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CHALLENGES OF MEASURING THE DIRECT EFFECTS OF E-BUSINESS IN SMEs

Igor PIHIR

ABSTRACT

Development of fast Internet and constant growth of new information and communication technology brought to expansion of interconnections between modern companies and their business partners through new kind of business integration so called electronic business (e-business). As the new kind of business connection paradigm has been implemented and started expansion, justification of its use came into the scientific focus. Significant direct and tangible effects of the e-business application have been found and proven in large companies, but in small and medium-sized enterprises (SMEs) these effects have still been the area of exploration. According to latest researches in this field this paper, as a part of dissertation proposal, deals with the issues in the existing methods for e-business direct effects measurement in business processes. This research shows lack of appropriate methods specifically oriented to SMEs. Dissertation proposal is focused on four main problems in measuring future effects of e-business implementation in business processes. The paper emphasizes these issues, whose solution will further lead to new methodology for measuring and assessing direct effects of e-business implementation in SMEs as part of business to business (B2B) communication and the exchange of structured electronic documents in business process cycle, from order to payment.

KEY WORDS

e-business, cost reduction, effects measurement, SME

INTRODUCTION

Implementation and usage of e-business as way of interconnection between business partners through modern information and communication technology (ICT) is on path of growth. Their effects in use are actual topic of many scientific and pragmatic research projects. Challenges of e-business development, growth and future implementation in companies across the world are in focus of strategies in many countries and political and economic associations. For example European Union marks e-business in its strategic initiatives, such as: *The Lisbon Strategy*, also known as the *Lisbon Agenda* [1], *eEurope - An Information Society for All* [2], and other strategic documents and programs such as *A Digital*

Igor PIHIR - University of Zagreb, Faculty of Organization and Informatics, Pavlinska 2, Varaždin, Croatia, igor.pihir@foi.hr

Agenda for Europe 2010 [3] and now the *Europe 2020 strategy* [4]. All these strategies have the same goal, expanding of e-business in broader use and bring its benefits into the market. Other countries like Croatia have also developed similar strategies [5] to support more rapid development and implementation of e-business. All these strategies have launched many projects and workshops about e-business like: *CEN Workshop Agreements* (CWA) [6], *European e-Business Lab* (EBL) [7], *Pan-European Public Procurement Online* (PEPPOL) [8] and in period from 2002-2010 *E-Business Watch* [9], whose goals were to make these strategies implemented and monitor their progress. But despite these efforts level of e-business penetration is still low, especially in process automation, which brings benefits from interchange of structural electronic documents and further integration of business processes. The most suitable and most frequent business document, an invoice, could be taken as referent point and its penetration in structural form is at average level below 10% in EU [10]. To overcome this problem and to increase the penetration level, scientists and professionals in this field have been investigating main barriers for further implementation of e-business and results show that there are few problems. Generally, but especially for SMEs, there have been non-realistic benefit expectations and lack of knowledge how to make realistic cost-benefit analysis for themselves [11], [12], [13]. The main identified benefits from e-business are divided into direct and indirect benefits and tangible and intangible benefits [13], [14], [15]. Direct benefits are recognised as increase in efficiency of business processes and they are foundation for measurable analysis of effects in e-business [14], [16], [17], [18]. Direct benefits are also tangible which means we can count them and measure them. Indirect benefits are also measurable but the effects from them could be perceived in longer time period which means we could not see them clearly right away. Intangible benefits are not of material kind, but rather qualitative in nature and therefore hard to measure. An example could be an increase in quality level or customer perception which could ultimately lead to growth of sale or similar effects. Methods for measurement of direct benefits of e-business implementation and identified problems in the measurement are focus of this research paper, with aim to identify directions of further research. This article is also a part of proposal for dissertation theme, which is already accepted at University of Zagreb.

MEASUREMENT OF E-BUSINESS EFFECTS

Effects and benefits of any kind are main variable in decision making for management in evaluation process of e-business projects. Sometimes the decision is made by larger business partner and small companies need to adapt to new conditions without objection. But even in that case management needs to know what will be the effect for the company itself and its processes.

