

PERFORMANCE MEASUREMENT SYSTEM TO EVALUATE THE EFFICIENCY OF E-BUSINESS

Narimantas Kazimieras Paliulis¹, Laura Uturytė – Vrubliauskienė²

*Vilnius Gediminas Technical University, Faculty of Business Management,
Saulėtekio ave. 11, LT-10223 Vilnius, Lithuania
Email: ¹paliulis@vgtu.lt; ²vlaura@vgtu.lt*

Abstract. Despite the significant growth of information technologies investments, evidence on their influence on organization performance remains inconclusive. Nowadays is very important to realize whether expected economic benefits of information technologies investments are being recognized in organizations. Currently organizations can no longer afford basically to lose their money in e-business initiatives without developing and using suitable metrics to measure the effectiveness of such investments and to find out the relationship between e-business and organizations performance. The study describes research aimed at determining the exact nature of such e-business performance measurement systems and the benefits that accrue from their use. The basic objective of this study is to present a framework for developing performance measurement metrics in the e-business environment.

Keywords: electronic business, effectiveness, performance measurement, information technology.

Jel classification: M15, M21

1. Introduction

Information technology (IT) created a great influence on the business world. Over the last decade, the World Wide Web and related communication technologies have influenced all parts of business and have fostered the development of electronic business (e-business). Almost all kinds of businesses have adopted a number of online technologies in their business, it doesn't matter internally or externally (Barnes, Hinton 2007). To improve their particular overall performance, organizations are investing an ever-increasing amount of money in information technology (IT). Over the last three decades, organizations increased investment strategies devoted to IT from nearly 5 % of nonresidential fixed investment in 1977 to approximately 23 % in 2010 (Bureau of Economic Analysis 2011). Regardless of the rapid development of IT investments, research which links IT investments to business performance remains undetermined.

The particular important amounts invested in IT combined with lack of evidence on their influence on organization performance put force on supervisors, scientists, and policy makers as well to explain how IT investments may play a role in business performance. Several numerous studies have shown attempted to study the financial impact of integrating IT into business organizations (Aral, Brynjolfsson, Alstyne 2006; Bharadwaj

2000; Dehning, Stratopoulos 2002; Brynjolfsson, Hitt 2003; Kim, Xiang, Lee 2009; Kudyba, Diwan 2002; Oh, Kim, Richardson 2006; Santhanam, Hartono 2003; Aral, Weill 2007; Paliulis, Uturytė-Vrubliauskienė 2010). The extant reading presents confounding evidence of the relationship among IT investments and organization economic performance, based mainly on financial measures of overall performance. IT investments are created depending on the assumption that they have the opportunity to further improve both the efficiency of business process and the competitive advantage of the business. These investments can be internally or externally focused. Internally concentrated IT investments make an effort to lower the costs of performing business, increase the high quality and quickness of operations, eliminate repeated business processes, and increase business flexibility. Externally aimed IT investments are designed to assist the organization to gain an environmentally friendly reasonably competitive benefit and improve its marketplace situation, specifically through the improvement of customer satisfaction (Chatterjee, Vernon, Robert 2001; Dos Santos, Peffer, Mauer 1993). In a very competitive market, businesses are forced to provide these intangible advantages because the “cost of staying in the game” (Brynjolfsson 1996), and perceive IT investments as being a strategic necessity (Clemons 1991).

The study describes research aimed at determining the exact nature of such e-business performance measurement system. The basic objective of this study is to present a framework for developing performance measurement system in the e-business environment.

2. Necessity of performance measurement system for e-business

2.1. ICT usage in business

In the second part of the XX century and particularly during the last few decades the rapid expansion of information and communication technologies (ICT) (Davidavičienė 2008; Gatautis 2008; Toločka 2005) and the saturation of its technologies into the daily organisational activities, at the same time the flattening and networking of organisational structure enabled many researchers who do research on new types of organizations, to understand that ICT has become one of the main reasons to move from business to e-business (Paliulis *et al.* 2003; Šarapovas *et al.* 2006)

