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IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY FOR FUNCTIONALITY OF PERFORMANCE MEASUREMENT SYSTEM

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Abstract

In the ever-changing world information and communication technology becomes increasingly important. The paper discloses application of information and communication technologies for performance measurement and its impact for systems functionality. Research is based on analytical methodology and systemic analysis of comparable theoretical and empirical studies. A quantitative analysis of the data was also used in this paper.

The main result of this study is fixed relationship between performance measurement systems functionality and Internet related technologies application level in Lithuanian companies. Following the quantitative analysis, when assessing the performance measurement systems and application of Internet related technologies in business, it was found that in Lithuania, however, during this period most companies are included in the intermediate group, which seek to use the growing number of Internet related technologies, thus achieving higher performance evaluation of the system.

Keywords: information and communication technology, performance measurement, performance measurement systems.

JEL Classification: M40, M10.

Introduction

In twentieth-century the world went through a very wide range of economic and social changes in the environment, which started with the intensive process of internationalization of markets and globalization. The internet creates new and free from any form society which is changing and affecting today's world, both in social and economic terms. In economic terms, the greatest influence made is by information technology-intensive business, which rapidly makes its way into almost all areas of activity and displaces the traditional operational activities. However, information technology-intensive business and process has its own characteristics compared with traditional businesses. This, in turn, leads to the evaluation and management of the problem. This problem is appropriate, relevant and necessary to examine, because the changing economic situation in Lithuania is determined by business development and evolution of the turnover of the various economic, social and cultural factors. The sensible and efficient information and communication technology and performance measurement systems use in business enable to improve the operational efficiency. It is recognized that the business development of the country's economy is very important. Business that uses more and more information technology allows reach wider markets and a wider customer base.

In this context problem of the performance measurement system could be analyzed form different points of view. Information and communication technology application reduce data processing costs, level of mistakes and leads to operational excellence. On the other hand information and communication technology is the precondition for data overload that leads to information management problems.

The research problem of this paper is formulated as a question:

Does the performance measurement systems functionality depend on information and communication technologies application level?

The aim of the paper is to identify the relationship between information and communication technology, and the performance measurement systems functionality in Lithuanian organizations.

Research is based on analytical methodology and systemic analysis of comparable theoretical and empirical studies. Quantitative analysis of the research (survey) results is also used.

The paper includes three main parts. The theoretical background and main presumptions are presented in the first part of the paper. Development hypothesis and research method are grounded in the second one. In order to identify the relationship between information and communication technology, and the performance measurement systems functionality in Lithuanian organizations, quantitative research was performed. The third part is for comprehensive analysis and interpretations of the research results in Lithuanian organizations.

The main result of this study is fixed relationship between performance measurement systems functionality and Internet related technologies use level in Lithuanian companies.

Theoretical background

Peculiarities of information and communication technology based business. Information and communication technology is conceptualized in academic literature differently. Most studies based on this direction were conducted by Andam (2003), Gatautis (2002), Clegg, Icasati-Johanson, Bennett, (2002), Pautasso, Alonso (2004), Lewis (2001), Biro, Messnarz (2000) and others.

As Andam (2003) states, the Internet economy pertains to all economic activities using electronic networks as a medium for commerce or those activities involved in both building the networks linked to the Internet and the purchase of application services such as the provision of enabling hardware and software and network equipment for Web-based/online retail and shopping malls (or "e-malls"). In the European e-Business Report (2008) states that information and communication technology includes networks, computers, other data processing and transmitting equipment, and software. The application of ICT in business processes leads to e-business.

Porter (1982) was of the opinion that the main tool for understanding the impact of information and communication technology to companies and competitive advantages in the formation of a value-added chain, is sequence of steps in which the goods are created and made available to clients. A special feature of information technology is the ability to associate one action with others, and all value-added chain in the operational data, both internally and to outside suppliers, channels and customers to the participants (Gatautis, 2002).

