

CHAPTER 33. INFORMATION AND COMMUNICATION TECHNOLOGIES AS THE BASIS FOR THE IMPROVEMENT OF COMPANIES' PERFORMANCE IN SERBIA¹

Aleksandra BRADIĆ-MARTINOVIĆ²
Aleksandar ZDRAVKOVIĆ³

Abstract:

The possibilities of using information and communication technologies for business improvement are numerous, but many studies show that there are significant problems in identifying the real impact of ICT investments and companies' performance. The first large problem arises in the field of definition of ICT in each company and the other one is connected with the link between the specific investment and selected performance measure. There is no standard measurement system and the results of individual studies are not comparable. The aim of this work is to explore this matter in Serbia. In this research we used the case study method, which was conducted in seven companies of different sizes and structures in the field of telecommunications, education, manufacture, accommodation and food service, financial and insurance activities and retail trade. Each of the representatives, mostly top management, gave answers about ICT assets and investments in their companies. The results of our research suggest that most of the companies in Serbia consider ICT assets and ICT investment as duty imposed by the business environment. The management of selected companies do not see obligation to treat the ICT investments as "regular investments" like building new facilities, purchase new machinery or expanding array of services. There is a strong possibility that Serbian companies overestimate or underestimate the value of investments in ICT because they do not use appropriate mechanism to control investments. Also, it is likely that investments do not lead to required results, because there is no control mechanism

¹ This paper is a part of research projects: 179015 (*Challenges and prospects of structural changes in Serbia: Strategic directions for economic development and harmonization with EU requirements*) and 47009 (*European integrations and social and economic changes in Serbian economy on the way to the EU*), financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

² Aleksandra Bradić-Martinović, PhD, Research associate, Institute of Economic Sciences, Belgrade, Serbia.

³ Aleksandar Zdravković, MA, Research associate, Institute of Economic Sciences, Belgrade, Serbia.

that measures the impact of certain investment on results or companies' performances.

Key words: *information and communication technologies, ICT, companies' performances, case study, Serbia*

INTRODUCTION

In contemporary environment the use of information and communication technologies (ICT) has become an integral part of every company. A modern, competitive business cannot be started without greater or lesser use of ICT. Companies are aware that the use of this technology is necessary for the normal functioning and for further growth and development (Becchetti et.al. 2003; Keramati, 2007). Therefore, large investments are focused on this area. Some research papers (Vu, 2002) even measured the impact of ICT investment on countries' economic growth.

Based on previous statements we can assume that there is a clear and simple relationship between investments in ICT and improvement of the companies' performance based on this type of investments. However, when we undertook a deeper analysis of this topic, we found out a range of problems which can be connected with the three main questions: *What is ICT asset in the company? What is considered to be ICT costs/investments? And which companies' performances are under direct or indirect influence of ICT?*

The first question (*What is ICT asset in the company?*) is connected with the lack of uniform definition of what companies consider to be ICT. According to Giles (2009) an acronym ICT can be interpreted in two ways. The first interpretation considers that the ICI is Information and Communication Technology. It implies a narrower scope, with only information technology and communication technology. Another interpretation of the acronym is Information, Communication and Technology, and then the coverage is much broader because it includes information (or data) and communication (in person or electronically) in addition to information technologies (software, hardware and electronics) and communication technologies (protocols along with software and hardware). Since there is no single accepted definitions of ICT, companies themselves determine which elements of their assets fall into this category. The consequence is that lots of research studies have different definition, so comparison of results is difficult or not possible.

The second question (*What is considered to be ICT costs/investments?*) is direct result of the first one and relates to the costs and investments of ICT. The broadest

coverage is assumed that investments in ICT represent investments in hardware, software, network infrastructure, employees in the IT sector, but also the costs of management information system, which includes Enterprises Resource planning (ERP), Customer Relationship Management (CRM) and Human Resource Information Systems (HRIS). Depending on how broadly the notion of ICT is, companies will have different level of investments.

