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Are "design networks" shaped by their own outcomes? coordination processes between actors and artefacts

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ASSESSING THE BUSINESS VALUE OF ELECTRONIC ORDER-TO-PAYMENT CYCLE

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Abstract

In this paper, we build an evaluation tool for assessing the business impacts of an electronic order-to-payment cycle. Based on a literature review and expert interviews, we formulate a three-stage model which includes performance indicators for electronic order, electronic invoice, and electronic payment processes. In addition, we pinpoint the inter-process linkages. We test the proposed evaluation tool in a business context and find that the impacts of automating the order-to-payment cycle relate closely to cost avoidance. However, a strong emphasis on asset utilization can be observed as well – better use of IT could enhance utilization of existing human resources and capital, affecting company profitability.

Keywords: Performance indicators, evaluation tool, e-order, e-invoice, e-payment.

1 INTRODUCTION

How can we utilize information technology (IT) to increase productivity? What IT innovations enable us to perform tasks in smarter ways than we used to? One important source of productivity growth lies in improving the processes of the financial administration. Using IT in financial administration has been recognised as one of the most important sources of profitability growth in Europe (EuropeanCommission 2007; EU 2006). As an example, EACT has estimated that by moving from paper-based invoicing to electronic invoicing, companies could save 243 billion euros in processing costs alone (EuropeanCommission 2007). Therefore, increasing productivity by using information technology (IT) in the financial administration is high on the EU agenda (EU 2006).

The extant literature provides a plethora of metrics and measures related to supply chain performance and financial administration. What is missing, though, in the current literature, is a holistic analysis on the potential productivity gains that could be derived from a full-scale digitalization of the order-to-payment cycle. Therefore, the objective of this study is to pinpoint the potential productivity gains from adopting an electronic order-to-payment cycle. To do this, based on an extensive review of the existing literature and expert interviews, we divide the order-to-payment cycle into three distinct processes (ordering, invoicing, and payment) and build an evaluation tool to assess the potential productivity gains. In addition, we report the findings of a multiple case study, testing the proposed evaluation tool in a business context. The proposed evaluation tool is developed from the point of view of the buying organization.

The structure of the study is as follows. In the second section, we discuss the literature on business value of information technology. In the third section, we develop the evaluation tool. In the fourth section, we test the proposed evaluation tool in the context of a Finnish design company. In the remaining sections, we provide some anecdotal evidence from two other case studies, draw conclusions, and suggest avenues for further research.

2 BUSINESS VALUE OF INFORMATION TECHNOLOGY

Effective measurement of information system success has been a serious concern for both managers and scholars - attempts to quantify the benefits of IT have often resulted in inconclusive or inconsistent results (Byrd et al. 2006). Research in IT business value examines the organizational performance impacts of information technology, such as productivity and profitability improvement, cost and inventory reduction, competitive advantage and other performance measures (Melville et al. 2004). There is a vast amount of studies regarding IT business value and almost as many proposed instruments to evaluate it; quantitative financial measures, information value measures, service quality tools (SERVQUAL), and multi-dimensional analysis have been used, among others (see Cronk & Fitzgerald 1999 for review).

2.1 Productivity paradox and beyond

In spite of the great promise of IT driving the biggest technological revolution men have known, there has been heated debate in the IS literature for the past decades about whether IT usage actually pays off (Brynjolfsson 1993). Labelled the productivity paradox of information technology, Brynjolfsson (1993) explains that although computing power in the (U.S.) economy has increased by more than two orders since 1970s, productivity seems to have stagnated. Particularly in the 80s, many studies claimed that the overall IT productivity impacts are neutral or even negative (e.g. Salerno 1985). Robert Solow, winner of the Nobel Prize in economics 1987 stated that "we see the computer age everywhere except in the productivity statistics" (New York Times Book Review 1987). Yet, the well established view today is that IT-intensive firms are more productive (e.g. Dedrick et al. 2003, Aral et al. 2006).