Found that the company creates value for customers by offering new products, services and ideas to reduce costs to manage the risk. Thus, it can be seen that the value creation process involving three dimensions: organization, customers and goods (and services). Information and communication technologies bring added value to consumers. The reduction in costs to companies, ping goods, in addition, the buyer also simplifies product search, ordering and receiving processes (Clegg, Icasati-Johanson, Bennett, 2002; Pautasso & Alonso, 2004). Business, applying more and more information and communications technology, covers a wider area, more traditional business products and services offered to consumers, focusing on the needs of customers. Information and communication technologies facilitate the execution of transactions and other transactions, which have a direct impact on company costs and business efficiency. Lewis (2001) argues that a firm of information technology allows organization to better promote their services / products in the international market, to shorten the production cycle and reduce costs, raise awareness, develop new information products, opening new sales channels and so on. Biro and Messnarz (2000) argues that the use of information and communication technology simplifies the communication between the company's partners - the decline of communication costs, communication becomes more speedy, there is the ability to communicate more and better information in a very short period of time. In addition, business partners, information and communication technology shortens the sales chain and reduce transaction costs. Andam (2003) states that in the emerging global economy, Internet related business have increasingly become a necessary component of business strategy and a strong catalyst for economic development. The integration of information and communications technology (ICT) in business has revolutionized relationships within organizations and those between and among organizations and individuals. Specifically, the use of ICT in business has enhanced productivity, encouraged greater customer participation, and enabled mass customization, besides reducing costs.

Information communication technology practices in the use of these opportunities include: e-mail, web site, e-commerce, e-business, network organization and the digital ecosystem (Gatautis, 2002). The CREC (Center for Research & Electronic Commerce, 2000) at the University of Texas has developed a conceptual framework for how the Internet economy works. It was found 4 layers of the information and communication use. Layer 1 is characterized as Internet Infrastructure – companies that provide the enabling hardware, software, and networking equipment for Internet and for the World Wide Web. Layer 2 is characterized as Internet Applications Infrastructure – companies that make software products that facilitate Web transactions; companies that provide Web development design and consulting services. Layer 3 is characterized as Internet Intermediaries – companies that link e-commerce buyers and sellers; companies that provide Web content; companies that provide marketplaces in which e-commerce transactions can occur. Layer 4 is characterized as Internet Commerce – companies that sell products or service directly to consumers or businesses.

It is noted that the e-mail has least innovation level, the lowest functional integration, and provides less benefits and business value to the consumer. Meanwhile, the digital ecosystem is the major innovation in the level of functional integration and the benefits to business and customer value is the highest.

Conceptualization of functionality of performance measurement system. Company performance evaluation is the concept and importance of which is used as a key management tool, which integrates the planning, development, employee motivation and control processes (Klovienė, 2012). It is noted that there is no single definition of performance measurement systems. Most authors define performance measurement systems in different ways. Anderson and McAdam (2004) stated that the performance measurement system is the performance indicators and measures. Olsen *et.al.* (2007) argues that performance measurement system includes a variable population used to assess the efficiency and effectiveness, as well as technologies (software and hardware) and data collection procedures. Gimžauskienė (2007) argues that performance measurement system is useful for continually renewing its management subsystem and includes key components related to the assessment process (measurement, control and planning), which provides 1) information about the three levels of the company's activities (strategy development, implementation and operational-tactical) results, collection and evaluation processes, 2) evaluation of the basic functions (data integration, the adequacy of the information available, the company adaptivity) and systems keep you with the necessary attributes (inputs, processes, outputs) - return connection and is associated with the external environment.

It can be argued that many of the traditional organization's evaluation systems are unable to assess the true value of the company and its determinants. Traditional performance measurement system does not solve the dynamic business conditions encountered in the context of managerial problems, and are being increasingly used in more advanced and sophisticated performance measurement systems. One can identify key functions used in performance measurement systems: communication, cost accounting, supply chain integration, management, motivation. In the most general sense is defined as a continuous communication, endless and the integral process in which the exchange is designed / structured information between two or more people to a common understanding. Organization's communication can be both external and internal. External communication is a work-related communication, ongoing communication with people outside the organization. These include sponsors, service companies, customers, press and so on. Internal communication takes place between the staff who implement the plans. It includes verbal commands and shell operators, employee communication work. The main management (management and cost) accounting purpose - to provide the company and its managers with the information upon which they are able to plan and organize activities of the company and its leadership as well as use available resources with bigger efficiency, to implement the challenges for entire enterprise and its subsidiaries (Kalčinskas, 2010). Each company, in order to gain effectiveness, must plan, manage, and control raw material supplies and finished goods storage and transportation of production to point of sale. The very concept of "governance" can be defined as a set of actions to enable the timely adoption of high-quality content-based decisions and the use of available financial, material, technological and human resources have an impact on the intended result. Management is used to assess the performance measurement systems: business management system, customer relationship management, supply chain management and so on. Motivation is a process which encourages and directs behavior. This may be a desire to test its ability to overcome challenges, to realize the ability to control the situations, to experience their own performance. Motivation is used to assess the performance measurement system (theories) as early and contemporary theories of motivation.