As reported by the survey “Internet access along with use associated with ICT in enterprises in 2011” from the EU's statistics office Eurostat, companies of Lithuania are amongst EU leaders in a number of segments connected with web as well as ICT. Hence, within obtaining of information from open public authorities' online stores, Lithuania is normally bypassed simply by Slovakia and is on the SME level as Finland. More than 90% of all enterprises in Slovakia (94 %), Lithuania and Finland (both 92 %) and Sweden (91 %) reported that they used the internet to obtain information from public authorities' websites in 2010, while it was less than half of enterprises in Romania (47 %) and the Netherlands (48 %). However, 97 % of enterprises in the Netherlands let slip that they used the internet in 2010 in order to upload accomplished styles electronically to public authorities, followed by 93 % in Lithuania and 87% in Greece, Poland and Finland. In Italy and Romania (both 39 %) and Cyprus (40 %) it had been less common for businesses to use the internet for the purpose of submitting completed forms electronically. 98 % of Lithuanian companies have access to the internet, ones 87 % have fixed and mobile broadband connection. With this indicator Lithuania can be among EU-27 leaders. Lithuania provides the primary ICT industry in the Baltic States through an outstanding likely for

both local and even foreign expanding businesses. Lithuania has world's 2nd speediest upload Internet, Europe's No. 1 fiber broadband penetration (23 %), EU's greatest mobile penetration of 147 %, and is world's No. 1 in the amount of mobile telephone subscribers 3.4 million of Lithuanians use almost 5 million active SIM cards as well as global leader in mobile e-signature. It is expected that by 2015 products of IT, laser technologies, biotechnologies, nanotechnologies and materials science will constitute 25 % of Lithuania's GDP and 80 % of national export. In conclusion ICT usage in Lithuanian's organizations it is important to mention that at the beginning of 2011, 98.1 per cent of manufacturing and service enterprises with the staff of 10 and more employees used computers, 94.9 per cent - broadband Internet. In everyday work, computers were used at least once a week by 38.8 per cent, the Internet - by 36.5 per cent of employees of such enterprises (at the beginning of 2010, 32.8 and 29.7 per cent respectively). 67.7 per cent of manufacturing and service enterprises had a website or home page (in 2010, 65.2 per cent). 36.6 per cent of enterprises indicated that their websites presented catalogues and pricelists of their products or services, 20.8 per cent of enterprises offered an opportunity to order, reserve or purchase products via the Internet, 18.7 per cent - to choose a preferable shape or design of a product.

Also it is important to mention that in 2010, 39.3 % of enterprises used computers and electronic networks for trading purposes (to purchase or sell goods or services): 33.2 per cent of enterprises purchased (ordered) goods or services via the Internet or other computer networks, 24.7 per cent - received orders. Purchases via electronic networks accounted for 12.8 per cent of all purchases made by enterprises (in 2009, 21.5 per cent), sales - for 11.9 per cent of the total turnover of enterprises (in 2009, 13.7 per cent). In 2011, electronic data transmission between enterprises systems were used by 69.8 per cent of enterprises (in 2010, 63.2 per cent). Such systems were mainly used for sending e-invoices (53.9 per cent), sending/receiving data to/from public authorities (48.9 per cent), receiving e-invoices (44.9 per cent). Enterprise resource planning (ERP) systems were used by 12.6 per cent, customer relationship management (CRM) systems - 16.8 per cent of enterprises (in 2010, 11.5 and 15.3 respectively) (Fig. 1).

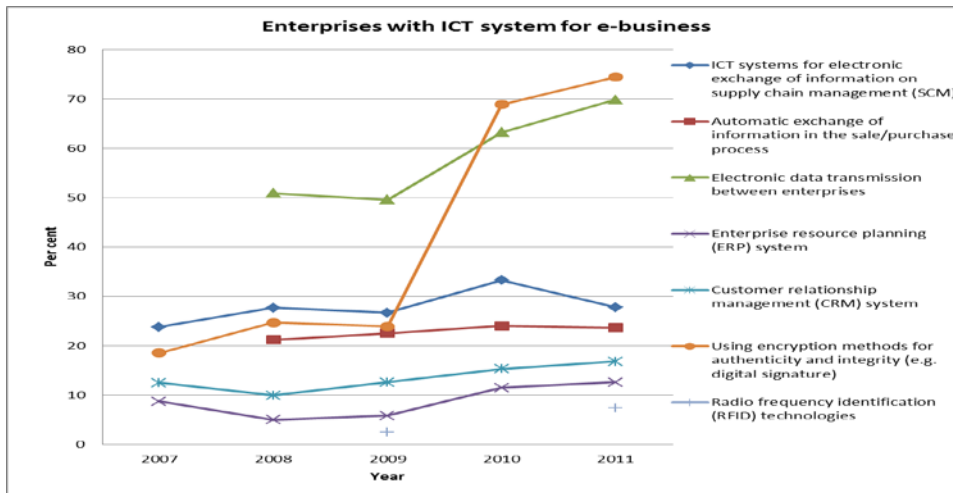


Fig.1. Enterprises with ICT system for e-business

For most of the enterprises, the important problem was the inaccessibility of ICT services, destruction or corruption of data due to software (hardware) failures.