The third question in this research is the type of the companies' performance that could be affected by ICT, or the answer of *Which companies' performances are under direct or indirect influence of ICT?* We can distinguish two basic groups of performances. The first group includes the quantitative performances (productivity, efficiency, growth, market share, sales growth, etc.). The other group is qualitative performances (availability of information used by company management, or used by company employees, improving customer satisfaction, etc.).

The aim of this research is to analyse the situation in the field of ICT investments and its connections with companies' performances in (the Republic of) Serbia. Due to the lack of funds we were forced to use the case study method as the basis of our research, instead of e.g. questionnaire which would lead us to a less biased analysis. After a brief review of research background we analysed seven companies in Serbia and in the third part of the research we presented the findings. In the fourth part we provide an insight in general findings of the research and conclusion.

RESEARCH BACKGROUND

Since the early seventies, the companies became aware that IT capabilities have become increasingly critical component of their success (Carr, 2003). However, the extremely rapid technological progress has reduced its strategic importance, and as a result of that controversy, an issue whether IT can provide a strategic advantage or not has emerged in the literature. Some research showed that ICT sector has the fastest growing rate in the economy, 68% between 2002 and 2012 (Zehir, et.al, 2010; Callahan, et.al, 2009). One possible resolution of this dilemma involves the division of *operational IT systems*, like transaction or operational control systems and *strategic IT systems*, like new products and services or expert systems (Weil, et.al, 1989). However, regardless of whether or not they can provide a strategic advantage, many studies show that ICT has an impact on the success of the companies and their performances.

Rankema & Bergoud (1995) did one of the first comparative reviews of methodologies for ICT investment evaluation. First, they made a distinction between

financial⁴ and non-financial consequences, and today we have two groups of techniques for evaluation of investments in ICT. The first one is traditional or financial technique (Return on Investment – ROI, Discounted Cash Flow Analysis – DCF, Net Present Value – NPV, Internal Rate of Return – IRR, Payback Method, Cost Benefit Analysis – CBA, Real Options Theory, and Return of Management (ROM)). All of these techniques try to transform investment into cash flow. The other group of techniques are integrated or non-financial methods. Those are: Weighted Scoring Methods, Information Economics, Categorisation Methods, Multi-Criteria Methods, Multi-Objective – Multi Criteria Methods (MOMC), Application Portfolio approaches and Balanced Scorecard. All these methods try to quantify, or to include secondary or qualitative benefits.⁵

Table 1 contains timeline of ICT evaluation thinking starting from 1950s until today.

Table 1: A timeline of ICT evaluation

Date	Primary applications	Approach to evaluation	Metrics
1950-to mid-1970s	Labour saving devices	Simple cost reduction or cost avoidance	Payback ROI
Late 1970s-1980s	More sophisticated applications including automate and informate applications	Still a strong emphasis on Accounting-based	Payback ROI but also NPV, IRR and other discounted measures
1990s	The concept of informate is strengthened and transformate becomes an issue	Although cost reduction or avoidance are still used they are now more sophisticated area	An increasing wide range of metrics which are then combined into multi-perspective format (e.g. balanced scorecard)
Late 1990s ⁶	Evaluation slow down	The idea of the new economy appears	Metrics are underplayed
2000	E-bubble burst		Calculation of money lost
Since	Increasingly wide	Some form of multi-	A series of balanced

⁴ The financial consequences can be expressed in monetary terms.

⁵ More on this subject: Remenyi, D, Bannister, F, Money, A. (2007)

⁶ Experiences with the e-bubble and the Y2K effect.

