

# Transition to e-invoicing and post-implementation benefits. Exploratory case studies

Information Systems Science

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## *Abstract*

This paper aimed at exploring the transition to electronic invoicing in real business settings with a focus on the transition experiences and post-implementation benefits withdrawn up to the present. To obtain detail-rich findings, multiple case study research was preferred over other research methods. The results of the three case studies were analysed through the prism of IT business value literature and compared to other papers on benefits of e-invoicing.

The cases showed that electronic invoice handling technology enhanced control over company invoicing, allowed better management of payables, and indeed increased labour productivity in invoice handling units. These and other realized benefits, such as processing time and cost savings, reduced interest on over due payments, decreased paper waste, etc., are expected to grow as the level of true e-invoice penetration and the development condition of the technology itself will mature. Due to insufficiency of data, the re-utilization patterns of labour released after the automation of invoicing in other more productive duties across the organization were found indecisive. As a transactional type of IT that is prone to network externalities, electronic invoicing system is posited to aid company financials largely through contracting costs, rather than boosting sales.

Besides the theoretical implications, the paper also offers practical considerations for implementation of electronic invoice processing technology and further promotion of e-invoicing.

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Keywords: e-invoice, electronic invoicing, electronic invoice processing technology, IT value, post-implementation benefits, productivity, case study

## *Tiivistelmä*

Tämän työn tarkoituksena oli selvittää yritysten kokemuksia sähköiseen laskutukseen siirtymisestä sekä tutkia siitä saadut hyödyt. Seikkaperäisten tulosten saamiseksi tutkielma toteutettiin multiple case –tutkimuksena. Case:ien seurauksia analysoitiin IT:n liiketoiminta-arveteorian valossa sekä vertailtiin muiden verkkolaskutustutkimusten tuloksiin.

Tutkielman empiirisessä osuudessa havaittiin, että case- organisaatioissa sähköinen laskutusjärjestelmä edisti ensisijaisesti yrityksen laskutusprosessin valvontaa, helpotti erääntyvien maksujen hallintaa ja kohotti laskutusosaston työntekijöiden tuottavuutta. Lisäksi sähköinen laskutusjärjestelmä auttoi supistamaan laskun prosessointiaikaa ja –kustannuksia, pienentämään erääntyneiden ostolaskujen korkomaksuja, vähentämään paperin käyttöä, ym. Näiden tehokkuushyötyjen odotetaan edelleen kasvavan kuin e-laskujen penetraatio yrityksen laskustoimintaan lisääntyy ja sähköinen laskutusteknologia itse tulee entistä kypsemmäksi. Riittämättömien tietojen vuoksi tutkimuksessa ei voitu yksiselitteisesti näyttää miten yritykset hyödyntävät laskutuksen automatisoinnin ansiosta vapautettua työvoimaa. Verkostovaikutuksia omavana transaktionaalisenä IT- tyyppinä, sähköinen laskutusjärjestelmä todettiin kohentavan yrityksen tulosta pääasiallisesti kustannuksien supistumisen kautta myynnin edistämisen sijasta.

Tietopuolisen merkityksen lisäksi tutkielma tarjoaa myös käytännöllisiä näkökohtia sähköisen laskutusjärjestelmän lanseeraukseen sekä e-laskutuksen edistämiseen.

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Avainsanat: e-lasku, verkkolasku, sähköinen laskutusjärjestelmä, e-laskutus, IT:n liiketoiminta-arvo, toteutuneet hyödyt, tuottavuus, case- tutkimus

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# 1 INTRODUCTION

This study is carried out within the frameworks of the Real Time Economy (RTE) Programme founded in collaboration with Tieto Plc and Aalto University School of Economics and partly funded by the Finnish Funding Agency for Technology and Innovation (TEKES). The Programme aims at research and promotion related to the implementation of new information technologies that enable real-time business processes, and consists of three subsequent projects focusing on electronic invoicing (e-invoicing), value chain processes and electronic accounting respectively. More specifically, the current thesis work is complementing the first part of the Programme by looking into the adoption of e-invoicing technology and realized benefits within a number of Finnish organizations.

## 1.1 BACKGROUND NOTES ON E-INVOICING AND RATIONALE FOR THE STUDY

Electronic invoicing as an emerging technology has been taking increasingly more attention in recent research and given a number of implementation initiatives, both domestically in Finland and different parts of the world.

While European Commission's Directorate General for Enterprise and Industry broadly defines e-invoicing as the electronic transfer of billing and payment information via the Internet or other electronic means between the parties involved in commercial transactions, this study uses a narrower definition. It refers more specifically to the transmission of invoices in a structured format through XML<sup>1</sup>-based open standards (Penttinen 2008) such as Finvoice, PostiXML

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<sup>1</sup> Extensible Markup Language, used for encoding documents electronically ([www.w3.org/TR/REC-xml/](http://www.w3.org/TR/REC-xml/)).

and TEAPSSXML in the Finnish context, and, thus, invoices in e.g. .doc, .xcl, .pdf, .jpg, etc. formats sent as attachments in e-mails are left out from the scope of this e-invoice definition.

At the European Union (EU) level within the Single Euro Payment Area (SEPA) project, e-invoicing is seen as a major contributor to European integration, transaction transparency and costs reduction, as well as to environment preservation, which is supported by a number of recent studies (e.g. EEI 2007, Capgemini 2007). Besides the afore mentioned and other advantages of e-invoicing, such as e.g. contribution to work efficiency and triggering of introduction of other digital transactions, it is also deemed to be a significant source of productivity<sup>1</sup> increases in Europe (Harald 2009).

Regardless of sound reasons to transfer to e-invoicing, a certain lag in adoption has been observed both in business-to-customer (B2C) and business-to-business (B2B) contexts. Even in Finland, though the country proved being a leading society in technology development and penetration<sup>2</sup>, out of all businesses there were only 34% receiving and 32% issuing e-invoices at the beginning of 2008 (Exhibit 1). Some of the restraining factors voiced were, for example, lack of conversion between operators, inability to send extra information together with an invoice such as file attachments, inflexible cost structures among companies, operators and banks, and differences in both data interchange standards and local legislation in relation to international e-invoicing (EBA 2008, Penttinen 2008).

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<sup>1</sup> Labour productivity is the ratio relating the output per worker to the inputs invested to produce it. Labour productivity growth measures how efficiently the resources are used to create value (Dedrick et al. 2003). In multifactor productivity, output is related to combined inputs of labour, capital and intermediate purchases. Capital here includes equipment, structures, land and inventories. Intermediate purchases are composed of materials, fuels, electricity, and variety of purchased services (Science-dictionary.org).

<sup>2</sup> Finland ranks seventh by IDC's Information Society Index measuring the ability of 53 countries to participate in the information revolution. Accessed 10 November 2006.

The lag in ubiquitous adoption of e-invoicing is reckoned to hinder the apprehension of considerable benefits at company and society levels. For academics, the lag also means that there is obvious scarcity of company data which can be used for assessing business value of the e-invoicing technology. In this respect, the current thesis uniquely contributes to the existing literature by exploring real life cases of the transition to e-invoicing and post-implementation gains that companies have been able to withdraw so far.

Having obtained in-depth information and factual support from the business life, the study helps to trace the experiences, understand internal processes, and see bottlenecks and success factors upon the implementation of electronic invoice handling system. This information can be used further, e.g. in studies investigating the technology adoption and suggesting best practices when automating invoicing and other routine office processes. The fact that the thesis also finds the evidence on actual post-implementation gains may facilitate promotion of e-invoicing among the businesses and prompt them to sooner undergo the transition.

## 1.2 OBJECTIVES OF THE STUDY

E-invoicing nowadays is receiving greater awareness among related stakeholders thanks to proactive work of the European Commission and efforts of individual companies and organizations in Finland and abroad. For example, the Real Time Economy competence center at Aalto University School of Economics alone has conducted and gathered various studies on e-invoicing. These, for instance, include papers on e-invoicing initiatives in Finland and EU (Penttinen 2008), impacts of the e-invoicing implementation on buyer-seller relationships (Penttinen et al. 2009), business value of electronic order-to-payment cycle (Lempinen & Penttinen 2009), and so on. Interesting facts on e-invoicing are also

found in a number of Master's theses (e.g. Rofhök-Björni 2006, Lempinen 2009).

Herewith, this study primarily aims at complementing the existing research on e-invoicing with real life case studies exploring the transition to e-invoicing in a number of Finnish organizations with a focus on the transition experiences and post-implementation benefits withdrawn up to the present. Yet ideally, the thesis is seen to practically contribute to the promotion of e-invoicing and computerization of other routine office practices that will help better tackle environmental and social challenges of our century.