Digital identification (authentication) tools were used by 72.4 per cent of enterprises (in 2010, 68.9 per cent). Many enterprises using ICT were striving to reduce the impact on the environment: 82.1 per cent of enterprises were striving to reduce the amount of paper used for printing and copying, 64.3 per cent – established electrical energy saving objectives in their internal regulations (28 per cent were using software for the optimisation of energy consumption in business processes). 51.7 per cent of enterprises made efforts to replace physical trips with virtual meetings – telephone, video or Internet conferences, 42.4 per cent – provided their staff with remote access to the enterprise’s email system, documents or programs.

As the ICT usage in our everyday life and also in our workplace takes important place and it is necessary to find out the performance measure how to evaluate the ICT, and to measure the efficiency of adoption of e-business solutions.

2.2. Traditional performance measures and limitations

The reason of measuring performance is not only to know how a business is performing but also to permit it to perform better. The difference between traditional and e-business also requires and different measurement means and systems. As the shortcomings of traditional measurement systems have prompted a performance measurement revolution (Eccles 1991; Neely 1999). Attention in consultancy and practitioner academic communities has turned to how organisations can replace their existing, traditionally cost based, measure-

ment systems with ones that reflect their current objectives and environment.

Due to the strong emphasis on financial reporting, internal performance measurement systems of companies were definitely normally dependant on management accounting methods. So, productiveness has been thought about the main indicator of a technology’s contribution (White 1996). Although the so-called efficiency paradox was in the beginning described in the economy level, most MIS researchers have answered the actual productiveness thing for the organization level (Devaraj, Kohli 2000). Several have tried to produce hard evidence of productivity gain as a result of IT investments. Studies have often led support to IT productivity paradox (Chan 2000). Many researchers have talked over the limitations of traditional performance measures, and the most typically cited units are that (Oz 2005):

1. As they are based on traditional management accounting systems, labor may be the significant cost driver and others are de-emphasized by grouping them in one category-overhead. However, today the most common labor cost rarely exceeds 12%, though overhead is 50-55% of manufacturing cost. Hence, labor has stopped being an important part.

2. Innovative technology investment might possibly not have instant impact and can take a few years to signify success. These types of lags may be of 2-3 years duration, simply because users may require learning and adjustment just before changing into proficient in the new technology.

3. Conveniences of aggregated IT investments may be redistributed at intervals or across the organization and, consequently, developments might not be demonstrated from the IT table of company accounts. Particularly, traditional financial reports are usually inflexible, since they have a very estab-

lished arrangement. Thus, performance measures used in one department might not be suitable for other people.

4. Cost reduction has become considered a powerful tool to accomplish reasonably competitive advantage.

However, customers' demands have changed and low cost is no longer the most important factor in most markets. Skinner (1986) argued that a manufacturing firm should instead concentrate on quality, reliable delivery, short lead times, customer service, product innovation, flexible capacity, and efficient capital deployment. To sum up traditional performance measure and their limitations we could make a conclusion that for new types of organizations needs new measures to evaluate the efficiency of performance. Nor is there any agreement amongst practitioners as to which measures are effective for measuring e-business performance (Hinton, Barnes 2005).

2.3. Measuring IT investments to business performance

Evaluating the business value of IT investments has already been an important challenge with regard to scientists and professionals (Dehning, Richardson 2002; Dehning *et al.* 2006; Kohli, Grover 2008). This really is partially as a result of oblique link between IT investments and organization performance. Most of the talk around performance measures of IT investments is related to the base of measurement, specially, financial vs. non-financial measures. A simple question is how to evaluate benefits created by investments in IT. A suitable response to this question would require a precise meaning of IT investments, an accurate classification of how organizations disclose these investments in the financial reports, and a obvious understanding of the particular nature of IT resources, their particular capabilities and the advantages that these resources are expected to build. Some Lithuanians researchers offers methods (like multicriteria) which could be adopted to evaluate the e-business performance, and the IT impact on performance, and they consist that when various multiple criteria methods are used to evaluate a particular object, conflicting results are naturally obtained (Ginevičius *et al.* 2008; Ginevičius 2006; Ginevičius *et al.* 2004, 2005; Tamošiūnienė *et al.* 2006). But it still surprising to find a lack of scholastic literature in the field of works which has been done in determining how performance measurement systems ought to be adapted for online business.