According to Brynjolfsson & Hitt (1998), the critical question for IT managers is not “Does IT pay off?” but “how can we best use computers?”

Brynjolfsson & Hitt (1998) refer to the business value of IT as its ability to contribute to productivity growth. Productivity growth comes from using resources more efficiently, or as Brynjolfsson & Hitt (1998) express it “productivity growth comes from working smarter”. This is the promise of computers; this is what IT should be able to offer. According to Tallon et al. (2000), some insights into IT payoff can be attained by firm-level research on the “productivity paradox”, principally in the form of returns on IT investment (IT productivity on the company level can be measured by comparing some IT factor to an organizational performance measure, e.g. annual IT expenditure vs. pre-tax profit). They argue, however, that too little attention has been given to other IT impacts such as improved inventory management, greater product variety and customer service. To be able to fully understand the benefits, they claim, additional indicators should be considered.

Although the discussion so far has provided few practical tools for assessing the business value of IT regarding this study, some valuable points have emerged. First of all, it is crucial to see that there is a variety of tangible and intangible variables to consider – not all IT investments are made simply to cut cost. Second, a process management and design view should be highlighted when building the evaluation tool. Gonzales-Benito (2007) found that IT investments have positive effect on operational purchasing performance since the use of IT allow companies to adopt certain purchasing practices and facilitates greater strategic integration of the purchasing function. Finally, it has become clear that the majority of the literature reviewed so far aim to measure direct impacts of IT on company level performance or even on a wider scope. Now the question remains how to measure business impacts of an electronic order-to-pay process; one specific business activity inside a company?

According to Silvius (2006), there are two distinct approaches to be found in IT business value literature; the variance approach investigating what the relationship between IT investment and organizational performance is, while the process approach tries to find out how this relationship works. Most research presented so far try to explain the productivity paradox by investigating direct company level impacts of IT and thus falls under the “variance approach” category. A growing body of IT business value research, however, prefer the process approach, suggesting a multi-dimensional impact structure in the organizational hierarchy.

2.2 Process-oriented approach for evaluating IT business value derived from the order to payment cycle

To gain insight on activity-specific impacts inside the process, it has to be split open into smaller phases and try to identify attainable benefits in each phase. This will, however, result only in a group of operative-level performance indicators which hardly give much insight on business impacts of automating the entire chain. On the other hand, the overall company, industry or macro-economic level analysis of IT productivity impacts are too general and cannot provide information that is accurate enough for process monitoring purposes. Thus, there should be some instrumentation in the middle to combine the lower-level and the top-level business impact indicators.

According to Barua et al. (1995), the growing concern of scholars is that IT effects on the enterprise level performance can be identified only through a web of intermediate level contributions - there is some evidence that IT impacts exist and that they can be detected by lower-level analysis in the organization. The lower level impacts, in turn, are expected to affect higher level performance. To evaluate these, Barua et al. (1995) propose a process-oriented methodology, which involves a two stage analysis of intermediate and higher level output variables. They strive to open up the black box of IT usage, detect and measure IT impacts where they occur - their main thesis is that economic contributions of IT can be measured at the operational level, where IT systems are implemented. The higher order impacts can be then traced through a chain of relationships within the organizational hierarchy.

An important side note to make here is that actually, the functions; ordering, invoicing and payment are better yet sub-processes of the order-to-pay activity. Tallon et al. (2000) argue that IT creates value for the company via individual business processes, or *inter-process linkages*, or both – the greater the impact of IT on processes and inter-process linkages, the greater the contribution of IT to firm performance. This encourages investigating IT impacts of individual sub-processes e-ordering, e-invoicing and e-payment but also pay great attention to IT impacts on inter-process linkages – in other words investigate the impact of *electronic integration* in an order-to-pay process.