Explicating the objective in more detail, the study seeks to investigate the impacts of implementation of electronic invoice handling technology on e.g. cost savings and labour productivity, compare the findings of case studies against the theoretically attributed benefits of e-invoicing and IT in general, explore the internal processes, such as e.g. the decision making in relation to the labour resources released after the automation of invoice handling, and offer practitioners the insights from real business cases of the transition to e-invoicing for further reference, learning and possible benchmarking.

### *1.2.1 Research question(s)*

In order to meet the thesis objectives and produce comprehensive results, the following research questions have been formulated: *What organizational processes does the transition to e-invoicing involve? After the adoption, what benefits/gains (theoretically attributed to e-invoicing), and how successfully, a company is able to apprehend? How can electronic invoicing be further promoted among businesses?*

### 1.3 SCOPE OF THE WORK

By means of multiple case studies, the thesis looks into the implementation of electronic invoice handling technology in three Finnish organizations and assesses how well these have been able to apprehend the benefits attributed to e-invoicing technology. The cases are largely built around incoming invoicing, because it is where the most benefits of electronic handling are expected to evolve.

Invoice handling itself is a very tiny process of supportive and non-revenue-generating nature that is intensely coupled with other processes within a supply network. Measuring contribution of e-invoicing benefits, such as e.g. productivity gains or profitability effects, at the level of a company's financials may be almost unfeasible due to complexity of interrelations of variables and often lack of relevant data. Herewith this study is bounded to rather look into qualitative merits and straightforward quantitative enhances observed at a department or individual level where appropriate.

When assessing the processing costs of an incoming invoice, the study only looks at the human labour requirements to handle one invoice. The estimates, thus, include purely labour costs per invoice processed, while other possible non-labour costs, e.g. technology license and service fees or complementary investments in training and reorganization, are left out from the scope of this thesis.

There are also limitations to the representativeness of the study's findings. Due to the nature of case study research, the results are summarized only to offer analytic, not statistical generalizations, and, thus, extrapolating the findings over larger number of companies may not be scientifically correct.

#### 1.4 STRUCTURE OF THE PAPER

The paper is organized as follows. In the second chapter the theories and complementing literature on information technology implementation and business value are reviewed, and several existing studies on e-invoicing benefits are discussed.

The third chapter justifies the choice of the research methodology and case organizations, and describes the research design. The chapter four introduces the chosen companies, and provides a detailed presentation of each e-invoicing case. The final section summarizes the findings, compares them with the underlying theory and research, and offers points to consider for managerial practices. The paper is resumed with suggestions for further research.

## 2 IT BUSINESS VALUE: REVIEW OF PRIOR RESEARCH

As information technologies have assumed a large role in business and society in overall, they have also come under greater scrutiny. While nowadays businesses increasingly demand that IT investments<sup>1</sup> demonstrate measurable returns, the academic counterparties continue to hotly discuss the topic of IT value and feed the argument with often contrary research findings. This chapter of the thesis presents key findings of the prior research on the value of information technologies and systems, reviews productivity and profitability aspects in more detail, discusses IT value realization coupled with different management practices, and concludes with the benefits attributed to electronic invoicing.

### 2.1 DEFINITION OF BUSINESS VALUE IN INFORMATION TECHNOLOGY CONTEXT

Though no office can nowadays survive without machines, technologies and networks, information technology<sup>2</sup> has become a matter of concern for business management and scholars. Great hopes and vision of IT's enormous potential to change the world of business and substantially improve its financial performance favoured the enormous growth of IT at the end of the last century, but surprisingly collided against the sober facts of the financials. It turned out that immense investment in information technologies does not necessarily mean a better competitive standing and abnormal increase in profits for every company.

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<sup>1</sup> Broadly defined, it includes investments in both computers and telecommunications, and in related hardware, software, and services. However, in many of the earlier studies in IT productivity, IT investment is limited mainly to computer hardware (Dedrick et al. 2003).

<sup>2</sup> Generally, information technology (IT) can be defined as a set of tools, processes, and methodologies (such as coding/programming, data communications, data conversion, storage and retrieval, systems analysis and design, systems control) and all associated equipment employed to collect, process, and present information (BusinessDictionary.com). For the purposes of this paper, IT mainly refers to office automation, i.e. computerization of routine organizational processes.

While there is a general assumption that IT improves productivity, managers are increasingly put under pressure to justify the investment outlay by quantifying the business value of IT.

In academic literature one may often see slightly different definitions for the term *business value* in relation to IT. It may, for instance, collectively refer to the impacts of information technology on the organizational performance, such as productivity enhancements, profitability increase, cost reduction, market share, improved inventory management, etc (e.g. Hitt & Brynjolfsson 1996, Mukhopadhyay et al. 1995). In other studies the definition can be more financial return bound (e.g. Weill 1992), as profit is the main meaning of any business. In this sense, IT can only deliver value through increasing or protecting profit and return on investment, which can be achieved by improving or sustaining revenue and reducing costs.

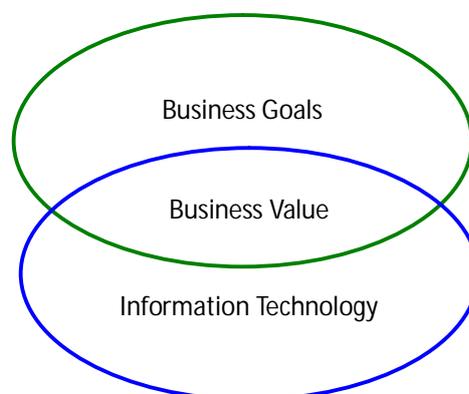
The dimensions named in the above definitions can, according to Melville et al. (2004), be clustered into two approaches to value, namely efficiency and effectiveness. The former refers to internal perspectives of firm performance, i.e. productivity enhancement and cost reductions, and the latter is related to the achievements in a firm's external environment, such as attainments of greater market share by developing unique competitive advantage in terms of e.g. strategy, technologies or assets (Melville et al. 2004). Hitt and Brynjolfsson (1996), however, assert that productivity is most closely associated with the very process of value creation, though other impacts are also important and often interlinked with productivity. Should IT investments lead to enhanced productivity, then more output is produced for a given quantity of input, which in turn leads to increased value that can be distributed among the company that made an investment, its suppliers, customers and other possible stakeholders (Hitt and Brynjolfsson 1996).

Sward (2006) takes a little different focus when elucidating the value of information technology. He broadens the definition of IT as the products, services and solutions that are deployed to store, retrieve, transport, and process information in the course of a business unit or end-user accomplishing a goal. He stresses the aspect of users and their tasks, and reminds that businesses deploy IT with a primary intention to assist employees in getting work objectives achieved. Business value, according to Sward (2006) is then the benefit for business unit and the enterprise as a whole, represented in dollar terms, that is the result of IT solutions or services, as evidenced by one or more of the following:

- direct contribution to the company's revenue or market position,
- deliverables and results that support solving business needs and challenges,
- cost savings or financial benefits, and
- examples of technology investment that advance the industry.

Figure 2.1 illustrates Sward's (2006) conception of business value of information technology as a product of the integrative relationships between business objectives, including user requirements, and IT capabilities.

Figure 2.1 IT Business Value



Source: Sward 2006

## 2.2 PRODUCTIVITY PARADOX

The first studies on IT value, i.e. the relationship of IT investments and productivity, were conducted in the 1980s - early 1990s focusing on aggregate industry and country-level productivity statistics as the firm-level data were largely unavailable. They sought to understand the role of IT in fostering economic growth and, consequently, the wealth of a country, but found little or no effect of IT investments on productivity growth (e.g. Loveman 1994, Barua et al. 1995, Strassman 1990).

In academic literature this phenomenon received a name of *productivity paradox*, as first stated by Solow (1987) and then elaborated by Brynjolfsson (1993) who summarized the research to date with the fact that, despite enormous improvements in the underlying technology, the benefits of IT spending have not been found in aggregate output statistics. Moreover, some studies produced even less encouraging results by finding that IT investments may be counterproductive and dysfunctional (e.g. Roach 1988, Weill 1992). For instance, Roach (1991) concludes that due to the introduction of IT related equipment, the output per "white collar" worker in some U.S. industries actually decreased or at least not kept the pace of production worker productivity in the manufacturing sector.

The productivity paradox motivated the academics to excavate the IT productivity deeper by using more refined research methods and larger data samples. Starting from around mid-1990s more recent firm-level data became available, which allowed the research to focus on exploring how increased levels of investment in IT affect labour productivity. These later firm-level studies used data of large U.S. companies, surveys of chief information officers, statistics on IT capital investments from market research firms, and employed econometric techniques that relate firm output, measured as value added by a firm, to a set of inputs including labour hours, IT and non-IT capital in order to estimate the marginal

product of IT capital (Dedrick et al. 2003). The findings report substantial contribution of IT investments to firm productivity and sometimes higher gross marginal returns than non-IT investments (Brynjofsson and Hitt 1996, 2003; Hitt et al 2002). For example, Brynjofsson and Hitt (2003) discover that for a large sample of companies studied over 1987-1994 the estimated contributions of computers are roughly equal to their costs in a short run, i.e. 1 year time horizon. In a longer run, i.e. 5 years, however, the contribution substantially rises above the capital costs.