Many authors [19], [20], [21] have investigated methods for measurement of business effects and they have used methods such as: *Cost Benefit Analysis* (CBA), *Return on Investments* (ROI), *Internal Rate of Return* (IRR) and *Net Present Value* (NVP). All these methods are well known and have been used in justification of e-business and IT projects, but still, main problem of these methods is the lack of data. Data for these methods are obtained mainly by estimates [19], [20], [21]. Mollogon and Raisinghani [20] in their paper show a practical approach to cost benefit analysis of e-business implementation. This approach and methods can be used in further analysis of business processes but only after we have already obtained the data about the processes in which the effects would be visible. For calculation of real costs and benefits of process improvement, researchers Giaglis, Mylonopoulos and Doukidis [22] have proposed modelling of business processes and use of simulation methods to obtain data about cost and time in processes improved by investments in ICT or electronic

data interchange (EDI). The next problem was how to measure real process costs because the estimates are not realistic. As a solution for this problem Peacock and Tanniru [14] and some other authors [17], [16] see an application of accounting methods that are used for allocation of indirect costs. Best known method is *Activity Based Costing* (ABC) described in paper from Cooper and Kaplan [23]. Peacock and Tanniru [14] propose this method for justification of IT investments. ABC method allocate, already incurred and jet known costs from accounting records to some *cost trigger* or so called *cost driver*. Recently there has been developed a new method as an improvement to ABC method, so called *Time Driven Activity Based Costing* (TDABC) [24]. The new method was based on ABC but the driver or trigger for cost allocation was time spent by the resource on activities in the process. Application of TDABC method is well described on case study example of process improvement by Stouthuysena and authors [25]. In measurement of e-business effects the ABC and TDABC methods were used by authors Voutilainen and Pento [17] in electronic invoice implementation and Perego and Salgaro [16] in measurement of cost reduction in *order-to-payment-cycle* or supply chain integration. Application of business process modelling and ABC methods lead to successful calculation of direct and tangible effects of e-business implementation [16], [17], [27]. These papers and the study show cost and cost reduction effects in cases of full use of e-business or in cases of no use of e-business at all. There are also scenarios of full or half automation of the processes but the extent of documents interchange is not taken into account.

Problems in this approach, as in professional studies like [26], [27], are in fact that effect are shown as large and mainly in consideration of full electronic way of doing business. The processes in which the e-business is implemented are processes that are supported with new technology and the cost reduction is possible, but it is not possible to do business in fully automated or new way because the implementation of e-business is slow and not all of our business partners would do the business with us in new way instantly. The same studies like Billentis study from year 2011 [26] show that the time needed to excide the level of, for example 60% of electronically processed invoices, could be gained through six to eight years period. See Figure 1 (left). With new method of involvement of business partners this period is lowered to approximately three years and it mainly means to force business partners to e-business or to help them to implement it. See Figure 1. (right).

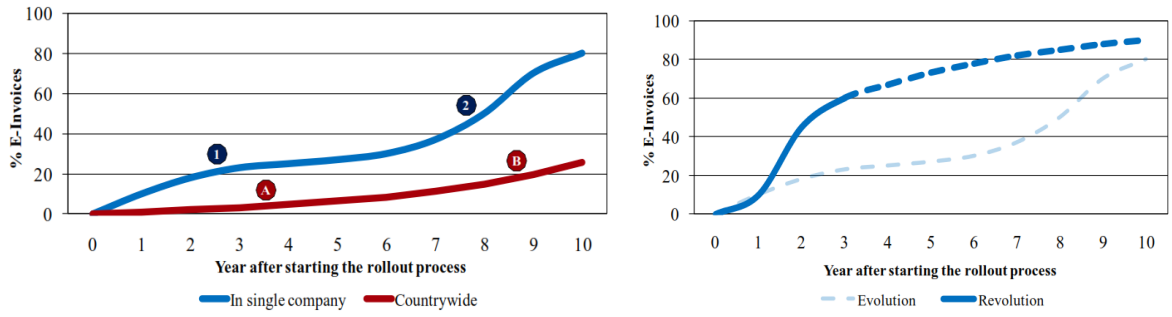

***Fig. 1** E-Invoicing penetration with traditional rollout methods (left) or with improved rollout methods (right)*

This study [26] shows us that penetration of e-business implementation is slow and not all business partners use it. This means that although we implement e-business in our process and we do business through that way with part of our business partners there is still large portion of business partners that do business with us at old fashion way through paper documentation. In perspective of SME the main thing is the parallel running of old and new business processes by which the company is able to reduce some of the costs. Problem is that the cost reduction will not be significant as promised by the studies, because some of cost reductions, mainly in