We divide IT impacts to three levels; application-specific impacts (e-ordering, e-invoicing, and e-payment), integrated process level impacts (order-to-pay) and finally the company level business impacts. First of all, the use of IT affects sub-processes directly, resulting in some impacts which are specific to each function. Second, IT usage impacts the entire order-to-pay process via inter-process linkages thus enabling full chain optimization. Finally, linkages between the process and the company level reveal the *contribution to company level business value* of IT. In short, automating an order-to-payment process yields application-specific impacts and through some yet unidentifiable intermediate variables contributes to overall IT business value for the company.

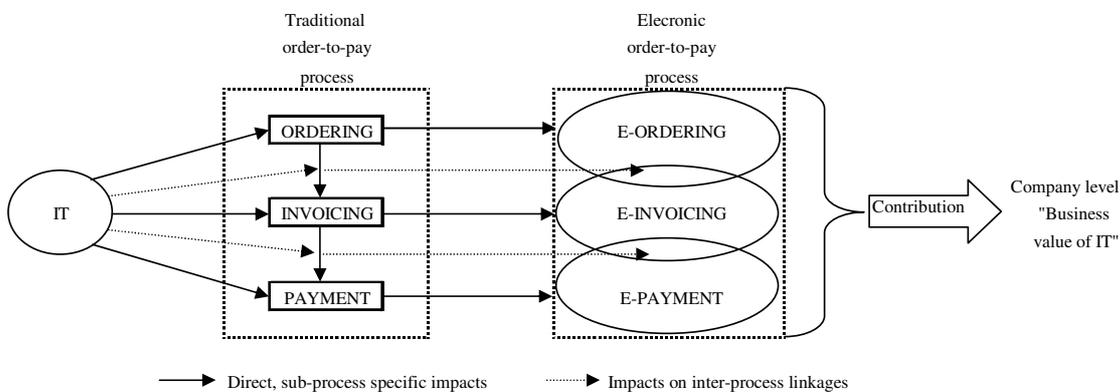


Figure 1. Conceptual framework for the study.

2.3 Uncovering the hierarchy: identifying the chains of IT impacts

To better identify the chains of different stage indicators for IT impact evaluation, some studies have borrowed a very well known multi-stage framework from the strategy literature. The Balanced Scorecard is a tool that translates a company's mission and strategy to a comprehensive set of organizational performance measures (Kaplan & Norton 1996). The Balanced Scorecard communicates a holistic model that links individual efforts and accomplishments to business unit objectives through a consistent series of objectives and measures. The idea is that each individual person could see how their efforts contribute to achieving broad organizational goals, thus offering means for organizational learning and improvement. To be able to track these linkages, however, the model needs to be more than a collection of critical indicators – the scorecard incorporates a complex set of cause-and-effect relationships among outcome measures and the related performance drivers. These relationships can be then traced through sequences of “if-then” statements.

Respectively, efforts to increase IT intensity in a specific function could be seen to affect company level financial measures through a similar chain. Following this idea, Epstein & Rejc (2005) introduce the IT Balanced Scorecard which is a tool for tackling the problem of properly evaluating IT payoffs. The authors argue that an IT performance measurement and management system must focus determining the key drivers of IT success and the causal relationships among them and develop numerous performance measures to track IT performance.

3 METHODOLOGY

Since the purpose of this study is to find out how IT creates business value in the order-to-payment cycle context, the first logical step was to conduct an extensive review on the general subject of business value of IT. It soon became clear that there are two quite different approaches to evaluate the impacts of IT, the variance approach studying *what* the impact is and on the process approach studying *how* this value is created. The process approach was chosen because of its suitability regarding our research question i.e. to answer the question “how”. A group of process-oriented models were reviewed next. Due to the specificity of the context, we soon realised that there is not a possibility to choose only one model and use it as such, but rather combine elements of a couple of them and create a modified evaluation tool.