Significant productivity gains were also reported by Weill (1992) who studied a sample of U.S. manufacturing firms over a period of 6 years. He argues, however, that a single measure of IT investment is too broad and should be broken down into IT for different management purposes, such as strategic (e.g. sales support), transactional (e.g. data processing) and informational (e.g. email system) investments. Weill (1992) found that transactional IT was strongly and consistently associated with labour productivity gains and stronger firm performance in overall, while heavy use of strategic and information types of IT were found to be neutral in the long run in relation to performance measures, i.e. labour productivity, sales and return on assets, partially due to the loss of competitive advantage as the technologies soon become common. Consistent with Weill's (1992) conclusions, Mukhopadhyay et al. (1995) assert that an understanding of the process by which IT is utilized is a prerequisite to assessing business value more correctly. Their study of EDI<sup>1</sup> technology introduced at Chrysler plant reports considerable productivity benefits. They find that total savings per vehicle is about USD100, where ca. 40% of this sum are attributable to decreased costs of information handling realized through reduced personnel costs and lower transmission charges.

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<sup>1</sup> Electronic Data Interchange is a system of electronic communication of business transactions, such as orders, confirmations and invoices, between organizations. EDI implies direct computer-to-computer transactions into vendors' databases and ordering systems. (PCMag.com/encyclopedia)

One of the explanations why the relationship of IT and productivity was not evident in earlier studies may partly be explained by learning curve the companies follow before being able to apply IT capital more productively. Indeed, Brynjolfsson (1993) refers to lags in withdrawal of benefits of information technology as a factor contributing to the productivity paradox. Lags in value realization are hypothesized to arise due to time and money consuming organizational adjustments that companies undertake before unlocking the significance of new technologies. Similar conclusions were made in the later research by e.g. Brynjolfsson 1996, Brynjofsson and Hitt 1998, Hitt et al 2002, Shao and Lin 2002, where computers are recorded to significantly contribute to technical efficiency and in turn give rise to productivity growth. For example, McAfee (2002), in his empirical investigation of ERP<sup>1</sup> adoption at one of U.S. high-tech manufactures, observed that after initial drop in lead times and on-time delivery these parameters significantly improved in months after the ERP implementation and soon surpassed the pre-adoption levels. He claims the observed performance pattern cannot be explained by rival causal factors, such as production and inventory volumes, headcounts and new product introductions, but presents an evidence of the timescale over which the benefits of IT appear. Lags in value realization are also confirmed in Byrd et al. (2006), where the results suggest that the effects of IT investment may be optimized over a period of a few years, rather than at a single point in time in close proximity to the actual implementation of a technology.

It would be commonsensical to expect that, if IT investments are increasing productivity at the firm level, they will also increase the productivity of entire industries and countries. Indeed, a number of more recent research at the industry and country levels has shown positive returns in the form of labour

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1 Enterprise Resource Planning (ERP) is an integrated information system that serves all departments within an enterprise. ERP implies the use of packaged software rather than proprietary one written by or for one customer. ERP modules may be integrated with an organization's own software and ERP modules may be customized up to the customer's needs. The system can include software for manufacturing, order entry, accounts receivable and payable, general ledger, purchasing, warehousing, transportation and human resources. (PCMag.com/encyclopedia)

productivity increases across many industrial sectors in late 1990s, and found that these increases were associated with greater IT investment. For example, in Stiroh (2001, 2002) two-thirds of 61 U.S. industry sectors he studied show an upturn in labour productivity after 1995, and industries with larger than average IT capital demonstrate higher labour productivity acceleration than other industries. Another evidence of the impact of IT investments is from domestic country level research, where Jalava and Pohjola (2007) demonstrate that the overall ICT<sup>1</sup> contribution to average labour productivity growth of 2,87% in Finland in 1995-2005 was as much as 65%.

It is interesting to notice that, though the overall pattern is positive, many industry-level studies show that there are differences in the impact of IT on productivity gains across industries (Dedrick et al. 2003). For example, manufacturing sector on average enjoyed higher productivity growth associated with IT investments than that in services (e.g. Gordon 2001, Triplett and Bosworth 2002). One of the likely explanations to these findings is the difficulty in measuring outputs in service industries (Dedrick et al. 2003). This is consistent with Brynjolfsson (1993) who underlines that nowadays value increasingly depends on intangible variables such as quality, convenience, responsiveness to customers, greater coordination of suppliers and timeliness in addition to the amount of products or services produced, and, thus, inputs and outputs are often difficult to identify correctly. This complexity has inevitably resulted in deficiencies in the measurement and methodological tools used by different researchers, which therefore has to be taken into consideration when interpreting the statistics on IT gains (Brynjolfsson 1993), especially for the service sector.

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<sup>1</sup> Information and Communication Technology is an umbrella term for information technology.

The differences in the results between contemporary studies and those of the 1980s can, thus, be attributed to low availability of quality data, less rigorous research methods and the very start of computer age; however, the fact that IT investment was too small a portion of the capital stock in the economy to have sizeable economic effects should also be considered (Dedrick et al.2003).

### 2.3 PROFITABILITY PARADOX

While the productivity paradox and its subsequent dismantling entertain the minds of theoreticians, actual IT investments are done by real companies that are interested in their own return, not that of the country as a whole (Dedrick et al. 2003). Therefore, business and technology executives have a concern whether the gains in efficiency associated with the launch of IT can show up in their firm's financials in a form of higher return.

To date there is mixed evidence at the firm level as to the impacts of IT investments on financial performance measures such as profitability or market value (Dedrick et al. 2003). For example, Barua et al. (1995) found that IT investment influences intermediate variables, such as inventory turnover, capacity utilization and product quality, which may in turn drive profits, but he could not confirm that the benefits extend to firm performance as measured by return on assets. Similar to the findings of Barua et al.(1995), the results of Byrd et al. (2006) also suggest that profitability increases thanks to the bottom line contraction, i.e. considerable cost reduction benefits, rather than to the changes in the upper line of the profit and loss account.

Hitt and Brynjolfsson (1996), in their study of 370 large U.S. firms, indicate that IT has contributed to increased productivity and brought substantial value for consumers, but there is no definite impact on profitability across the sample

companies. They explain this finding by claiming that IT value is composed of several related, but very distinct questions: whether IT investments increase productivity, improve business profitability, and create value for consumers. Though these issues are interrelated, they enquire ultimately different topics. The first asks whether IT has enabled the production of more “output” for a given quantity of “inputs.” The second considers whether firms are able to use IT to gain competitive advantage and earn higher profits than they would have earned otherwise. The final one is concerned with the magnitude of the benefits that have been passed on to consumers, or reclaimed from them. They conclude that while productivity and consumer surplus can facilitate higher business profitability, it is neither necessary nor sufficient as a firm’s financial performance is determined by a wider range of strategic and competitive factors. (Hitt and Brynjolfsson 1996)

Brynjolfsson (1993) explains the phenomenon of “productivity without profits” by referring to rent dissipation when the gains of IT investment flow towards consumers, thus, creating social benefits rather than a measurable return to the investments. A good example of this can be found from consumer banking industry, where ATMs<sup>1</sup> and electronic banking greatly aid the customers to handle their routine money management, but virtually create no straight revenue to the banks, and even can decrease labour productivity if calculated in written cheques and such.

Profits may also be affected by the redistribution of the benefits. This can occur when IT investments are disproportionally used for supportive business processes, such as e.g. market research or marketing, and though these processes are interlinked with other important functions within a firm, they would add little to total productivity and profitability (Brynjolfsson 1993).

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<sup>1</sup> Automated Teller Machine enables a customer to perform basic banking activities, even outside the working hours of a bank.

Competition is another culprit behind the unsustainability of supranormal profits. No matter how well protected a proprietary technology is, if it generates higher than average returns and the market has low “barriers to entry”, the competitors will soon be prompted to start using similar technologies and, thus, balance the extra profit away by driving the prices down (Hitt and Brynjofsson 1996). A firm can enjoy abnormal returns in a longer run only if it is able to retain the value, e.g. exclusive information technology or innovative use of those, or operates in a market with distinct barriers to entry (Hitt and Brynjofsson 1996). These conditions are fairly difficult to keep up nowadays as most markets are highly competitive and information technologies are virtually very easy to replicate.