Date	Primary applications	Approach to evaluation	Metrics
2000	range of applications ⁷	dimensional perspective with emphasis on the strategic impact of ICT and more appreciation of the life time cost of ICT	scorecard type metrics

Source: Adapted table from Remenyi, D, Bannister, F, Money, A. (2007)

Based on the above methodologies various studies explore the impact of ICT on the companies' performance, but none of them conducted a systematic and long-term research (Schubert & Leimstoll, 2006). Instead, individual studies that have been realised, mostly showed the relationship between ICT investments and companies' performance in some countries or specific industries. Therefore, the results of the research studies are very different. For instance, Shubert, Leimstoll (2006) show that *"there are noticeable dependencies between company characteristics and the degree in which a company succeeds in reaping benefits from the use of ICT"*. Another study (Weill, et.al, 1989) shows that there is a *"wide variety of definitions and methods of tracking"* and that companies *"do not have satisfactory way of assessing the relationship."* The study on national and multinational companies conducted by Zehir, et.al (2010) showed that there is a strong relationship between ICT investments and leading position on the market, which was also confirmed in the work of Apulu & Latham (2011). The result of research conducted by Keramati (2007) shows that there is a strong relationship between companies' performance and ICT usage, especially in sectors of planning, administration and pecuniary affairs. Lim et.al (2011) carried out a study of relationship between ICT investments and companies' financial performances. Their research confirms that there is a positive correlation between these two values over time.

Very interesting results regarding this topic can be found in the work of Naidoo & Chikasha (2010). They found that the management process, subjective opinion, bounded rationality, information overload, group thinking, risk aversive behaviour, preference for simply and easily collectable data, and the human inclination to favour first impressions can be more important in the decisions of ICT investments than the objective criteria like ROI coefficient, in developing countries.

⁷ Realization of the importance of management instinct in ICT evaluation and realization of the challenges inherent in producing relevant cost data.

The listed papers show positive correlation between IT investments and companies' performances, but some research (Aral, Weill, 2007) emphasize that results vary across firms and performance measures. Also, some evidence (Indjikian & Siegel, 2005) show that there are differences between developed and developing countries. Specific problem which arises in this analysis is the time component, because the benefits of IT infrastructure investments are indirect and long-term (Renkema, 2000). This problem is also called productivity paradox.⁸

CASE STUDY - SERBIA

The main guideline which provides the basis for information society development in Serbia is *"The Strategy for information society development in Republic of Serbia until 2020"* prepared by the Government.⁹ The document emphasizes that the development of information society should be directed towards utilizing potential of ICT to increase efficiency, economic growth, higher employment and higher quality of life for all citizens of Serbia. The drivers of the information society are the following:

- Open, accessible and quality Internet access;
- Developed e-commerce, including e-governance, e-inclusion, e-justice, e-health and e-education.

The use of ICT in Serbia has been spreading rapidly in the new millennium, although comparative analyses do not show particularly promising results. International Telecommunication Union calculate the ICT Development Index - IDI (ITU, 2011, pp. 7), which is composite index and benchmark measure that serves to monitor and compare developments in information and communication technology across countries.¹⁰ According to the latest data in that report Serbia was in the 50th place in 2010, among 152 countries, with the score of 5.11¹¹. If we observe the scores in the regional environment (Europe), Serbian results are very poor (33rd of 38 places).

⁸ See more on the subject in Turban, et al., (2002), pp. 568.

⁹ „Official Gazette of the Republic of Serbia“, no. 51/2010.

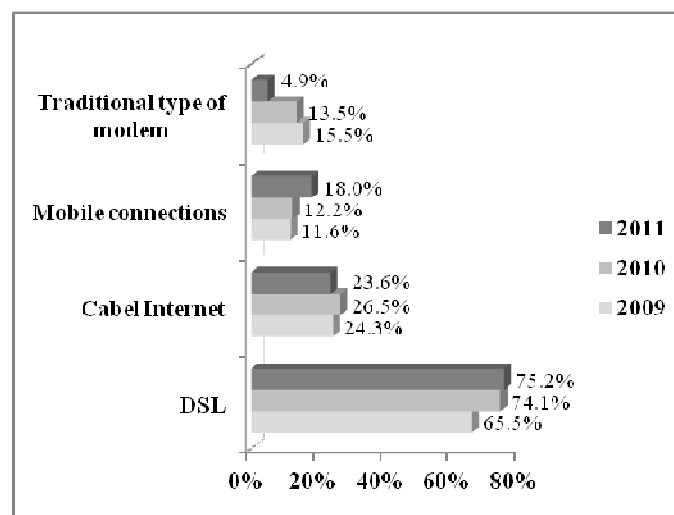
¹⁰ The main objectives of the IDI are to measure the level and evolution over time of ICT development, progress in ICT development in both developed and developing countries, the digital divide (differences between countries with different levels of ICT development and the development potential of ICT (ITU, 2011, pp.7).