As the second part of the literature review, we collected benefits regarding e-ordering, e-invoicing and e-payment to gain in-depth knowledge of order-to-payment cycle automation potential. Also, interviews with field specialists were conducted to get comments and new ideas along the way. The expert interviews were particularly useful in determining the value created by IT impacts on the inter-process linkages – it is something that until now was implicitly understood by business people but not explicitly stated in the books.

To illustrate and test how the proposed evaluation tool works, we chose to use the case study methodology to make an in-depth analysis in one case company. The case study methodology has distinct advantage when a “how” or “why” question is being asked about a contemporary set of events, over which the investigator has little or no control (Yin, 1994). The case study methodology was especially suitable for our research as we investigate how companies use information technology in their financial administration and what performance indicators they perceive as important in the process. Furthermore, the strength of the case study approach is that it enables the capture of “reality” in considerably greater detail and the analysis of a considerably greater number of variables than is possible with many other approaches (Galliers, 1991). This was especially important in our work as the objective of this research was to find the underlying performance indicators to IT investments in financial administration, and not just the company policy statements.

More specifically, to develop the evaluation tool, we conducted 10 industry expert interviews (leading specialists in companies providing e-payment, e-invoice, and e-procurement services, the Federation of Finnish banks, the Finnish Information Society Development Centre etc.) and academic professionals (professors at Finnish business universities). For the illustrative case part, at Marimekko, we interviewed six people in total each from different functions that were relevant regarding our study. We covered extensively the entire order-to-payment cycle by interviewing people from buying, invoice handling, treasury, IT system development, and supply chain management. In addition, we conducted supplementary case studies in two large Finnish companies. These case studies included altogether eight interviews.

4 DEVELOPMENT OF THE EVALUATION TOOL

In developing the evaluation tool to analyze the order-to-payment cycle, we adopt the process view discussed above and divide the order-to-payment cycle into three distinct processes: e-ordering, e-invoicing, and e-payment.

4.1 E-ordering impacts and performance indicators

The classic argument for adopting e-procurement systems is that it creates substantial cost savings (e.g. Bakos 1997). To find out how these savings can be achieved, Johnson & Klassen (2005) discuss three different dimension of e-procurement in their article; e-sourcing, e-coordination and e-communities. Many e-procurement studies address e-sourcing issues e.g. the emergence of electronic

(reverse) auctions and other transparent e-marketplace structures which have, e.g., allowed companies to negotiate better prices for purchases and reduce search costs. E-communities, on the other hand, refer to different e-procurement systems platform structures. Proprietary platform procurement systems are point to point links between buyers and suppliers (often EDI-systems), open platform procurement systems are open Internet-based systems, and hybrid platforms have elements of both.

Johnson & Klassen (2005) note that reported benefits of e-coordination are diverse and varied, including cost savings from process improvements (less slack and reduced rework due to errors), price reductions, greater visibility of orders and enhanced inventory turnover and accuracy, among other things. Also, it has been reported that fewer Request for Proposals (RFPs) elicit no bids when sent electronically. Ordering automation can lead to purchase price reductions due multiple reasons. First, since e-ordering allows for a more coordinated and centralized buying process, orders can be bundled to be able to negotiate volume discounts. Second, e-ordering systems provide a transparent bidding platform for a growing number of suppliers, thus increasing price competition. Reduced probability of human mistakes in ordering and storing due to the use of IT allows improved inventory accuracy. Enhanced inventory turnover, in turn, is largely due to reductions in average inventory levels.

Inventory level reductions come from increased inventory accuracy and enhanced transparency of incoming raw material and replenishment deliveries. Other effectiveness and efficiency gains provided by e-ordering systems include lower transaction costs mainly due to less manual work in the process (Presutti 2003) and shorter order cycle times meaning that users receive requested goods or services faster (e.g. Johnson & Klassen 2005, Presutti 2003, Reunis et al. 2001). The following figure (Figure 2) depicts the performance indicators for the e-ordering process.