Research method

The effects of ICT on corporate performance are not clear because not all studies have demonstrated clear payoffs from ICT investments (Chan, 2004; Kohli & Devaraj, 2003). In addition, the results vary depending on how performance and ICT payoffs are measured and analyzed. According to analyzed theoretical background, a matrix can be set, distinguishing between organizations according to their information and communication technologies and the application of performance measurement systems (Figure 1).

It can be argued that organizations that use e-mail and website can be attributed to traditional businesses. These companies have the traditional means of communication and are avoiding major technological innovation. The performance measurement systems functionality in terms of the level is relatively low because it includes only two performance measurement system functions (communications, and supply chain integration). Among organizations that use e-commerce and e-business, are intermediate-size enterprises, which evaluate and implement technological innovations. The functionality level of performance measurement system is average because it includes only four performance measurement system functions (communication, cost accounting, supply chain integration, management). Meanwhile, widely

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installing Internet related technological solutions that include virtual enterprises, because their activity is based on technology and application integrity. The performance measurement system functionality in terms of the level is high because it includes all performance measurement system functions.

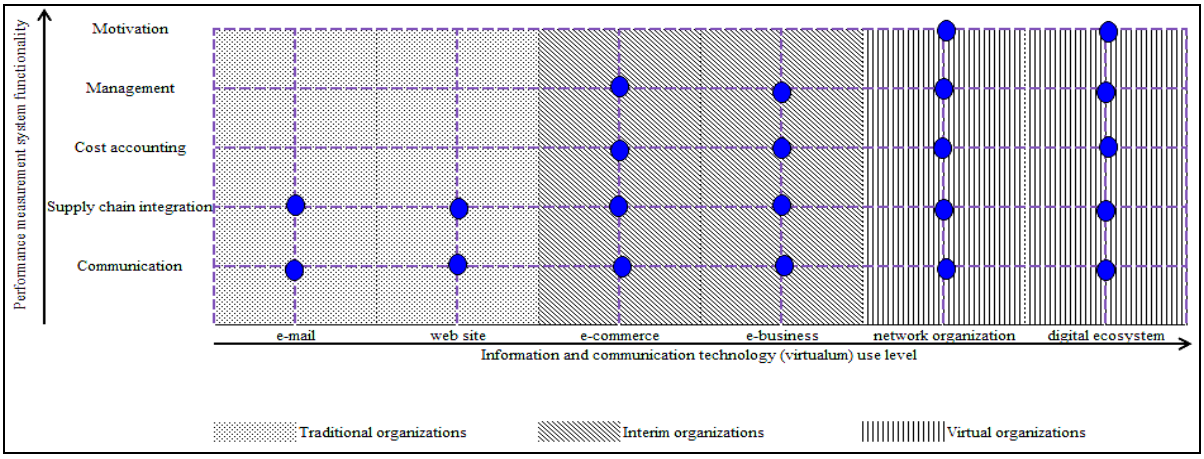

Figure 1. The matrix of the impact of information and communication technology for functionality of performance measurement system

In order to identify the relationship between information and communication technology, and the performance measurement system functionality in Lithuanian organizations, a quantitative research (survey) was performed. The survey was performed in Lithuanian organizations, which were chosen by handy selection method. The analysis of level of information and communication technology adaptation in Lithuanian organizations was performed in this research. On the other hand, it was analyzed what levels of performance measurement systems are applied in the organizations. Also it was used to figure out how information and communication technology with the performance measurement systems used by the company changed its activities.

Based on the overall analysis of the identified problem and taking into account the objective of the study, it is possible to hypothesize what will be approved or denied after the research. The main research hypothesis is:

The higher level of application of information and communication technology leads to more functional performance measurement system. This hypothesis could be operationalised to prepositions as follows:

- It is likely that information and communication technology adaptation rates are high in Lithuanian organizations;
- It is likely that the performance measurement system functionality is extensive in Lithuanians organizations;
- It is likely that there is a relationship between information and communication technology, and the performance measurement system functionality in Lithuanian organizations.

Descriptive study aims to determine which parameters or events affect the dependence between the level of information and communication technology adaptation and performance measurement system functionality. For descriptive questionnaire study a data collection method was selected due to its ability to get a large amount of information required for ongoing investigation. The available information is not difficult to analyze and interpret.