personnel, would not be possible due to normally small number of employees involved into the whole process in SMEs. Another problem is that in some cases the old process would be more expensive now then it was before, because the common cost would be divided onto smaller number of units (eg. smaller number of invoices was taken to the post office and overall cost of that activity remains the same).

MEASUREMENT OF E-BUSINESS EFFECT IN SMEs

SMEs are substantially different from large ones. The processes are in some way simpler but the logic is the same. What differentiates them substantially is the lower capital strength to make the change in there processes and small number of employees with knowledge that is needed for complex analysis. Harland and authors [11] made a longitudinal study in four years period to research differences between SMEs and large companies in implementation of e-business through supply chain. Authors found that the main barriers to implement the new way of doing business are lack of strategy for e-business implementation in supply chain, differentiation of companies in the supply chain by size (bargaining power and power of capital) and as third the lack of knowledge about the potential benefits from e-business implementation. Zheng and authors [12] state that SMEs have problems in identification and quantification of benefits of e-business, so they wait with process integration as an advanced form of e-business. Presence on Internet, web-page and e-mail usage is understood as simple form of doing e-business. MacGregor and Vrazalic [28] described full range of characteristics that differentiate the SMEs from large companies and represent them as special group of enterprises with main barriers to implement e-business in cost of implementation and project complexity. Cohen and Kalliroi [13] made a survey in Greece, were SMEs saw the cost reduction not as main goal of e-business implementation, but they perceive the direct and tangible costs of e-business as more significant than indirect and intangible ones. Cohen and Kalliroi [13] stated that large companies performed the analyses of the e-business implementation effects much more frequently than SMEs. Results are 3:1 in favour of large companies. This proves that there are really different groups of companies and that SMEs mainly or in much smaller manner have been doing analysis of e-business implementation effects before implementation. On the other hand, SMEs perceive direct costs and their decrease as important factor for e-business implementation, which leaves space for new methods for direct effects measurement especially tailored for SMEs. Chan, Chong and Zhou [29] in their research found twelve factors that influence the implementation of e-business and one of them was process efficiency.

Based on this we can assume that after the SMEs would conduct its own calculation of potential savings they could be more interested in the introduction of more advanced forms of e-business and integration with business partners. Furthermore, Volker [30] state that mutual identification of corresponding business processes lead to identification of activities which enable cost reduction and mutual benefits for both partners. The author also emphasizes significance of business processes modelling in standard notation or language such as *Unified Modeling Language* (UML), *Event-Driven-Process Chain* (EPC) or today standard in that area *Business Process Modeling and Notation* (BPMN).

Lyu, Huang and Li [31] state that the research made by Forester in 2006 on a sample of 540 SMEs in North America showed that the most significant impact that SMEs recognize was the increase in process efficiency by increase of employees' efficiency. The same authors [31] in their own empirical research on a sample of 200 SMEs in Taiwan, in 2010, made results in which 80% of SMEs reduced costs and increased the efficiency of the processes. Zheng and authors [12] state that there is a need for realistic business cases and examples that

show the real implementation effects of e-business in SMEs. For SMEs management they recommend identifying four important factors necessary for the decision on the introduction of e-business: a) to identify successful and realistic case studies with as much detail as possible, b) identify a set of data relevant for decision making, c) identify the SME business model, taking into account the conflicting objectives and d) find models for the cost-benefit analysis based on real examples.

RESEARCH PROBLEMS AND FURTHER WORK

In previous chapters literature review showed contemporary methods and approaches to measurement of e-business implementation effects. During the pilot research, on the real case study, process models were developed which employed contemporary measurement methods. Through this process some new research problems were found.