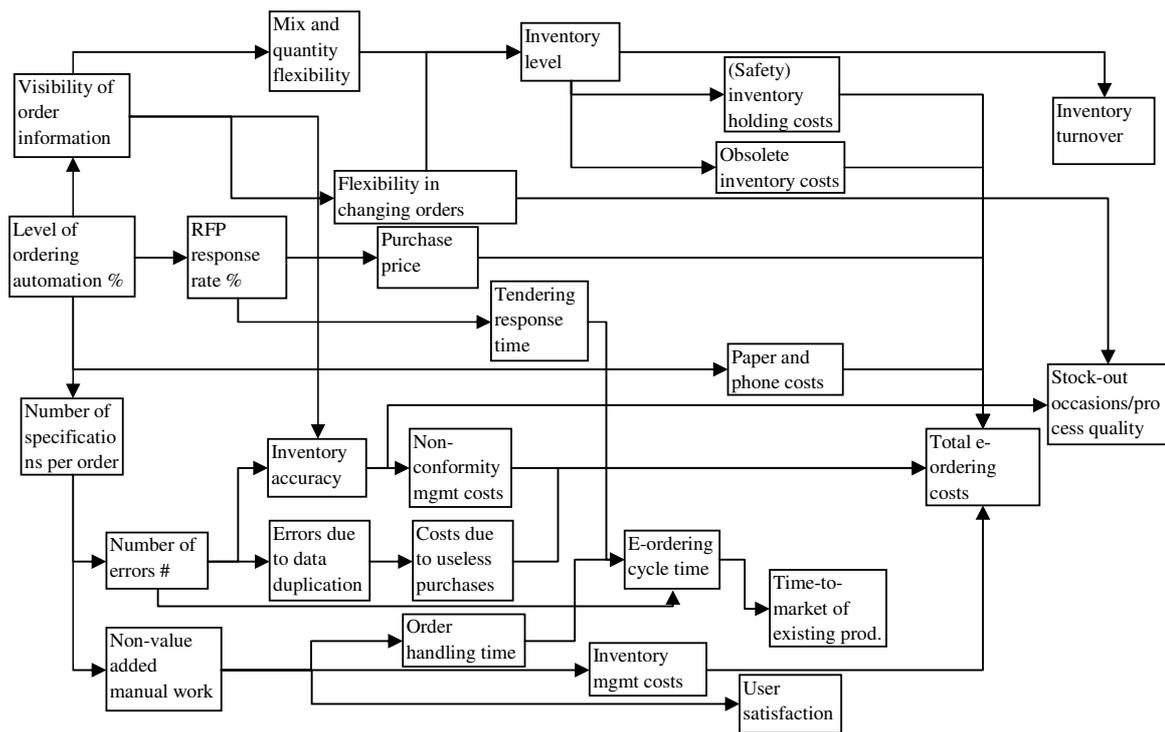


Figure 2. E-ordering performance indicators.

4.2 E-invoicing impacts and performance indicators

The benefits from the electronic invoicing process of invoicing stem primarily from the decreased processing costs and numbers of errors, reduction of materials use, and decreasing handling times. Penttinen & Hyttiäinen (2008) argue that adopting e-invoicing has clear benefits; transition from

paper bills to e-invoicing brings considerable financial savings. It has been estimated that an incoming paper invoice incurs cost of 30-50 euros to the receiving company. By moving to electronic invoicing, these costs can be cut considerably mainly due to reduction in handling costs (Penttinen 2008). The following figure (Figure 3) depicts the performance indicators for e-invoicing process.