A descriptive survey method to collect the data was used for the survey as well. A questionnaire of four parts, which depend on the study objectives, was created. It includes issues related to: a) Structure of the organizations; b) The adaptation rate of information and communication technology in organizations; c) The level of performance measurement systems functionality in organizations; d) Opportunities of the information and communication the technology uses; e) Opportunities of the performance measurement the systems use.

For this study a primary data analysis was chosen, which calculated the frequency distribution and cross-table was drawn up. Frequency distribution is analyzed by statistical criteria of central tendency (mean, mode, median). In this case Mean and Mode ways will be used, because the variables are of nominal scale or

have a category. The analysis seeks to determine the distribution of the responses and make appropriate conclusions. Meanwhile, cross-table helps to clarify a relationship between available variables. Of course, this method of analysis does not show reasons, but certain trends can show the dependence.

Results and interpretations

A postal questioner was used to collect data for this survey. The research population is confined to Lithuanian organizations. The survey covers a total sample of over 100 organizations.

Structure of the organizations. Resuming research results, it could be stated that most of organizations work in the service (46%) and manufacturing (39%) sectors. There are 15% of organizations that belong to trade sector. Assessment of company size by number of employees found that the majority of the participating companies were of medium (37%) and large (28%) size. According to the research results, it could be stated that 76% of the organizations have a clear structure and their service is limited to traditional offices, 15% of the organizations have a clear structure, and the service takes place both in traditional offices and virtual offices, and the structure of 9% of the organizations is unclear, with their services taking place in virtual offices only. The analysis of the research results found that 72% of the organizations have the resources, which structure of the material consists of 60-79%. Meanwhile, there is no organization that would be completely full of material or immaterial resources. The study found that only 88% of organizations do work on time, 6% of organizations working in the agreed time, and another 6% - around the clock. It may be noted that the service sector companies (other than manufacturing and trade sector businesses) apply the wider range of customer service techniques: not only in traditional offices, but also virtual and working hours are not strictly determined. Together with the data from the study it can be seen that the service sector companies use a wider information and communication technology functions (e-commerce, network organization). Meanwhile, the manufacturing and marketing companies in the sector for information and communication technologies use a simpler and narrower technology (e-mail, e-commerce). According to the survey, the production and marketing sector companies use basic performance evaluation of communication systems, functions and cost accounting. Meanwhile, the service-sector companies use not only the basic functions of performance evaluation, but also seek to use functions such as management and motivation.

The adaptation rate of information and communication technology in organizations. Companies from all of the sectors use ICT. According to the research results, it could be stated that 95% of the organizations used information and communication technologies and 5% of the organizations do not use the Internet related technologies in business.

The objectives and the focus of ICT use differ widely between sectors. Variations depend in particular on the types of products and services which companies offer, the scale of the markets in which they operate and on their marketing strategy, including the choice of distribution channels. In manufacturing sectors, the e-business strategies of companies focus on supporting procurement, optimizing supply chain management, integrating with retail and distribution, and increasingly on providing the best possible service to customers. In the service sector, internal operations are largely based on highly complex ICT systems. In trade sector, the Internet has transformed the whole sector and become a critical element in the business strategy of trade sector. It is noted that 45% of the organizations use e-business and 34% - e-commerce in their work. It is observed that 3% of the organizations use only e-mail at work. Meanwhile, 2% of the organizations can be classified as networked organizations, as their work is very extensive use of information and communication technology. Meanwhile, the study found that in Lithuania there is not single organization that could be attributed to the digital ecosystem.

According to research results, it could be stated that the information and communication technology adaptation rate is higher than medium in Lithuanian organizations, because a very few decisions, that are influenced by a better business opportunities, related to Internet technology, are used. The hypothesis - it is likely that information and communication technology adaptation rates are high in Lithuanian organizations - denied.

The level of performance measurement systems functionality in organizations. By analyzing the research results it was found that almost all organizations used the performance measurement systems for communication (100) and cost accounting (97) development. 74 organizations use performance measurement systems for supply chain integration, and 35 - for management. Only two organizations use the performance measurement systems to increase motivation.

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According to research results, it could be stated that the performance measurement system functionality is not very extensive in Lithuanian organizations. The hypothesis - It is likely that the performance measurement system functionality is extensive in Lithuanian organizations – denied.