First problem lies in lack of knowledge and resources for process modelling in SMEs as a basis for analysis of possible effects. As a solution it is proposed to develop detailed models of generic business processes for SMEs on the basis of previous studies of generic process models made by author and developed in the projects [32], [33]. Also, generic process reference models developed by the organization UN / CEFACT, NES (*Northern European cooperation on e-commerce and e-procurement*) and CEN (*European Committee for Standardization*) will be used as reference point. Process modelling in SMEs would not be made from scratch, but the generic model would be adjusted for specific company. In further research, according to the results of pilot research, several generic reference models will be used as reference and developed further in more detail needed for process simulation and cost calculation. Previous work [16], [17] has not shown the detailed level of process models from which SME could benefit in the implementation of measurement and analysis of the possible effects of e-business implementation.

Second problem is identified as lack in research methods used in most major papers and researches made by authors Perego and Salgaro [16] and Voutilainen and Pento [17]. A measurement of activities duration in these studies was based only on time estimates of employees without measurement in practice. Authors of the paper [5] stated that they have measured time, but the data has actually been measured by employees themselves during performing these activities. Authors also made no detailed explanation of methodological procedure. Andersen and Kaplan [24] have stated that the application of TDABC methods is based on analysis of activities duration, which can be determined in three ways. The most precise measurement can be achieved by stopwatch method performed on the sample and the least precise method is estimate of time by employees themselves, which was applied in paper [4] and self-measurement as something in between was used in [5]. This raises the question about the difference between the estimated and actual measured duration of activities and the accuracy of such calculations based only on an assessment of employees.

Third problem is a gradual introduction of e-business in the processes and parallel execution of processes supported by e-business and the processes that are run in old manner. This fact is not well described and taken into account in current studies and it is mainly ignored. Open question is how to improve the estimation and differentiation between the potential savings and realistically achievable savings in the context of parallel execution of existing and improved processes. The introduction of e-business is not a single sided project; the savings depend on the amount and dynamics of joint activities between business partners. Since previous studies suggest an increase in performance of the process and thereby induced savings in the work of employees as the most measurable direct effect of e-business, the

question is whether this kind of savings could be made in SMEs, with a relatively small number of employees in these processes. This problem is recognized by other authors exploring large companies [16], [17] and referred to by such use of free resources to other activities, but in the context of SMEs question is whether it would be really feasible and whether it would ultimately deliver savings.

Fourth problem partially lies on third problem and it is neglected in contemporary studies [16], [17]. Previous research [16], [17] calculated savings and the effect of e-business implementation by neglecting the amount or scope of activities that will be improved. Analysis has been made on idealistic scenarios when all activities or business processes are improved. Also effects are calculated in cases where all documents are in electronic form and the process is automated or semi-automated. This is good calculation for possible maximum effects but that kind of effects would not be real or possible to achieve. Studies on the development of e-business rather suggest that the application of e-business is only in its infancy and only a small number of businesses in the EU use e-business and structured exchange of electronic documents. Its applications were estimated at 10-20% of transactions [26], [27]. Further work would be oriented on benefits measurement and assessment in SMEs that do not yet have an e-business, so the question is how to estimate the potential scope of future e-business application with business partners and thus profitability of the overall assessment.

CONCLUSION

Based on previous research, it could be said that there is a need for new broader methodology especially developed for measurement of direct effects of e-business implementation in SMEs business processes. Even if SMEs often do not carry out cost-benefit analysis before or after e-business implementation, by the application of new methodology and generic business process models this would be possible. The new methodology would bring sufficient knowledge and SMEs would be able to use process models and conduct cost-benefit analysis to answer its own questions about feasibility of e-business implementation. Almost all contemporary studies suggest that the process improvement and cost savings motivate the introduction of e-business in SMEs, so the new methodology, with answers to previously mentioned issues in current research approaches would give SMEs a clearer picture of the effects and stimulate SMEs to implement e-business. Development of new methodology, which could provide more precise calculations and assessment of achievable savings by e-business implementation in SMEs, would be the subject of further research and dissertation of author.

The expected scientific and social contribution of this research would be a new methodology that would enable the prediction and measurement of the direct effects of possible e-business implementation in SMEs. Consequently author assumes greater utilization and faster implementation of e-business in SMEs.

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