2.3.1. The definition of IT investments

Most recent analysis defines IT investments in different ways. Bacon (1992) defines IT investments as the cost incurred with "any acquisition of computer hardware, network facilities, or pre-developed software or any in-house systems development project that is expected to add to or enhance an organization's information systems capabilities and create benefits beyond the short term". Weill, Olson (1989) link IT investments when using the expenses related to acquiring computers, software, networks, as well as personnel to manage and operate a firm's information system. The above mentioned definitions view IT investments like a variety of quite a few factors that include IT personnel, system software, IT computer hardware, and also computer software.

Since IT investments are different naturally and mirror various organization methods, it is important to disaggregate these types of investments based on their particular characteristics or asset types. Aral, Weill (2007) classify IT investments into four different types, in accordance with their strategic purposes:

1. infrastructure investments (e.g., computers, networks, shared customers databases, help desks) that creates the inspiration of IT service used by various IT computer programs in the firm;

2. transactional investments (e.g., accounts receivable system, get refinement, policy restoration, bank cash withdrawal) which automate the repetitive financial transaction processing characteristics of the firm;

3. informational investments (e.g., profits analysis, data mining of customer reactions towards the firm's products, services, and Sarbanes-Oxley reporting systems) that supply information necessary to manage, account, report, and communicate internally with customers, suppliers, and regulators;

4. strategic investments (e.g., the introduction of the ATM within the banking industry or new iPhone applications, namely, iPhone's apps ecosystem) that assist an organisation to acquire an aggressive advantage or position available on the market by supporting the entry straight into a new market or the growth and development of new products or services.

Focusing on the strategic goals of IT, Stoel and Muhanna (2009) classify IT investments into externally and internally focused. Although, externally focused IT investments are those meant to help the firm quickly respond to modifications in the market and shifts in customers' needs, internally focused IT investments conserve the firm to produce reliable products or services and minimize

their costs. Separating IT investments into their sub-components gives insights into the nature of those investments (e.g., tangible vs. intangible), provides the ground to be aware of the accounting treatment of these investments (e.g., hardware vs. software), and facilitates the process of mapping each kind of investment to particular performance measure (e.g., financial vs. nonfinancial).

2.3.2. Challenges in measuring the impacts of IT to business performance

It may look obvious that there are significant impacts of information and communication technologies (ICT). However, as mentioned succinctly by ITU (2006): “You want to know the difference information and communication technologies make? Try to live without them.” It might appear, illustrating impacts of ICT statistically are far from simple, for several reasons:

1. there are a number of different ICTs, with different impacts in numerous contexts and countries. They include goods, such as mobile phone handsets, and services, for example mobile telecommunications services, which change rapidly eventually;

2. many ICTs are general-purpose technologies, which facilitate change and thereby have indirect impacts;

3. it is difficult to determine what is meant by “impact”. For example, a model proposed by OECD for ICT impacts (figure 2) illustrates the diversity of influences, in terms of intensity, directness, scope, stage, time-frame and characterization (economic, social or environmental, positive or negative, intended or unintended, subjective or objective);

4. determining causality is tough. There may be a demonstrable relationship and a positive correlation between dependent and independent variables. However, such a relationship cannot readily be proven to be causal.

It is important to take into consideration where impacts lie inside a broader information society conceptual model. The model used by OECD to illustrate the information society (OECD 2009) identifies the following inter-related segments: ICT demand (use and users), ICT supply (the ICT sector), ICT infrastructure, ICT products, information and electronic articles and ICT in a very wider social and political context.

Many studies have classified ICT impacts as economic, social or (more infrequently) environmental. However, the picture is generally more

complicated than this. For example, although some direct impacts of ICT use can be defined as economical, there might be indirect impacts which can be social or environmental. In addition, direct impacts might be both economic and social, related through human capital, which can be based on OECD as “productive wealth embodied in labour, skills and knowledge”. From the perspective of the economy, human capital is a necessary situation for economic growth and competitiveness (World Bank 2009).