There are also complementary factors that influence the payoff from IT investments. At the industry and national levels these may come from industry organization, economic structure, government policy, and investment in human capital (Dedrick et al. 2003). At the firm level, these may include supplementary investments as well as organization and management practices. Nevertheless, as Dedrick et al. (2003) concludes their review of the research on IT’s payoff, firm-level studies have so far failed to identify a clear link from IT investment to profitability.

The failure to document this relationship may stem from incomplete accounting of complementary investments and the inability to quantify and incorporate the various unobservable factors that determine a firm’s competitive position and outcomes. Moreover, the results offered by existent firm-level studies cannot be taken to represent the entire universe of firms, as the samples have only been formed from large public companies (Dedrick et al. 2003). These limitations necessitate the development of more sophisticated models for quantifying the IT investment – profitability relationship as well as the studies of larger range of company profiles.

## 2.4 SWITCHING POINT IN IT VALUE RESEARCH

Returning to the benefits attributed to IT in overall, Brynjolfsson and Hitt (1998) summarize that, while the productivity paradox can be considered as refuted due to the fact that benefits and average returns to IT investment are solidly positive, there is still huge variation across companies. Success stories of e.g. Dell and Cisco on the one hand are opposed by numerous examples of cost overruns, abandoned systems investments and failed IT projects on the other hand. In other words, some firms manage to use IT more productively than others. That is why the focus of today's IT productivity research is changing from the paradox towards the question of how automation and computerization can be made more effective.

Brynjolfsson and Hitt (1998) estimate that firm effects may account for as much as half of the measured benefits of IT, where two types of factors stand out. There are characteristics generally shared by all companies, e.g. organizational structure, strategy and management practices, and those that are unique to a certain firm, e.g. market position, brand recognition, rigidities in cost structures, and leadership abilities of key executives. The former can directly be influenced through restructuring, new management control systems, the redesign of work processes and employee training, while the latter can only change over time and are not easily manipulated in the short run (Dedrick et al. 2003).

Many researchers have attempted to detect a relationship between IT payoffs, management practices, business strategy and complementary investments. For instance, Loveman (1994) in his analysis of manufacturing firms argued that failed IT investments can partly be explained by management failure to effectively integrate IT with the firm's business strategy, human resource management strategy, and efficient resource allocation. For example, greater employee's empowerment and participation in regular decision making can add to overall motivation and job satisfaction. Indeed, Brynjolfsson and Hitt (2000)

show that companies with a cluster of management practices including decentralized decision-making tend to outperform firms with traditional hierarchical forms of management, given a comparable level of IT spending.

Upper management's understanding of the specifics of IT investments, deeper involvement in promoting, monitoring and assessment of technology implementation may additionally influence the returns, as confirmed by Weill (1992) who demonstrated that the commitment of a firm's management to IT projects enhances the contribution of IT investments to firm performance. This finding supports another Brynjolfsson's (1993) explanation for unproductive IT, namely what he calls mismanagement of information and technology. It is closely related to the so-called agency problem caused by company management who may act in other than the company's interests or simply use outdated criteria for decision making and pay insufficient diligence in relation to IT investments. For example, a mere increasing of IT spending without having clear goals for the technology introduced (Tallon et al. 2000) and investing proper efforts to disseminate it across the users, e.g. through training, policies and incentives, can predictably result in the implementation of inefficient systems and organizational slack.

Aligning IT investments along the overall business strategy has also become a commonly voiced action to better management of IT in a company. Indeed, Tallon et al. (2000) found that specific management practices, namely strategic alignment and IT evaluation, are strongly associated with perceived payoffs from IT investments. In particular, firms whose IT was closely aligned with the business strategy and who make extensive use of IT evaluation techniques and post-implementation reviews had higher perceived payoffs, while in firms where strategic alignment and investment assessment practices were weak perceived IT contribution was significantly lower. They also found that the very IT assessment

techniques can help firms to improve strategic alignment and enhance the ability of the IT organization to learn from its mistakes, which is critical to the discovery of best practices for managing future IT investments.

Likewise the study of Byrd et al. (2006) underlines importance of IS plan and its quality to the success of IT investments and realization of the benefits. By IS planning they refer to the development strategy of organizational IT stating the purpose, requirements of and goals for the systems implemented, priorities for choosing applications and system functions, etc., while IS plan quality stands for the extent to which the IT development strategy exists and creates opportunities for IT to provide benefits to the organization. According to Byrd et al. (2006), IS plans may even be more important today than in past years because of the many different types of IT and the extreme number of options in information technology. Making sense of how all the different types of technology such as personal digital assistants, Web services, enterprise resource planning systems, customer relationship management software, the World Wide Web, etc. might fit into overall organizational and business strategy is a challenging, but rewarding necessity for a smoother IT and business alignment which in turn can secure benefits from IT investments (Byrd et al. 2006). Otherwise, IT investments done on ad hoc needs basic without considering their further aptitude in a firm's IT asset portfolio can lead to that the productivity and monetary impacts of effective systems will be neutralized by ineffective systems (Mukhopadhyay et al. 1995).

Taking a bigger perspective, Weill et al. (1994) stress the importance of forming of and investing in *IT infrastructure* in order to enjoy better payoffs by enabling information systems<sup>1</sup> and individual IT initiatives to more effectively support

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1 In the literature on information technologies the notions of information technology and information system (IS) are often used interchangeably. For the purposes of this paper, an IS refers to a particular business application, e.g. e-invoicing system, that supports concrete organizational functions and work processes, whereas IT rather means the underlying technology framework consisting of a range of hardware, software and networks used to process, transmit and retrieve information for users (Melville et al. 2004).

business processes. They define IT infrastructure as the base foundation of IT capability, in the form of reliable services shared throughout the firm and provided by the information systems function. The IT capability includes not only technical, but also managerial expertise. For example, IT infrastructure services in a firm might include firm-wide communication network services, management and provision of large scale computing, universal file access, the management of shared databases and research and development expertise aimed at identifying the application of emerging technologies to the business. The investments in infrastructure are typically large and long-term in nature, and are critical for future competitiveness of firms. (Weill et al 2004)

In more recent literature, Ross et al. (2006) suggest a yet more comprehensive approach to managing IT in overall and ensuring that IT projects deliver against the expectations in particular. They assert that IT implementations carried out through the widely cited aligning of IT to the articulated business strategy are still problematic in many companies and it usually takes up to two years to employ a new system to support a new strategic initiative. Instead they advocate that firms should build their “foundation for execution” that results from carefully selecting which processes and IT systems to standardize and integrate, and greatly contributes to business agility on the whole.

The foundation for execution features three critical parts which need to be defined by a firm’s management. First is the operating model which is the necessary level of business process integration, e.g. the extent to which different business units share data, and standardization for delivering goods and services to customers. Second, the enterprise architecture is the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of a firm’s operating model. While the core of enterprise architecture is to identify the processes, data, technologies, and customer interfaces that take the operating model from vision to reality, its goal is to provide a long-term view of those so that individual projects can build

capabilities for the future, not only serve immediate needs. The third part of the foundation for execution is the IT engagement model which is the system of governance mechanisms that ensure business and IT projects achieve both local and companywide objectives. It influences project decisions so that individual solutions are guided by the enterprise architecture, provides for alignment between the IT and business objectives of projects, and coordinates the IT and business process decisions made at multiple organizational levels. According to Ross et al. (2006), commitment to the foundation would allow a firm to base its strategies on identifying opportunities to leverage its existing capabilities instead of mere reacting to customer demands or competitor initiatives, and, thus, prepare itself for future strategic engagement, without yet knowing what those might be.

Nevertheless, while there have been a number of management practices developed and appraised besides the above, e.g. COBIT<sup>1</sup> best practices of IT governance, PMBOK<sup>2</sup> project management guide, business process redesign<sup>3</sup>, etc. and there is now a strong evidence that these complementary investments can improve the performance of direct IT investments in some organizations, it is still hardly possible to extrapolate these findings to a wider sample of companies as well as to translate those into specific actions for individual firms.

A primary hindrance for such generalizations would naturally be idiosyncratic firm differences resulting in different opportunities and abilities to employ IT productively (Dedrick et al. 2003).