¹¹ Korea is at the 1st place, with the score of 8.40, and at the 152nd place is Chad, with the score of 0.83 (ITU, 2011, pp.13).

Annually, the Statistical Office of Serbia analyses the use of ICT in the country and publishes reports *“The Use of ICT in the Republic of Serbia”*. The survey includes households/individuals and businesses sector.¹²

According to the 2011 report, 98.1% of companies use the computer in their business, which is 0.3% more than in 2010. Proportion of the computers is the largest in large enterprises (companies more than 250 employees) and in medium enterprises (50-249 employees) and it is 100%, while presence of computers in small business (10-49 employees) is 98%. At the same year almost all companies have internet access (97.2%) and the quality of the connection is very good. Based on the results, the total number of companies which have internet connection 75.2% have DSL¹³, 23.6% have cable connection, while 4.9% have modem connection.

Figure 1: types of Internet connections used in the companies in Serbia during 2009, 2010 and 2011¹⁴



Source: *The Use of ICT in the Republic of Serbia, 2011, pp. 14.*

In 2010 the 32.5% of companies with internet access in Serbia ordered goods / services via the Internet, which was an increase of 9.2% compared to 2009, and 10.1% compared to 2008. The results show that only 20.7% of companies with

¹² The methodology is harmonized with Eurostat, and the analysis covers the territory of the Republic of Serbia, without Kosovo. The Statistical Office of Serbia has no data about Kosovo and Metohija since 1999, so they are not included in the coverage or under the description “total”.

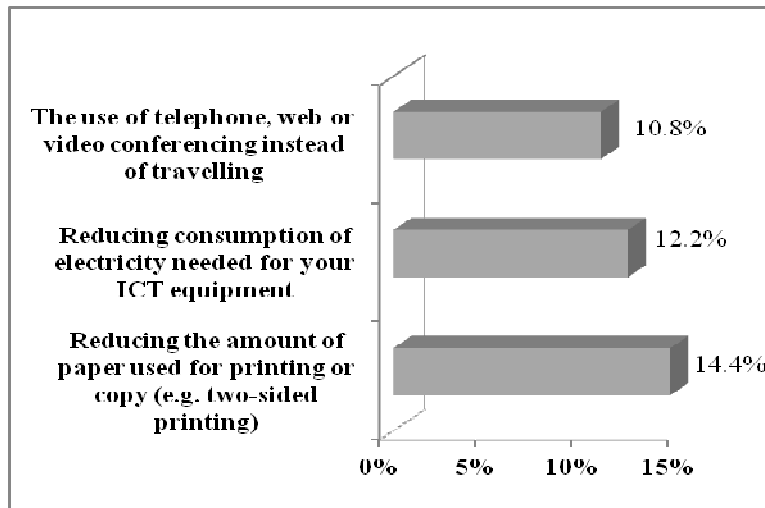
¹³ xDSL, ADSL, SDSL etc. connection

¹⁴ This question has multiple answers.

internet access received an order (except for e-ordering) via the Internet in 2010, which makes an increase of 0.7% compared to 2009 and 0.8% compared to 2008.

Figure 2 presents the results of the question: “Is there formal instructions (rules) in your company in 2011 that referred to: a) Reducing the amount of paper used for printing or copy (e.g. two-sided printing); b) Reducing consumption of electricity needed for your ICT equipment; c) The use of telephone, web or video conferencing instead of travelling?”