2.3.3. Nonfinancial measures of IT investments

As performance measurement has attracted increasing interest from scholars within the e-business research e-business scientists advocate the adoption of non-financial performance measures furthermore to traditional financial measures regarding overall organization effectiveness. The necessity for delivering nonfinancial, forward-searching information with the clients of monetary reviews has acquired growing attention recently (Hayes, Hunton, Reck 2000; Lang, Warfield 1997). Healy and Palepu (2001) argue that the traditional accounting model has not kept abreast of economic changes in the business environment. One of the performance metrics delivered to the company, individuals non-financial measures underneath the BSC framework could possibly be typically the most popular one for academic and exercise world (Kaplan, Norton 1996, 2001; Neely *et al.* 1995; Neely 1999; Dossi, Patelli 2010). The existing performance management literature (Kaplan, Norton 1996) claim that traditional financial performance measures, for example roi and internet profits, aren't enough for managers to watch their firm's performance. This is usually explained in terms of the limitations of financial performance measures that they are unable to satisfactorily reflect firm performance as they are too late, too aggregate, and too one-dimensional in nature to be useful (Ittner, Larcker 1998). Thus, recent developments in performance measurement systems have recommended using non-financial performance measures additionally in the direction of the particular traditional financial metrics. Non-financial performance measures are regarded as more forward-searching, able to better predict future performance, and much more helpful for developing and keeping lengthy-term reasonably competitive advantages than traditional financial metrics (Dossi, Patelli 2010).

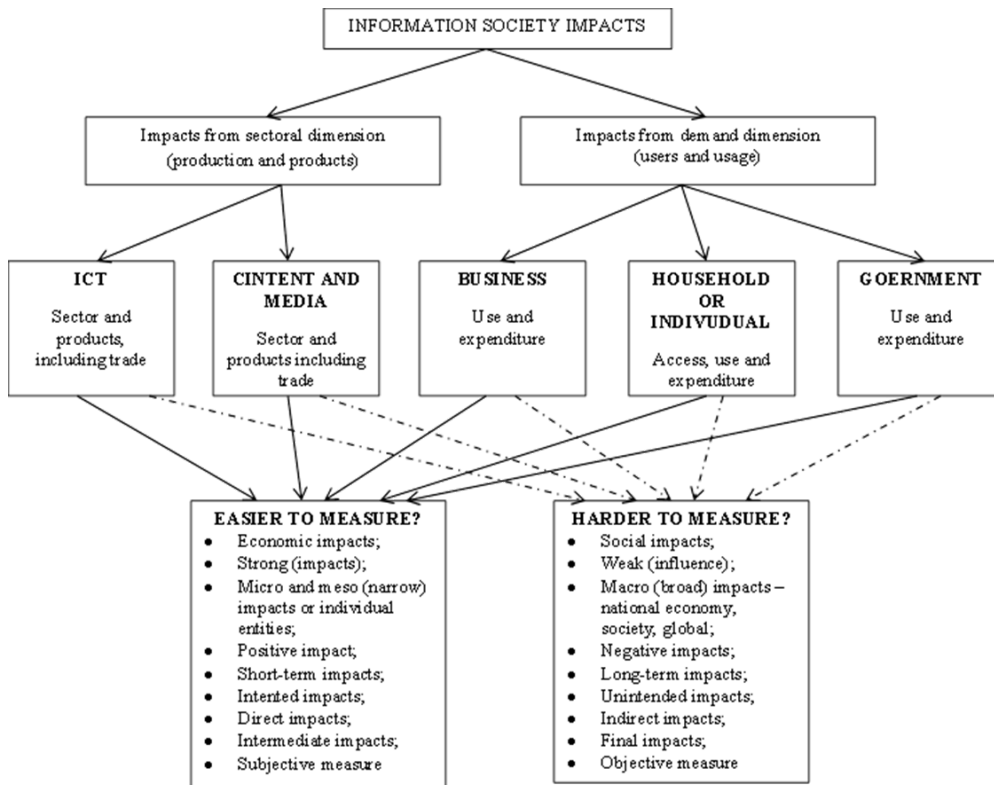


Fig. 2. Information society impacts measurement model (OECD 2009)

Kaplan and Norton (1996) study results indicate that non-financial performance measures concentrate on a firm’s lengthy-term success factors for example client satisfaction, employment of recent technology, and worker satisfaction, and this leads to the advance of business performance over time (Kaplan, Norton 1996). Similarly, empirical research by Ittner and Larcker (1998) and Dossi and Patelli (2010) provide you with the role of non-financial performance measures as foremost indications for the future financial performance. Consequently, contemporary methods to performance measurement systems suggest the adoption of non-financial performance measures to beat the insufficiencies of traditional financial performance measures.