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1 COBIT is an IT governance framework and supporting toolset that allows managers to bridge the gap between control requirements, technical issues and business risks. COBIT enables clear policy development and good practice for IT control throughout organizations. COBIT emphasizes regulatory compliance, helps organizations to increase the value attained from IT, enables alignment and simplifies implementation of the COBIT framework. ([www.isaca.org](http://www.isaca.org))

2 The Project Management Body of Knowledge (PMBOK) is an internationally recognized standard that provides the fundamentals of project management which apply to a wide range of projects, including software, engineering, etc. ([www.pmi.org](http://www.pmi.org))

3 Business Process Reengineering (BPR) is, in computer science and management, an approach aiming at improvements by means of elevating efficiency and effectiveness of the business processes that exist within an organization. The core of BPR is in fundamental rethinking and redesign of business processes in order to achieve improvements in costs, quality, speed and service. ([www.wikipedia.org](http://www.wikipedia.org))

## 2.5 SUMMARY

The above overview of the research on IT payoffs can be concluded with an assertion that the productivity paradox has been put to rest thanks to the recent studies that have shown considerable convergence in relation to the productivity impact of IT investments. Mere automation of existing processes as such may or may not bring productivity gains, but when coupled with complementary investments and related organizational changes, productivity enhances are realized and perceived at most. Nevertheless, different researchers sometimes come to still conflicting conclusions and have diverse interpretations of the data. The concern behind is largely caused by measurement inconsistencies regarding the inputs and outputs of firms and whole industries. This is particularly true for the service sector, where measurement problems are most severe and IT returns are least understood. Individual differences and capabilities of firms to withdraw value from IT investments are, however, another explanation for divergences in research results.

The question of “productivity without profits” has so far remained a topical issue. The fact that current studies fail to show a positive relationship between IT investment and measures of overall financial performance may indicate that better datasets and models enabling to control for more of the additional factors that affect profitability need to be developed. The relationship of IT payoffs and investments in complementary assets and practices as well as the mechanisms by which some companies receive higher returns from IT use and accompanying investments than others need, thus, further investigation.

Within the frame of the current thesis, the literature reviewed provides some insights on how to approach the case studies, and allows making certain presumptions. The fact that electronic invoicing is a small part of a bigger order-to-payment process, that is in turn a part of supply chain management and so on in the hierarchy of business activities, suggests that it would be fairly impossible

to trace its value in the company's overall financials. Firms rarely assess the costs of individual processes and hardly ever thoroughly analyze IT investments after the implementation, which means that much of important data would be hard to find.

However, the impact of e-invoicing applications can be evaluated through more straightforward or intermediate variables, such as e.g. cost benefits from decreased labour requirements, time savings and volume of processed invoices per invoice handling employee, change in the interest paid on overdue invoices, number of invoices with errors, etc. In the methodology part of the thesis these and other impacts proposed by Lempinen & Penttinen (2009), Dolman (2005) and Lempinen (2009) will be systemized (Table 4.1) to check against when carrying out the case studies. The results will then be seen within the context of a certain company, but generalizations of e-invoicing value to other technologies will be avoided due to likely differences of technology purposes, implementation experiences, operational complexity, technology usage time, etc. as well as individual firm effects affecting the realization of IT benefits.

Also, consistent with the findings of the reviewed research, it is hypothesized that those case organizations that make complementary investments in the e-invoicing technology implementation, have set up goals for it, undertake evaluation check-ups of its performance, and have incorporated e-invoicing into overall IT's and business development strategy, should perceive e-invoicing benefits greater and realize better returns.

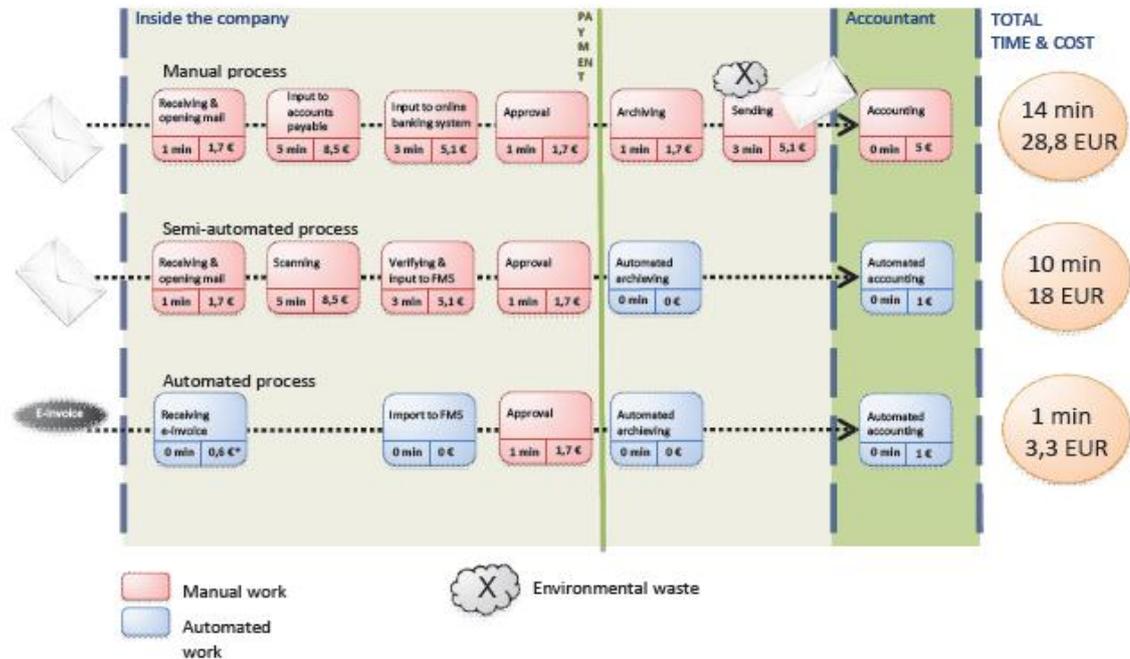
### 3 E-INVOICING: ENDUED BENEFITS

Environmentally friendly, time saving, cost effective, fast, error proof, and so on - before listing all the merits offered by proponent literature and developers of the e-invoice technology, it is wise to sketch and contrast the processes of manual and electronic handling of invoices to understand where the benefits may originate from.

As it was mentioned earlier in this paper, the thesis is largely focusing on incoming invoicing, because it is where major part of productivity gains is expected to emerge (Penttinen 2008). Borrowed from Penttinen (2008), Figure 3.1 gives an idea of the processing stages involved in handling of incoming invoice in a small private company. It contrasts conventional manual processing, when corporate accounting and payment systems are not integrated and all circulation of invoices in between the processing stages would happen in envelopes from desk to desk, against the contemporary semi-automated and true electronic modes of incoming invoice handling. As it is shown, the intermediate stages of invoice processing in the latter two are skipped thanks to automation.

Eliminating the need for manual opening of mail, registering the invoices by hand, floor circulation of invoices in envelopes, as well as scanning and controlling for right content in case of semi-automated processing, is ascribed with substantial savings and immaterial benefits. As Penttinen (2008) and Capgemini (2007) recap, these come from reduced manual work requirements, greater number of payments made on time, decreased costs of paper consumption, increased accounting transparency, more meaningful work for employees, and pro-environmental image of the company.

Figure 3.1 Handling stages, time and cost of incoming invoice in a small company



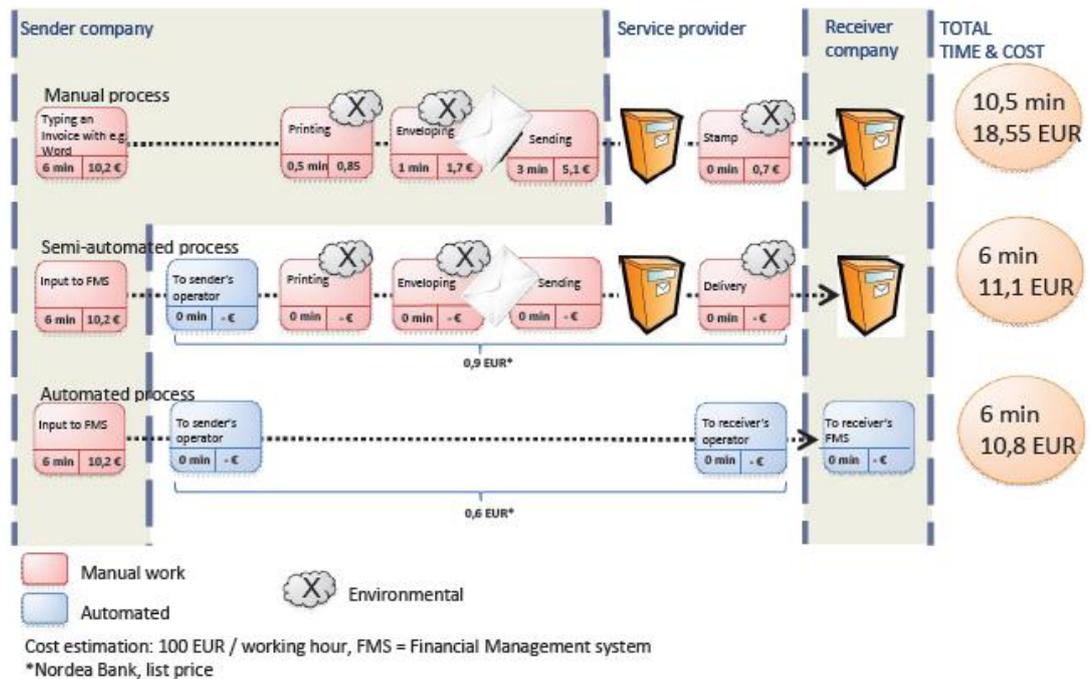
Source: Penttinen 2008

Besides the above, Dolman (2005) and Penttinen (2008) speak about a significant reduction in errors, as opposed to manual processing, real-time tracking, status notification, and instant delivery. These system features may result in reduction of costs and labour required for e.g. dispute resolution, reconciling overpayments when errors occur, follow-up phone calls, and increased return on cash as a company may receive discounts from early settlements. Dolman (2005) asserts further that electronic storage option creates savings as well thanks to elimination of warehousing and security fees, availability and easy retrievability of invoice data, and potentially lower overhead costs.