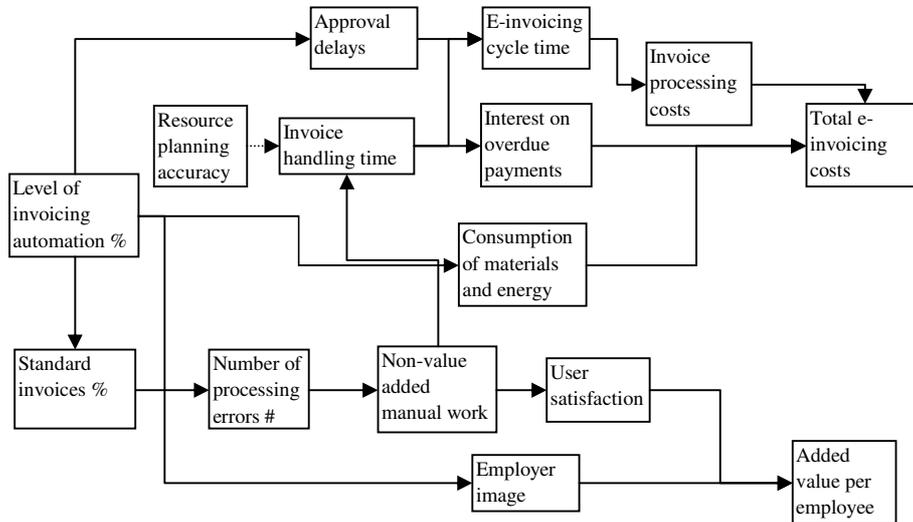


Figure 3. E-invoicing performance indicators.

4.3 E-payment impacts and performance indicators

The promise of e-payment has been that they ease payment and lower transaction cost (Southard 2004). Cotteleer et al. (2007) listed top ten attributes based on perceived value for B2B e-payment users across multiple U.S. industries and found that transaction cost savings was considered most valuable. These cost savings come from improved processing efficiency – no more manual feeding of payment information is needed etc. Shorter payment cycles can also result in savings for the buyers in form of possible vendor discounts for early payments (Jolly 2007). The following figure depicts the performance indicators for electronic payment process.

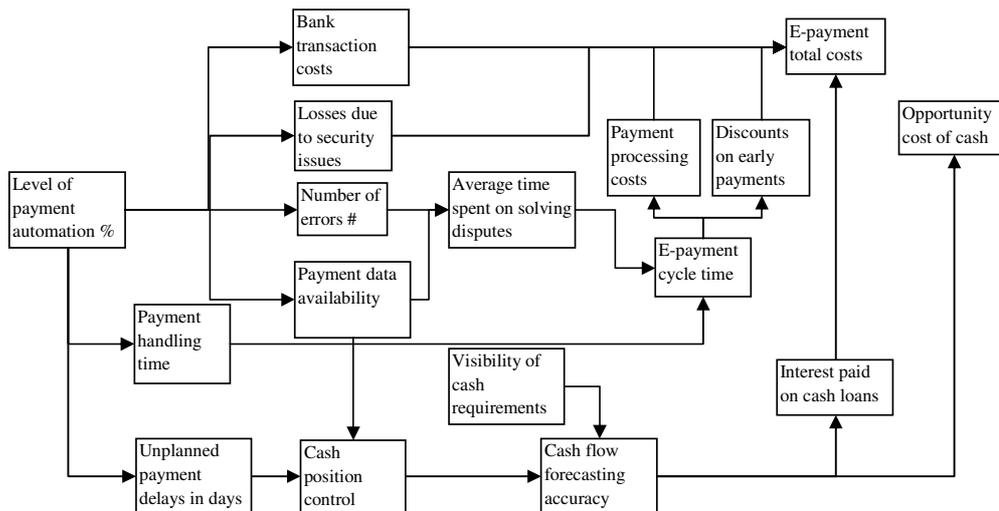


Figure 4. E-payment performance indicators.