Figure 2: Few ways of reduction by using ICT in Serbia in 2011¹⁵



Source: *The Use of ICT in the Republic of Serbia, 2011*, pp. 16.

Presented results point out that companies in Serbia widely use ICT, but the last figure partially indicates that it is not used in the best possible way. According to that, we found that it is necessary to conduct additional case study research. We chose seven companies and asked them questions about the use and investments in ICT in their company. The case study included one large-sized company in the field of telecommunications, five medium-sized companies in the field of education, manufacture, accommodation and food service, financial and insurance activities and one small-sized company in the field of trade – retail. We decided to predominantly cover medium-sized companies because the large-sized companies have small share in the total number of companies in Serbia¹⁶ and the micro-sized and small-sized companies have sufficient potential for significant ICT investments.

¹⁵ This question has multiply answers.

¹⁶ For company classification we used the number of employees, and according to latest data in Serbia 86% are micro-sized companies (0-9 employees), 10% are small-sized companies (10-49),

The main questions were:

- a. What assets do you classify as ICT?
- b. Who makes decisions about ICT investment and is there any specific procedure for that?
- c. In which segment of your company is the impetus for ICT investment (bottom-up, middle-up, top-down)?
- d. Do you have objective criteria when you make decisions about ICT investment?
- e. How do you track your ICT investment and do you conduct analysis about impact of ICT investment in your companies' performances?

Company 1 - Telecommunication

Company 1 is large enterprise in the area of broadcasting. The interviewee was a person who is a top manager. ICT sector is very extensive, with many employees. The company has all kind of ICT equipment (personal computers, servers, specialized equipment for broadcasting etc.). The ICT assets consist of hardware, software, employees in ICT sector and ERP implemented in all business processes. Network infrastructure and inventory are not included.

The company spends about 2% of the budget on ICT, but it does not have investment strategy, but only rough framework. Investments in ICT are based on ad hoc decisions directed by the need of production process. Generally the decision process follows few steps. First initiative comes from the technological process after the middle management made an analysis and then they give the initiative to the top management, which ultimately makes the decision. At the most cases the decision is defined in the technical sector of the company and the top management have a task to provide financing. There are no objective criteria or any methodology for assessment of investment or mechanism for evaluation the impact of specific investment on business performances. The only guideline in the decision-making process is the assessment that draws on personal experience of the decision-makers. In some cases they follow the competition.

The biggest investment in software made by this company is investment in ERP¹⁷, which connects all processes and enables the control. They believe that the business without this software is impossible in the company of this size.

2.5% are medium-sized companies (50-249) and 0,5% are large-sized companies (over 250 employees), Statistical Office of the Republic of Serbia, (2010), Companies in Republic of Serbia by size, p.p. 6.

¹⁷ Made by one of the largest producers of this type of software in the world.

Company 2 - Education

The second company is a high school which is medium-sized enterprise in the field of education. The interviewee was a person who is the top manager.

Hardware, software and network infrastructure make ICT asset in this company. They have only one full time employee in this sector and engage additional personnel as outsource solution. Until 2010 the school has invested approximately 5% of the budget in ICT, but after the economic crisis they keep all ICT investments at low level. These investments were reduced only to maintain the system. The school does not have strategy for ICT development. Latest strategic investment was the purchase of the software for electronic testing of students. The analysis of the system, however, indicates that it will be necessary to invest in software that would connect business processes, i.e. ERP systems, in the near future.

In the future, if the school manages to improve financial situation, the management have plans to acquire software that would allow distance learning. Apart from that, management also have a plan to purchase the system for recording attendance at classes by using the electronic card system. All decisions regarding these investments are taken by the head manager, but the initial impulse, at the most cases, is from the middle level of organization. Using ROI coefficient is intended as a control mechanism when making strategic decisions related to investments in ICT. As guidelines for investments school often uses activities of competitors. It is very interesting that the management consider strategic investments only the investments that exceed a certain amount, but not those that have an effect on the strategic position of the school. Based on that, it is clear that the school management has no real insight into the impact of investments in ICT in their performances. The only estimates is based on a "good feeling" of the management.