Most of the above benefits is equally accredited to outgoing invoice handling, however, due to longer processing time, savings of working time and employee costs are more conservative, as shown in Figure 3.2. On the other hand, growing

customer satisfaction associated with less error in invoices should overwhelm modest numbers in a long run (Penttinen 2008).

Figure 3.2 Handling stages, time and cost of outgoing invoice in a small company



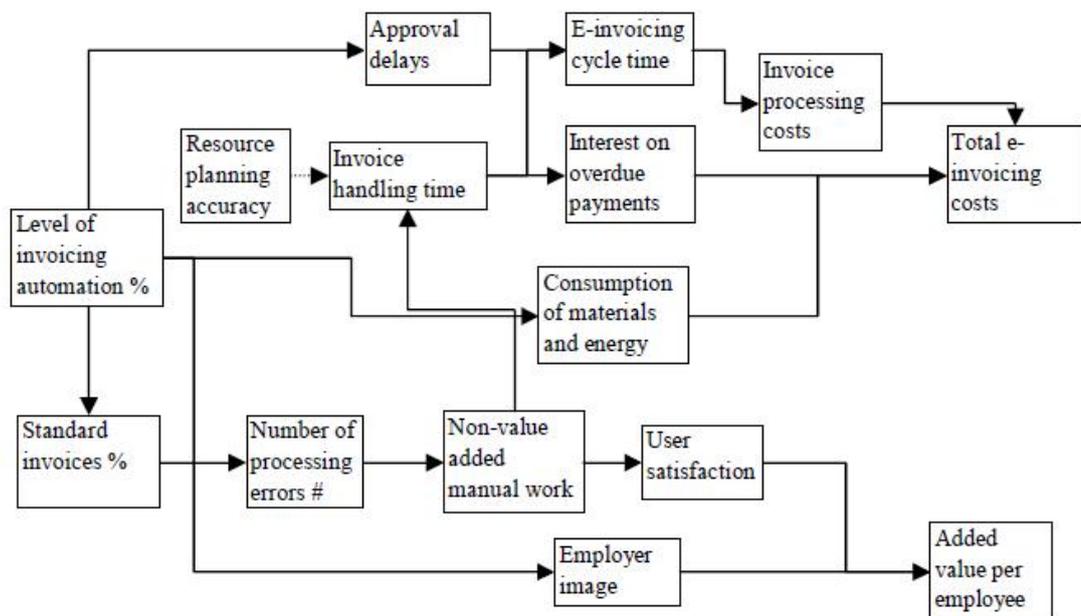
Source: Penttinen 2008

While the numbers given in Figures 3.1 and 3.2 are biased to a concrete business case, the relative differences are, nonetheless, fairly contrasting and inspiring. There is a reduction of almost 93% in time and 87% in costs of fully automated procedure over manual processing in case of incoming invoices. For an outgoing invoice the savings of automated handling are 43% in time and 42% in costs.

Taking into account the perceived or expected benefits, most of which are discussed above, Lempinen & Penttinen (2009) develop the metrics for assessing the value of electronic invoice handling technology at a company level. For example, they speak about value added per employee that comes in form of

more meaningful work thanks to automated routines, such as electronic handling of invoices. Another effect is that the image of an employer may improve, which in turn may result in and can be assessed by e.g. higher user satisfaction and increased interest from younger recruits. Other variables, such as e.g. faster cycling time and less error in invoice processing, may be expressed through improved customer satisfaction, reduced number of disputes, less overdue payments and so on. Figure 3.3 depicts the causal relationships of the metrics of e-invoicing value.

Figure 3.3 Causal structure of e-invoicing metrics



Source: Lempinen & Penttinen 2009

Many of Lempinen & Penttinen's (2009) metrics are used in the methodology part of this thesis (e.g. Table 4.1) when constructing the base for analysing the benefits realized in the case companies after the introduction of electronic invoice handling technology.

Speaking about the benefits at a macro scale, the European Associations of Corporate Treasurers (EACT) estimates that the resulting cost reductions in the supply chain expenditures across Europe would total 243 billion Euros (EEI 2007) once the e-invoicing would be fully adopted. A SEPA study sponsored by the European Commission provides estimates of EUR 226 billion Euros of monetary savings over six years in business-to-business transactions alone in the EU (Capgemini 2007). The Confederation for Finnish Industries assesses that yearly savings separately for Finland would be 2,8 billion Euros<sup>1</sup>. According to the estimates for environmental effects, the transition from paper bills to electronic invoicing would be seen in 12 - 16 million trees saved<sup>2</sup> annually in the EU alone.

Another widely ascribed benefit of the adoption of electronic invoicing is the increase in productivity the e-invoices offers (EEI 2007). To meet the challenges of ageing European population and reduced work force, the EU economies will have to pursue the ways of squeezing out the inefficiencies in business processes so that to ensure at least the present GDP and economy growth, according to the Chairman of EU Expert Group on E-Invoicing Bo Harald (2009). A soon coming shortage of tax payers and increasing numbers of senior population all over Europe, as Exhibit 2 illustrates, may well result in deterioration of development in many industry sectors, while affecting health care and public services most. Making labour in companies and whole industries more productive would be a winning solution (Harald 2009). Automation and digitalization of paper invoicing as well as other work processes, that reside in cost centers and have historically been performed manually, would, believes Harald (2009), be a core part of that solution.

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<sup>1</sup> Estimates of the Confederation of Finnish Industries (EK) ([www.ek.fi](http://www.ek.fi)).

<sup>2</sup> Estimates of e.g. Pagero Ltd., "Pagero and IFS – an expanded cooperation" press release of 29.11.2007, and GreenBill Ltd., Green Billing Calculator. Calculated for approx. 20 billion paper invoices issued in the EU per year.

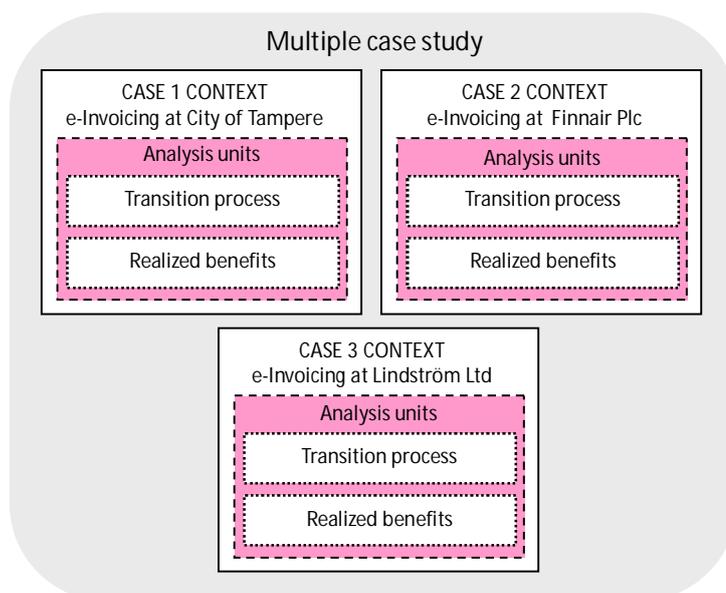
Naturally, there is an obvious increase in productivity in the invoice handling department as the amount of processed invoices per employee grows substantially. However, there is also another source of productivity expected to take place. Namely, the employees whose positions would become redundant due to automation can potentially be redeployed to other duties, reducing the need to hire new employees. In this manner, the company preserves the same level of capital investment in terms of personnel costs, but enjoys greater labour availability for the work where extra personnel are required. This is expected to be reflected in higher output/input ratio and hence, increase in productivity.