4.4 Links between the processes

So far, we have reviewed a group of indicators that can be more or less assigned to each function along the order-to-payment cycle. This is insufficient due to a couple of reasons. First, in real-life, the situation often is that operational level indicators are in active use but too often there is not a proper connection to business thinking. This leads to operations-driven improvement, rather than business-driven improvement – people in operations do not necessarily know the business impacts of their efforts. Also, some of the indicators used to evaluate process level performance can be included in cross-organizational service level agreements (SLAs) without actual knowledge of their economic effects. Second, it was already proposed that in addition to the individual sub-process level impacts, IT usage actually impacts the inter-process linkages as well. Therefore, we must strive to uncover the linkages between IT inputs on the grass-root level and the company level economic outputs as well as between the three functions. In developing the holistic evaluation tool (illustrated in the next section through the case example), we identified a number of links between the processes. Due to page limitations, these links will only be available as an appendix (Appendix 1).

5 CASE

To test the proposed evaluation tool, we conducted an in-depth case study at Marimekko Corporation, which is a leading Finnish textile and clothing design company that was established in 1951. The company designs, manufactures and markets high-quality clothing, interior decoration textiles, bags, and other accessories under the Marimekko brand, both in Finland and abroad (for further details see www.marimekko.fi). We conducted six face-to-face interviews with representatives from the company's financial administration, purchasing, logistics and IT departments.

Using IT in financial administration is nothing totally new to Marimekko – they adopted e-banking systems and even electronic ordering already a few years ago. However, they have only quite recently adopted electronic invoice handling systems for incoming invoices. Approximately 16,000 – 17,000 invoices flow through their invoice management system (IM) every year. Although they have systems at place, they do not currently measure the impacts of IT usage in this context. However, they consider measuring important, particularly as basis for process development and as justification for the recent IT investments.

First, we decided to analyse the current state of processes; examining which phases exactly along the order-to-payment cycle are automated and which are still conducted manually. Further, we asked people from different functions to intuitively identify benefits that they consider important regarding process automation in the financial administration. Benefits they assigned for e-buying were mainly related to cost avoidance and time savings but also enhanced user satisfaction was reported. As for future challenges, enhanced asset utilization was considered most critical due to the fact that Marimekko currently holds substantially large inventories. Reported benefits regarding electronic invoice handling included centralization, decreasing circulation time and also reliability of electronic document exchange compared to regular mail. Perceived e-payment benefits were undisputed: reduced manual feeding leads to fewer errors, handling time reduction, and cost savings.

Finally, we asked people from different functions to comment our evaluation tool (regarding e-ordering, e-invoice handling and e-payment). It was very much a pleasure to see that during this exchange of thoughts, other important impacts were identified in addition to the ones that were first intuitively stated. The collected feedback regarding each measure was categorized (high, medium or low) according to expressed importance. Appendix 1 illustrates the evaluation tool from the point of view of Marimekko. We colour-coded the indicators so that green stands for highly important, yellow is medium, while red stands for low. After this, it was quite easy to draw “critical paths” for each sub-process. The ones marked with thick solid arrows illustrate the most critical mechanisms of value

creation. Dashed arrows show the paths that were considered slightly less critical yet worth considering.

E-payment systems in the case company are fully developed and well integrated into invoice management systems. Accounts payable sends a batch of payment proposals to the cashier and after that it takes only three clicks and approximately half a minute to approve and complete payments. Hence, there is limited potential for improvement in the payment section. That is why most of the boxes in payment are green and critical paths were not even drawn between them – there is hardly anything “critical” left to be improved in the payment side. Challenges at Marimekko relate more to the electronic integration aspects between payment and the other functions, particularly in how the order information could be better utilized in cash flow management and forecasting (illustrated by yellow boxes and the dashed path in payment).

It became clear that the yet untapped potential lies mainly on automating invoice handling and ordering even further. Critical paths in e-ordering include the above mentioned inventory level challenges and its effect on holding costs as well as asset utilization (turnover). One major challenge would be to automate inventory management even further to save buyers’ time. Additionally, reduced routine work enhanced user satisfaction. Another e-buying related issue is visualized by a dashed path: currently, buyers go manually through stock listings in order to identify purchase requirements and inevitably miss some requirements. This will of course lead to longer lead times and late deliveries to customers. If information systems would manage inventories automatically and alarm buyers when needed, human mistakes would decrease and thereby they would be able to deliver on-time to their customers. This could, through improved customer satisfaction, increase sales and thus create economic value for the company. The problem is, however, that these revenue side impacts are difficult to measure.