Company 3 – Manufacture

The company that has been selected in the field of manufacture is the medium-sized company engaged in the production of builders' ware of plastic (plastic doors, windows and their frames and door thresholds)¹⁸. The interviewee was a person who is the top manager. The factory has long experience and is located in the central part of Serbia. The production process involves manufacturing of tailor-made products and it is semi-manual. Factory uses ICT primarily in the office, and in some phases of production process, mainly for control. They outsource IT specialists for all purposes.

¹⁸ According to NACE Rev. 2: 22 Manufacture of rubber and plastic products

Management do not consider investment in ICT as strategic and there is no clear idea of the structure of assets that could be classified as ICT. There are no plans for ERP implementation in the future, or some partial solutions like CRM or HRIS. Annual investment in ICT is around 1% of total budget or less. Decisions about these investments are made by top management in the company. There are no objective criteria in the decision process, just experts' estimation and there is no strategic plan of investment in ICT.

The general impression is that the management of this company is more oriented on the traditional, old way of doing business. They do not perceive a possibility to improve business through the implementation of IT solutions, neither in the manufacturing process nor in the area of non-material benefits (better information of the management or employees, reduced time for routine operations, etc.). Previous investments were reduced to the minimum level required by the business process, and it was limited to the accounting programs, multifunctional office packages and use of Internet for communication (e-mails, etc.).

Company 4 – Accommodation and food service

The fourth selected company is a hotel. It is a part of the group of hotels, and the top management hold the whole group. This hotel is a separate legal entity, but strategic decisions are always made by the top management of the group. The interviewee was the top manager of the hotel, but not of the group.

Hardware, software, network infrastructure and costs for IT personnel make ICT asset. Hotel does not have full time employee, but outsource IT firm based on annual contract. In the initial year they have large investments in ICT, especially in network infrastructure, because each room at the hotel has network connection and hot-spot at the lobby. After that the hotel did not have any major investment in this area. They have a plan to improve their business by implementing hotel management information system, but not in the near future. Decision on this, as well as any other ICT investment will be made by top management. Main source of ideas for improving the business through the use of modern information and communication technology is derived from seminars attended by members of management.

The initial step in the decision making process is the assessment of the top management, which must be verified with ROI coefficient. Unfortunately, after that they do not monitor the flow of investment and they have no insight into their impact on business. Management does not distinguish clearly strategic and tactical IS, but by examining the current situation, we concluded that all parts of the IS are

operational IS. Implementation of hotel management system will be the first strategic IS in this hotel.

Company 5 – Financial and insurance activities

The next example is insurance company. The company sells life and non-life insurance and it is medium-sized enterprise. The interviewee was the middle manager.

The company has contemporary information system, which was developed within the company and improved constantly. Information system connects all the processes and it is solid basis for all business operations. Also, they have CRM and their customers can use part of the services online and HRIS. The support staff consist five employees in IT department.

Company 5 considers hardware, ERP, CRM and HRIS as ICT asset. Employees and network infrastructure are excluded. Company spends around 4% of budget for ICT, annually. All necessary decisions are made by top management, and in the past impetus to invest was middle-up or just at the top level of management. Management of the company does not rely only on assessment of IT experts in the firm, but they also monitor new trends in the field of ICT and management information systems in order to improve business activities. The company has long-term ICT strategy and it is integrated into overall corporate planning.

The main reason of systematic approach in this matter is high competitiveness in the industry and heightened awareness of the need for strategic investment in ICT. Company uses several measures in the decision process regarding ICT and the most important is ROI for individual projects and five years growth rate for the company, but the most important is the awareness of the need for continuous system improvement. The management does not make an evaluation of intangible benefits but they have plans to introduce this evaluation in the future.