In practice, the redeployment may come as enrichment of daily occupancy of the invoice processing personnel with other functions, or as relocation of a fraction of the personnel to other departments within the organization. The often voiced duties the released work force can be assigned with are e.g. customer care, call center, sales, cash flow analysis, supplier relationships and such (Penttinen 2008, Dolman 2005). However, there is little evidence on whether and how successfully the companies-adopters have managed to take on an opportunity of relocating the freed human resources and actually withdraw benefits in terms of productivity gains from such relocation. In addition, as reasonably noticed by Lempinen (2009), staff relocation issues can be tricky in general. Namely, there is no guarantee that the idle work contribution will be used in more productive areas of work. Instead, the people, who formerly made routine work, may not have the necessary skills and abilities to do anything else and can therefore be fired and replaced with more skilful ones. However, sometimes firing people can be financially and "mentally" costly, and if the company thereby avoids it, redeployment can lead to organizational slack rather than bring productivity benefits.

## 4 RESEARCH DESIGN AND METHODOLOGICAL ASPECTS

The study's research questions are of exploratory nature and at the grass roots inquire about companies' experiences of the transition to e-invoicing and benefits realized after the technology's implementation. The latter may come as merely perceived and/or factually recorded, and their specific differences are naturally subject to the context. Moreover, e-invoicing itself, though being a promising technology, refers to a tiny work process of non-revenue-generating nature and its contribution to industry's productivity or company's financials is hard to trace statistically due to complicated interrelations of related variables. In order to best approach these issues as well as to reflect the study's practical question, i.e. how to promote e-invoicing and automation of routine office duties further, multiple case research design has been chosen over others as the one that enables disclosing detailed, data-rich contexts of e-invoicing implementation and companies' experiences, finding out straight-forward gains it brings in real business settings and challenges it faces. Figure 4.1 schematically illustrates the study's research framework.

Figure 4.1 Study framework



Source: adopted from Yin (2003)

As Yin (2003) stresses, multiple cases should be considered as multiple experiments that follow a replication logic. This means that cases are not sampled by the means of statistical tools from the entire pool of potential respondents, but rather selected from those that have analogous conditions and presumably yield comparable results<sup>1</sup>. The number of replications, according to Yin (2003), should depend on the certainty one would like to have for the multiple-case results. In the event where the underlining theories are grossly different, he suggests that a small number of cases would be sufficient. Taking into consideration the theoretical framework of this paper, which is in few words whether or not the e-invoicing technology brings the benefits attributed to it, three cases have been chosen.

Thus, the three case organizations are the City of Tampere, Lindström Ltd and Finnair Plc. All of the three fit the requirements of similar conditions of e-invoicing implementation: first, the companies are of a mid-to-large size range, operate heavy amounts of invoices where yearly figure for incoming invoices is from tens of thousands to hundreds of thousands, and have employees or whole departments dedicated to only invoice handling; second, automated processing of invoices has been launched approximately 5-7 years ago, and therefore all these companies have had adequate time for technology adoption, organizational learning, work processes restructuring and value realization (Brynjolfsson 1993); third, the providers of the technology have been chosen from few major and long established ones operating in the local market, which means systems and standards used in the case companies are either same or a comparable product from a competing provider; and forth, all companies fall under Finnish Labour Law and principles of employee protection, and, thus, the post-automation decrease in labour requirements in invoice handling departments would not be managed away with personnel layoffs at first place.

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<sup>1</sup> A literal replication (Yin 2003, p.47)

The latter condition is especially important as it allows seeing how well companies can utilize released work force for other more productive functions within a company, which is one of the widely cited factors to raise productivity.

Although all case organization fit basic multiple case requirements, there are nevertheless differences that are worth to mention. For example, the City of Tampere is a public organization that serves customers and works with vendors solely domestically. This implies that the City mostly has permanent continuous contract arrangements with their workers and is *obliged to* relocate the released hands to some other duties, as opposed to private companies who may employ under fixed job agreements and, thus, are more flexible with obsolete resources. It also means that the City may have higher e-invoicing penetration percentage because of merely Finnish suppliers and the fact that Finland is one of the leaders in e-invoice technology implementation. Finnair and Lindström operate internationally, which means that overseas vendors may not commonly have the e-invoicing technology at hand. Based on these implications, two assumptions can be developed: organizations with life-long work contract have larger fraction of relocated invoice handling personnel, and the more a company operates in (information) technology- advanced markets, the higher is the penetration of e-invoicing.

Table 4.1 summarizes the impacts of electronic invoice handling in a company suggested in Penttinen (2008) and Lempinen & Penttinen (2009), and lists possible control variables that may be used to assess these impacts. This list of impacts will be used as a reference when looking at and assessing the benefits of electronic invoicing in the case organizations selected for this thesis.

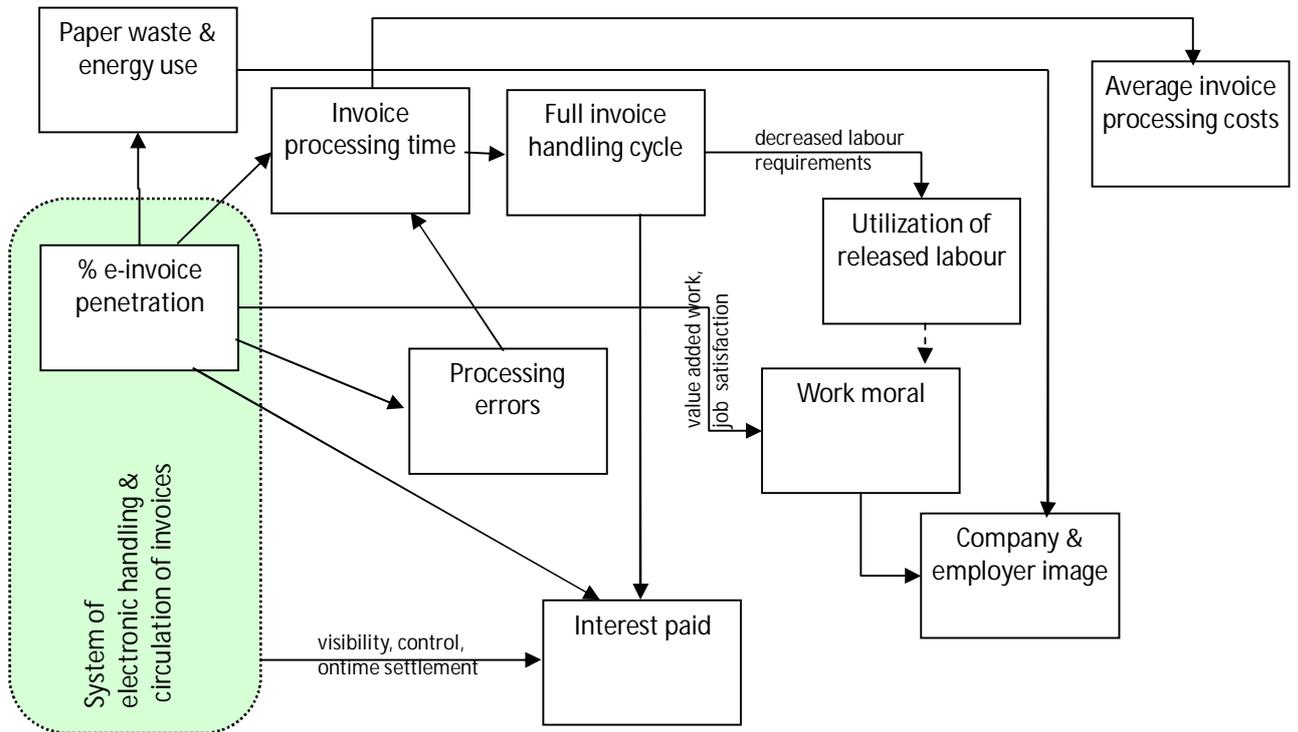
For better comprehension, Figure 4.2 also illustrates causal relationships of the impacts of the introduction of electronic invoicing handling system.

Table 4.1 Suggested impacts of electronic invoicing handling

No	E-invoicing impact area and suggested impact(s)	Possible control variable(s)
1	Invoice processing time (human labour time required to process an invoice from receiving until the payment): decreases thanks to penetration of true e-invoices that require less processing time	Reported labour time required to process one incoming invoice at different stages incl. opening, sorting, scanning, inspection, inserting required data, etc.
2	Invoice handling cycle (the whole circulation time from receiving an invoice through its payment including delay time between the processing stages): decreases thanks to reduced processing time and electronic circulation	Time from receiving an invoice until its transfer for approval, approval delay time, last check-up time before sending for payment;
3	Number of processing errors: decreases thanks to penetration of true e-invoices that virtually come with no error as opposed to manually handled invoices	Amount of error messages; delays in between the processing cycle stages;
4	Interest on overdue payments: decreases thanks to timely invoice management and reduced handling cycle	Amount of interest paid for late payments annually;
5	Invoice processing costs: decreases thanks to reduced processing time	Amount of human labour costs associated with processing of one incoming invoice;  For calculations fully loaded labour costs may be used, not only wages and employee benefits.
6	Released labour resources: can be re-used in more productive functions within a company	Number of invoice handling people freed up and internally redeployed; nature of the duties the workers perform after the redeployment;  These tell how successfully firms try and can re-utilize the released labour resources in other functions.
7	Work moral benefits: convenience and modernization of work routines add to user satisfaction and value added per employee	% of non-value added manual work; user satisfaction; employees' feedback;
8	Consumption of materials and energy: decreases thanks to less paper waste	Paper and energy savings (e.g. reflected in Income statement);
9	Organizational image (incl. employer image): improves thanks to pro-environmental work processes	Number of application per opening; repeated orders from customers; more interest from the media; employee loyalty and feedback;  These may tell about customers', partners', workers' and potential employees' perception of quality and environmental friendliness of a company.