In invoice handling, circulation time was considered more critical than actual handling time and related costs. The largest obstacle was actually identified to be “approval delays” which refer to the time each invoice has to wait for approval at each person’s “desk”. Another related critical phase is getting purchased goods visible in stock as soon as possible. Standardization of documents was also considered highly important in order to avoid mistakes and needless rework. The same goes for system integration, where the question is how to standardize documents so that systems would understand each other leading to fewer mistakes and how to utilize the potential of information visibility in order to promote dialogue between purchasing and sales?

Part of the proposed indicators (such as inventory levels and some cost items) could be translated into relevant metrics directly; they could be derived from data already stored in company information systems. Others would require field studies, for example measuring the handling time spent on particular activities or user satisfaction. In fact, an important lesson learned from this case study is that the actual metrics have to be agreed upon according to individual characteristics of each case company.

All in all, it seems that in the case of Marimekko, impacts of automating the order-to-payment cycle relate closely to cost avoidance as intuitively stated. Yet contradictory to the intuition, a strong emphasis on asset utilization can be observed – better use of IT could enhance utilization of existing human resources and capital, affecting company profitability. They also leave the door open for revenue impacts with some reservations; the message was that these impacts are important yet difficult to observe and evaluate. However, it seems that the evaluation tool can be used in a real-life company context as an instrument for communicating, categorizing and sketching impacts and related measures. To be able to really measure and get accurate quantitative results, one would have to dig deeper to identify actual metrics that best indicate desired impacts and make efforts to collect relevant data.

6 DISCUSSION AND CONCLUSIONS

In this paper, we set out to build an evaluation tool to assess the impacts of the electronic order-to-payment cycle. We reviewed the extant literature and conducted expert interviews. Based on these, we built an evaluation tool that was divided into three sub-processes: e-ordering, e-invoicing, and e-payment. We then conducted a case study at Marimekko to illustrate how the proposed model works in real-life context.

In addition to case Marimekko, we tested the model in two supplementary case companies. Cost related effects were repeatedly emphasized which further supports the argument about impacts of automating order-to-payment cycles being cost-centric. However, the message was that once applications were implemented, challenges and post-auditing efforts related closely to better asset utilization. As a comparison, a retailing company reported that the share of e-orders in direct buying is already close to 100%, whereas current challenges relate to digitizing and centralizing indirect purchases. Concerning the e-invoice indicators, enhancing efficiency of the e-invoice “approval loop” was considered as a major challenge in all case companies.

The use of IT offers undisputed potential for process improvement in financial administration. Companies are making efforts in this area, yet progress is slow. Most companies have already well-established e-payment systems at place and electronic invoice management systems seem to be the current area of concern. Probably the largest unutilized potential lies in developing smart electronic applications for ordering. Despite of the potential, companies do not often monitor impacts of IT usage in this context. They rather implement, see what happens and never actually quantify the benefits. This might have undesirable effects – it is difficult for the companies to improve operations and further IT development investments might be impossible to justify. Measurement could thereby enhance the already great potential of process automation, yet it is rarely utilized. This contradiction acted as motivation for the whole study.

We developed an evaluation tool which strives to visualize mechanisms of value creation in the electronic order-to-payment cycle. The tool offers visibility over and across the entire business activity. As the case study showed, it works quite well at least as an instrument for cross-functional communication. Also, hierarchical categorization of metrics turned out to provide a useful skeletal structure for identifying critical cause-and-effect linkages between impacts. The purpose of building the model was to raise thoughts, promote awareness and provide a platform for productive dialogue. Based on the first company case, we can safely say that this objective was already fulfilled. Exact measurement would require extensive field studies within the organization.

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Appendix 1