Company 6 – Financial and insurance activities

The next company that has been selected is commercial bank. It is medium-sized company with ICT implemented in every activity and business process. The interviewee was the middle manager and according to the interviewee the bank considers that all investments related to information systems are the ICT asset - hardware, software (excluding office software packages), network infrastructure and monthly charges for service, employees in IT department and ERP system.

Decisions about ICT investments are made by top management based on the opinion of experts in IT department. Employees in this department also have to monitor global developments and progress of ICT in order to implement the recent software or hardware products or processes and for each year the bank prepares IT strategy. The reason for this is a very strong competition in the banking sector.

Bank management does not consider that it is necessary to calculate return of investment in ICT or any other measure, if such investment is result of tracking competitors. They find that the harm from bad investment is usually smaller than the harm that would accrue in case that absence of investment results in losing the market position. For instance, they provided example of e-banking or m-banking services. Also, management does not have mechanism for following the investment, just rough estimation. They think that the bank needs ICT investment as imperative and they do not want to spend additional time or money for investment analysis.

Company 7 – Trade - retail

The last company that has been analysed in this study case is a small-sized enterprise in the field of computer trade and repair services. The company operates for fifteen years and has not changed its organizational structure that includes around twenty employees. It does not have ambition to expand the business operations. The interviewee was the owner of the company and the top management.

Hardware, software and network infrastructure are considered as ICT investment, excluding employees, because the firm is in IT business and 85% of employees are computer experts. All the decisions in the firm are made by the owner, but in cooperation with other employees. Anyone in the firm can make suggestions about ICT investment, and the owner will decide at the end.

There are no objective criteria for investment analysis, just the assessment made by the employees and the owner. They think that the company spends less than needed for ICT, despite that they have expert knowledge which enables them to have better insight into needs and opportunities.

GENERAL FINDINGS AND CONCLUSIONS

This research aims to give the first insight into the ICT assets and investments treatment by the Serbian companies in wider framework of business performance evaluation, as this kind of research, according to our knowledge, has never been conducted in Serbia. We are aware that results of our analysis could be biased due

to the very limited sample and thus we could not make strong generalization of the conclusions for all Serbian companies. Thus, this analysis should be considered as the first step of the further research that will be based on broad survey research.

In order to present the general findings we present the following table with systematized key answers of companies' representatives.

Table 2: Systematized key aspects of ICT investments

No company	ICT asset	Decision about investments	ICT investment strategy	Objective criteria and measures for ICT investments
Company 1 – telecommunication	Hardware, software, employment	From middle to top management	NO	NO
Company 2 - education	Hardware, software, network infrastructure	Top management	NO	ROI
Company 3 – manufacture	No classification	Top management	NO	ROI
Company 4 – accomm. and food service	Hardware, software, network infrastructure, IT personnel	Top management	NO	ROI
Company 5 – financial and insurance	Hardware, ERP, CRM, HRIS	From middle to top management	YES	ROI, five years growth rate
Company 6 – financial and insurance	Hardware, software (excluding office package), network infrastructure, ERP	From middle to top management	NO	NO
Company 7 – trade - retail	Hardware, software, network infrastructure	Top management	NO	NO

It is common for all companies to include hardware and software as ICT assets, but only part of them includes network infrastructure and employees. If a company has ERP, CRM or HRIS, it considers it as ICT asset. In all covered companies the decisions about ICT investment are made either directly by top management or upon initiative made by the middle management. Only one company out of seven has ICT investment strategy and about half of it use ROI coefficient for assessment of ICT investments.

The results of our research suggest that companies in Serbia included in this mini case study consider ICT assets and ICT investment as duty imposed by the business environment. The management of selected companies do not see obligation to treat the ICT investments as “regular investments” like building new facilities, purchase new machinery or expanding an array of services. They believe that the need for ICT investments is imposed by rapid development in this field and that ICT has positive impact on the business performances, so there is no reason for deep analysis.