3. Measurement framework the impacts of ICT on business performance

Different analytical techniques are already used to appraise the economical impacts regarding ICT in the macroeconomic, sectoral and microeconomic (organization) amount. The main methods are econometric modeling making use of regression, development accounting as well as input-output analysis. Econometric regression models have recently been employed in other areas of measurement, by way of example, to appraise the impacts associated with ICT experience instructional final results. The usual objective of an ICT impact anal-

ysis is to examine the relationship between ICT and productivity, economic growth or employment. The study usually consists of additional determinants like work, non-ICT funds and, pertaining to firm-level scientific studies, aspects for example firm features, abilities as well as development. Included in ICT are the ICT-producing sectors, often split into manufacturing and services, and ICT diffusion, measured by ICT investment and/ or use. Productivity measures relate a measure of output (gross output or value added) to one or more inputs. In recent years, much attention has been paid to firm-level studies of ICT impacts. This sort of research can provide information hard to get at from macro-level information, for example, the particular complementary positions associated with abilities and also organizational adjust (OECD 2004). Organization level studies are according to evaluation (usually depending on econometric regression versions) of data on the individual organization level. Data frequently arrive from diverse statistical resources and they are connected at the organization degree. They include firm overall performance, ICT investment, ICT use (various through by using computers in order to advanced e-business applications), firm size and age, skill level, organizational factors along with other types of innovation. In some countries, these data are created in longitudinal databases, which provide data over different points in time. Economic impacts studied include labour productivity,

multifactor productivity and value added. Also it is important to mention that much of the work on measuring ICT impacts is based on case studies, often small scale and project based. They may be longitudinal, examining changes over time. They are generally very detailed which enable it to involve a number of qualitative and/or quantitative data sources. They can take advantage of a number of existing, in addition to new, data sources. Case studies may be used to explore causation within their scope. At the same time, research study findings are bound by the context through which they are conducted. While their results are not going to usually be generalizable beyond their context, they may indicate hypotheses or topics that might be assessed more broadly. Panel studies are longitudinal and may be survey based, in contrast with cross-sectional surveys, which collect data at a point in time across a population. A panel is selected at the start of the study and data are collected about its members, for example, individuals or businesses, during successive periods. Such studies can be useful in examining impacts, as they can provide good baseline data and account for time lags. Controlled experiments can establish causality by controlling all the independent variables. Therefore, the experimenter can modify a common condition and observe the effect. Generally, the kinds of studies of interest for ICT impact analysis cannot be controlled as far as required to determine a cause-and-effect relationship. However, where the conditions are limited, a controlled experiment is quite possible. Other methodologies and data sources include the use of focus groups, direct observation and document examination (Heeks, Molla 2009). Scenarios could be used to establish impacts in different situations, using different groups of assumptions. Forecasting may be used to estimate the near future impacts of ICT and can involve a number of techniques, data sources and assumptions. It is clear that there are a number of different methodological approaches and data sources included in the measurement with the impacts of ICT, each has strengths and weaknesses, to avoid weakness and also to create the e-business performance measurement system to evaluate the IT impact on business performance ought to be integrate all strength to the system.

4. Conclusions

For over a decade, empirical numerous studies have shown analyzed the impact of IT investments on various performance measures The study describes research aimed at determining the exact nature of such e-business performance measurement system. The basic objective of this study is to

present a framework for developing performance measurement system in the e-business environment. The fundamental objective on this study is to present a framework for developing performance measurement in the e-business environment. Based on the results of survey companies of Lithuania are among EU leaders in various segments of internet and ICT. Also statistics results show that ICT investments in organizations' performance are significant: 39.3 of organizations used computers and electronic networks for trading purposes; 33.2 per cent of enterprises purchased (ordered) goods or services via the Internet or other computer networks, 24.7 per cent - received orders. In 2011, electronic data transmission between enterprises systems were used by 69.8 per cent of enterprises. Enterprise resource planning (ERP) systems were used by 12.6 per cent, customer relationship management (CRM) systems - 16.8 per cent of enterprises. As the ICT usage in our everyday life and also in our workplace takes important place it is necessary to find out the performance measure how to evaluate the ICT, and to measure the efficiency of adoption of e-business solutions

In study was discussed the limitation of traditional performance measures. To sum up traditional performance measure and their limitations we could make a conclusion that for e-business need new measures to evaluate e-business performance. As a result should be mentioned that since financial measurements alone are not capturing the expected intangible benefits of IT, they are of limited value to measure the real contribution of IT and justify the investment. Hence, a framework that emphasizes nonfinancial measures, such as quality, innovation, and consumer satisfaction, is being proposed.

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