The relationship between information and communication technology and the performance of measurement systems functionality. The study found the following advantages of using information and communication technology: easier communication (97), visibility (85) and greater business opportunities (35). Resuming research results, it could be stated that most organizations identify the following advantages of using performance measurement system such as: easier communication (89), easier cost accounting (76), speedy work (64) and higher motivation (31). According to research results, it could be stated that the activity of the organizations, whose business is based on extensive use of information and communications technology and use of performance measurement systems, is more efficient. By using more and more of Internet related technologies, the organizations acquire more effective use of available resources and also achieve better economic results.

Using the formed matrix (Figure 1) and the research results, it was used to determine whether there is the correlation between the performance measurement systems functionality and use of information and communication technology level in Lithuanian organizations (Figure 2).

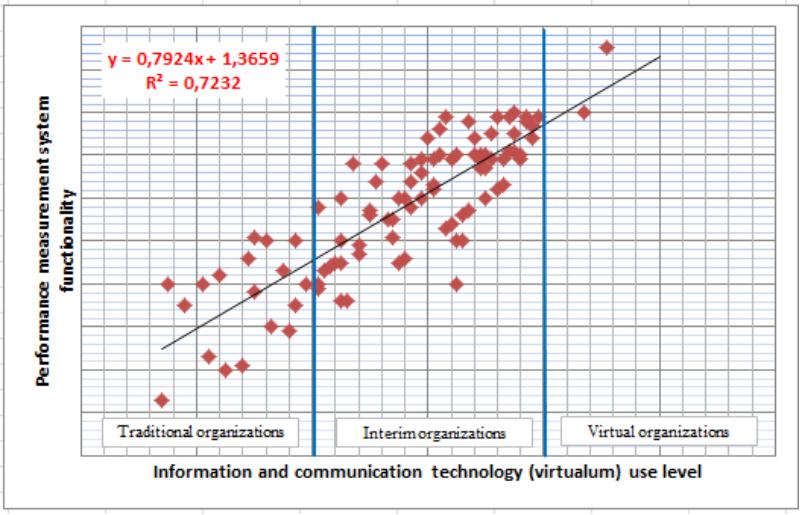

Figure 2. The performance measurement systems functionality dependence on information and communication technologies use in Lithuanian organizations

Analyzing the research results a significant correlations were found between the performance measurement systems functionality and the information and communication use level in Lithuanian organizations. The correlation coefficient is equal to 0,7232 (72,32%). When the correlation coefficient value is greater than 0.7, it is stated that there is a strong connection among the analyzed variables. Thus, it can be concluded that there is a linear relationship between the analyzed variables. The hypothesis -It is likely that there is the relationship between information and communication technology, and the performance measurement systems functionality in Lithuanian organizations – confirmed.

In Lithuania, however, most of organizations in this period are attributed to the intermediate group, which aims to a growing number of information and communication technologies, thus achieving higher performance evaluation of the systems. As more and more organizations use Internet related technologies, it is natural to decreases organizations in the traditional group of organizations. In Lithuania there are very few organizations of the group of virtual organizations. This situation occurred because few companies have the potential to apply the latest Internet related technology solutions that enhance the effectiveness of their organization.

So it can be concluded that intermediate type of organizations are dominant in Lithuania. They use an average of the available information and communication technology resources, thus achieving only an average performance evaluation system level of functionality. However situation is slowly changing as more and more organizations use information and communication technology resources more effectively, thus achieving better business performance measurement systems results.

Conclusions

1. After the scientific literature analysis, it was found that in organizations information and communication technologies are use in different levels, which affect the benefits and value created both to the company and consumers. It also was found that performance measurement systems can be classified according to their function, which leads to corporate performance measurement systems in the functional integration.
2. According to theoretical prepositions it could be stated that the parallel use of information and communication technologies and performance measurement systems could form more productive and efficient activity.
3. On scientific literature analysis was made the matrix of impact of information and communication technology for functionality of the performance evaluation system. As organizations have different level of information and communication technology use as well as different level of use of the performance measurement systems. This allows organizations to distribute the organizations into three groups: traditional organizations, intermediate organizations and virtual organizations. Empirical research has shown that in Lithuania in this period most of organizations are attributed to the intermediate group.
4. According to the research results, it could be stated that there is a relationship between information and communication technology, and the performance measurement systems functionality in Lithuanian organizations. The study found that among these dimensions is a direct interface.

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