Finally, although the sample of selected companies is significantly diversified across sectors and size, most of them exhibit the similar pattern regarding the ICT investments. This leads us to believe that there is a strong possibility that Serbian companies overestimate or underestimate the value of investments in ICT because they do not use appropriate mechanism to control investments, despite very limited size of the sample. It is also likely that investments do not lead to required results, because there is no control mechanism that measures the impact of certain investment on results or companies’ performances.

References

- [1] Apulu, I, Latham, A, (2011), An Evaluation of the Impact of Information and Communication Technologies: Two Case Study Examples, *International Business Research*, 4(3), pp. 3-9. Available at:
- [2] <http://www.ccsenet.org/journal/index.php/ibr/article/view/11078>
- [3] Aral, S, Weill, P. (2007), IT Assets, Organizational Capabilities, and Firm Performance: How Resource Allocations and Organizational Differences Explain Performance Variation, *Organization Science*, 18(5), pp. 763-780. Available at: <http://orgsci.journal.informs.org/cgi/doi/10.1287/orsc.1070.0306>
- [4] Becchetti, L, Bedoy, D.A.L, Paganetto, L. (2003), ICT investment, productivity and efficiency: evidence at firm level using a stochastic frontier approach, *CEIS Tor Verata – Research Paper Series*, Vol. 10, No. 29
- [5] Carr, N.G. (2003), IT doesn’t matter, *Harvard Business Review*, 81(5), pp. 41-49, Available at: <http://www.ncbi.nlm.nih.gov/pubmed/13129827>.
- [6] Farbey, B, Land, F.W, Targett, D. (1993), *How to assess your IT investment: A study of methods and practice*, Boston, Oxford

-
- [7] Giles, J. (2009), *What is ICT?*, Michalsons, Available at:
- [8] www.michalsons.co.za/what-is-ict
- [9] ITU, (2011), *Measuring the Information Society*, Report of International Telecommunication Union, Geneva, Switzerland
- [10] Keramati, A. (2007) Assessing the Effects of Information Technology on Firm Performance Using Canonical Correlation Analysis: A Survey in Iran Car Part Suppliers Sector, pp.11-18.
- [11] Lim, J-H, Dehning, B, Richardson, V.J, Smith, E.S, (2011), A Meta-Analysis of the Effects of IT Investment on Firm Financial Performance, *Journal of Information Systems*, 25(2), pp. 145-169.
- [12] Naidoo, R, Chikasha, S. (2010), Are ICT investments realising planned benefits? An empirical study of African organizations, International Conference on ICT for Africa, International Center for Information Technology and Development
- [13] Schubert, P, Leimstoll, U. (2006) The Importance of ICT : An Empirical Study in Swiss SMEs. In *eValues*. pp. 1-18.
- [14] Statistical Office of the Republic of Serbia, (2010), Companies in Republic of Serbia by size, available at http://webrzs.stat.gov.rs/WebSite/repository/documents/00/00/41/40/RD_77_Preduzeca.pdf
- [15] Turban, et al., (2002) *Information technology for management*, John Willey and Sons Inc.
- [16] Vu, K. (2005), Measuring the Impact of ICT Investments on Economic Growth, *Journal of Economic Growth*, October 2005.
- [17] Weill, P, Olson, M.H. (1989), Managing Investment in Information Technology: Mini Case Exaples and Implications, *MIS Quarterly*, March 1989, pp. 3-17
- [18] Zehir, C. et al., (2010) The Impact of Information Technology Investment on Firm Performance in National and Multinational Companies, *Journal of Global Strategic Management*, pp.143-154.
- [19] Indjikian, R, Siegel, D. (2005), The Impact of Investment in IT on Economic Performance: Implications for Developing Countries. *World Development*, 33(5), pp. 681-700. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0305750X05000094>
- [20] Remenyi, D, Bannister, F, Money, A. (2007), *The Effective Measurement and Management of ICT Costs and Benefits*, third edition, CIMA Publishing/Elsevier