networks and partners
Vertical hierarchy, organisational silos	High flexibility, ad hoc structures, e- integration enabled

Integration through structure, high level of formal control and command	Social and networked integration and control
Lower security sensitivity, low intensity of information in- and outflows	Higher security sensitivity, high intensity of information in- and outflows
Structural balance of power in decision-making	Dynamic equilibrium of bargaining power in decision-making

The obvious advantage of such a model is to save on fees for room and equipment. However, much more important is the ability to engage in business with the most cost-effective resources and most talented employees but not limited to the confines of the city. Added bonuses include the convenience for employees, high mobility and potential savings on taxes.” (Procrastination Definition, 2015). See table 3. below:

Table 3. Cost of implications of virtualization for SMEs

Source: (Nash Networks Inc 2009)

Item	Effect	Comments
Hardware	Same or down	Fewer computers needed, but they need to be more powerful. Less network infrastructure needed.
Licenses	Same or up	Small business virtualization software is usually free or inexpensive but can be costly. Minimal to no savings can be expected for other software.
IT support	Same or down	Some extra skills are needed, but management is easier and faster.
Bandwidth	Same or up	Bandwidth has to be more robust and with redundant connections if the servers are in a data centre
Disaster recovery	Down	Planning, implementation and recovery are much cheaper and faster
Data centre colocation space	Down or up	Fewer computers mean less space to pay for- but many businesses might not have needed data centre space at all prior to virtualization
Power and cooling	Down	Savings are only significant if costs were high in the first place

The major potential benefits of virtualization for small businesses are: **Better and cheaper disaster recovery.** Not to belabour the point, but this is probably the biggest advantage of virtualization for the typical small business.

Scalability. More servers can be added without extra hardware costs.

Flexibility. Servers can be added and removed, test servers can be created, and computers can be rolled back to previous versions.

There’s surprisingly little to say on this topic, despite the fact that a certain amount has been written about it. One reason is that this really is a decision that has to be made on a case-by-case basis, with the specifics of each company’s needs and budget taken into account. The main reason, though, is that in general, virtualization technology is still too heavyweight for most smaller companies. Virtualization technology that makes fewer demands on the system and management resources would change this. (Nash Networks Inc, 2009).

Nowadays some companies have their businesses structured so that they operate under a Virtual Business Model. This is a business structure without the traditional bricks and mortar, physical office set up and is operating 'in the cloud'. Some businesses will want only a small portion of their business transitioned to the Virtual Business Operating Model while others will want 100% operating virtually.(Bayer, V-biz 2015).

Figure 4 illustrates that virtual companies typically form virtual workgroups and alliances with business partners that are interlinked by the Internet, intranets, and extranets. It is worth noticing that this company has organized internally into clusters of a process and cross-functional teams linked by intranets. It has also developed alliances and extranet links that form inter enterprise information system with suppliers, customers, subcontractors, and competitors. Thus, virtual companies create flexible and adaptable virtual workgroups and alliances keyed to exploit fast-changing business opportunities, figure 4.

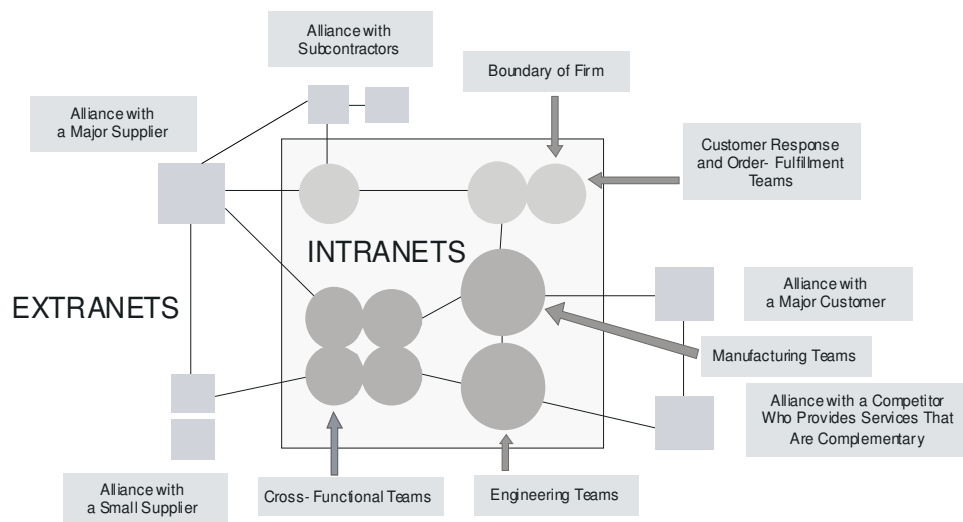


Figure 4. Virtual Company

Source: (O'Bieren & Marks 2010, p. pp. 62)

A Virtual Business Model provides many benefits that you may be unaware of:

1. It is environmentally friendly. By operating virtually, or 'in the cloud', the benefit of reducing the environmental impact is exponentially increased. It means less impact on power usage and lowered CO2 emissions because you and your staff no longer need to commute to and from work.
2. Industry Specialists. As a Virtual organization, the benefit extends to your ability to be able to source personnel who are specialists in their area of expertise, and distance is no longer an issue.
3. Reduced staffing costs. The ability to hire sub-contractors who operate virtually means that the a Virtual organisation doesn't have to think about costs such as workers compensation, payroll tax, superannuation. (Bayer, V-biz 2015).

One of the biggest income-replacement trends in the global economy is matching professionals with companies which wish to contract them for various projects. These professionals are performing work, giving companies the type of worker they desire. The majority of virtual positions are managerial, professional and sales roles – all jobs with more autonomy to begin with. These workers are becoming Virtualpreneurs.

The Virtualpreneur will play an important role in business in the future because they will have a positive impact on economic recovery and subsequent growth. Companies will find

efficiency, effectiveness and cost savings in utilizing Virtualpreneurs for the new work model of globalization and virtualization. (Maxwell, 2012).

In order to fully leverage the Virtualpreneurs, companies should address the advantages and disadvantages of why this new workforce is emerging. Even considering these disadvantages, the advantages are still tilting the scales to a new virtual contingent workforce, creating a mutually beneficial relationship between the employer and worker. (Houlne, 2013). See table 4 below:

Table 4. Advantages and disadvantages of the virtual form of work

Source: (Houlne, 2013)

Advantages	
Employer	Worker
Flex staffing Reduced overhead No benefits Scale Improved margin Specialty expertise as needed No labor unions Variable labor model	Flexibility of hours Work remotely Variable work Variety More opportunities Projects you choose Less job discontentment Self-employment
Disadvantages	
Employer	Worker
No loyalty Less retention Lost domain knowledge Challenging social aspects	Limited job security Minimal benefits Cyclical wages Less career advancement

Mobile technologies in business

The next prominent and very important direction of business development is mobile technologies. Internet technology provides a person with the ability to access information wherever he is. Employees can now have the same access to information whether they are working out of their homes or working at their offices. Employees who need to travel to support customers are no longer constrained by their inability to access information that resides within the company. Providing access to information from any place and at any time can improve the company's ability to respond to customer needs (Rosen, 2002).

The organizations that succeed will be the ones which are able to use mobile applications to make their offer attractive and help customers using smartphones, tablets etc. Companies do not have to significantly change the fundamental principles of operation to obtain benefit with the use of mobile intelligence. The essence of the task is to provide leadership, market, and give key external players the most current information and the ability to make quick decisions with mobile devices. The prevalence of mobile broadband and decreasing equipment costs are two of the conditions for the application of this technology also in the area of economic activity, independent of the business model (B2B, B2C, B2E, B2G).

The evolution of mobile technology in equipment tends to go in several directions: personal laptops, handhelds, mobile phones (Pawełszek-Korek, 2009), whereas mobile applications aim to combine the following three main features: Business Intelligence, transaction volumes and multimedia (Pawlak-Lis, 2013). Mobile devices and applications allow users to take advantage of the marketing activities aimed at the Internet. Moreover, they are the means of information and promotion binding the online and offline world. For this reason in the

future the realization of special websites for mobiles probably will be necessary. In addition, because the rules of SEO for mobile devices are different than stationary equipment, the opportunity to adopt a high position (even in highly competitive niches) will be a crucial issue. Owning a mobile site also the obtaining of additional passive income from contextual mobile advertising (Gancarz-Wójcicka, 2013).

An increasing amount of online purchases is performed using mobile phones and other portable devices – so-called m-commerce or mobile commerce. Individual mobile applications are responsible for much of this increase - popular sites such as Amazon and eBay have applications for smart phones which 'push' news and updates to customers, alert them to deals, and provide an electronic shop front to make purchases. M-commerce applications are particularly useful for sites which require an immediate response - such as special deals sites or online auctions (Gray, 2013).

6. CONCLUSION

This study focused on the emerging trends and approaches in technology and its impact on SMEs. It has been demonstrated that use of ICT by SMEs in different sectors is a key factor in the current global economy. Currently, a major concern for entrepreneurs is to offer many products and services in small or very small numbers for individual customers, while maintaining very high quality and a comprehensive service. So the "flexible" approach to doing business in increasingly unstable conditions seems to be a necessity, and virtual and mobile solutions can improve and speed up business processes. It seems that "flexible" companies which use ICT (virtual and mobile solutions) will be able to overcome various sudden problems, conquer new markets, overcome geographical limitations, cultural and language barriers and quickly respond to the changing business environment. In addition, on the one hand, companies can use virtual and mobile technologies to overcome these barriers and emerging problems, but on the other they can be effective tools to ensure the freedom to conduct business. Moreover, virtual enterprises will easily react to necessary changes and accept new challenges, trends and systems value.

In the world today, SMEs should have their own strategy concerning virtualization.

However, although the results of research, particularly in relation to private SMEs, appear rather negative, there are some positive signs in virtualization. Considerable pressure from the market of goods and services have caused significant issues regarding virtualization. The findings are of direct practical relevance.

The growing role of virtualization is in the education of students. Numerous Polish universities already have curricula items with "Virtualization in business" issues.

On the basis of the findings presented in this paper, work on the remaining issues is continuing and will be presented in future papers. The next stage of the research will concern **the methodology of the optimization of business processes using virtualization.**

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