Source: partially adopted from Lempinen & Penttinen (2009) and Penttinen (2008)

Figure 4.2 E-invoicing impacts: causal relationships

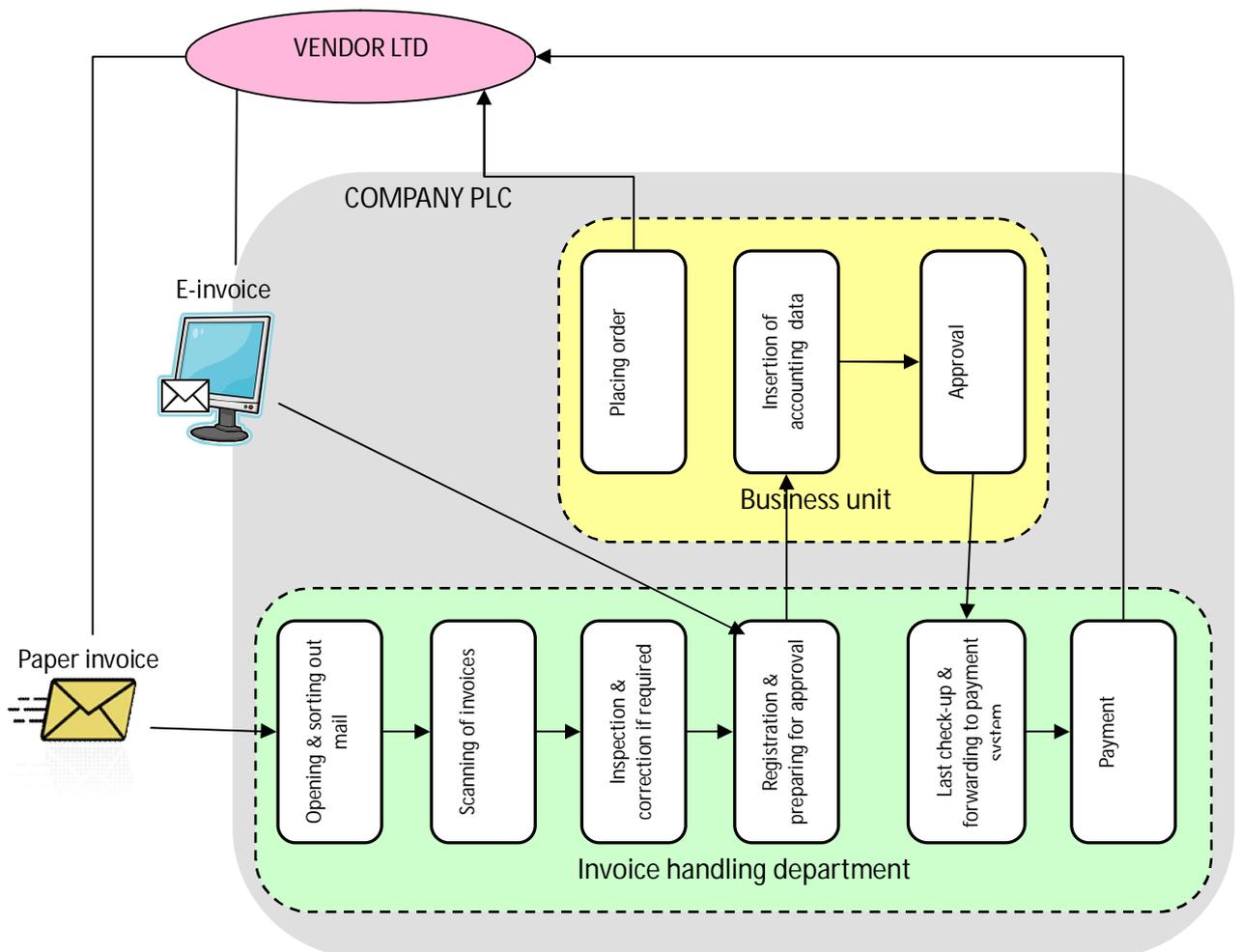


To correctly understand the cases' findings related to the impact areas 1, 2 and 5, it is sensible to elucidate what the terms of invoice handling cycle, invoice processing time, and invoice processing costs encompass within the frameworks of this multiple case study, and how these processing times and costs will be estimated.

All the case companies started off the modernization of their invoice handling systems by first centralizing the company's invoicing into a distinct business function to be carried out in a dedicated company unit, and then by acquiring electronic system for invoice handling and circulation. In practice this means that, at the present, a business unit that makes a purchase has to only participate in two processing fractions, such as approval and insertion of accounting information (e.g. project number, cost center, etc.), while all the other handling is

carried out by the dedicated invoice handling center. Before the centralization, an invoice used to be fully handled by a respective business unit. The implemented electronic invoicing system has allowed not only the automation of some processing stages, but also integration of invoice handling with other applications within the company ERP as well as electronic circulation and instant accessibility of invoice data by related users in the invoice handling department and business units. Figure 4.3 generalizes the organization of incoming invoicing processing across the case companies. It also represents invoice handling cycle with all related processing stages included for both of current modes of invoice handling, i.e. for semi-automated and electronic processing.

Figure 4.3 Incoming invoice handling cycle in case companies



Invoice handling cycle can, thus, be termed as total average time required to handle one incoming invoice from receiving until the payment of outstanding sum to the supplier. The estimates of contemporary invoice handling cycle will be compared with the estimate of conventional invoice processing where most of processing would be manual, circulation of invoices among related users would happen in envelopes from desk to desk, and accounting, payment and other corporate systems would have low integration. Manual processing is depicted in the upper line of Figure 3.2.

To obtain the estimates of invoice handling cycle, the time spent in processing stages and delays in between them will be approximated and summed up. At the present, some processing stages are automated, e.g. the payment system automatically picks up invoices that are approved and close to their due date, or eliminated if it is a true e-invoice. The delays are currently caused by not physical travelling of invoices from desk to desk as it used to be before the electronic invoice handling system, but mostly happen due to limited technology capacity at the side of invoice handling department or because of a business unit purchaser's lingering to approve and insert accounting data to the invoice that she almost instantly receives after the initial processing stages at the invoice handling department have been completed.

Since the enhancements in labour requirements for processing an incoming invoice are of primary interest of this study, the invoice processing time is defined and will be calculated as total average human labour time spent across the processing stages of invoice handling cycle to handle one incoming invoice. This means that all non-human labour stages, e.g. automated payment, and delays in between the processing phases are excluded from the calculations.

Herewith, the costs of invoice handling will purely be calculated as average human labour costs incurred while processing one incoming invoice, i.e. average human labour contribution per one incoming invoice multiplied by average fully

loaded costs of invoice handling employee. It is obvious that for current semi-automated and true electronic handling the costs estimates will be somewhat different because of different labour contribution, that is why the aggregate estimate for both processing ways will be used for comparing the current labour requirements and costs against the manual processing mode.

Should one be interested in obtaining a more complete estimate of incoming invoice handling costs, the formula may be loaded with other direct and indirect costs associated with invoice processing, such as e.g. the electronic invoicing technology license fees, scanners' maintenance, paper consumption, opportunity costs if a invoice handler has to wait for the system's slow response time, etc. However, this thesis is kept bounded to human labour contribution and man-hour costs of invoice processing, which may explain possible difference with own company estimates of invoice handling time and costs and earlier calculations proposed by the related research.

Data for the cases were decided to be collected through interviews, documentation and archival records where available. All interviewees, whose duties are closely related to invoice management, were suggested by the companies themselves, and the interview appointments took place in October 2009 – February 2010. Interviews were designed as focused with a set of questions sent to the respondents in advance (see Exhibit 7 Sample interview questions), but were conducted in a conversational manner in order to allow the respondents to reveal more background details, opinions and perceptions. All interviews were tape-recorded and debriefed in writing afterwards.

Weaknesses of the chosen data collection methods, such as e.g. biases due to recall inaccuracies, possible language and wording misunderstandings, and limited accessibility and low retrievability of certain data have been aware of and tried to be mitigated where possible. For example, interviewing in native Finnish and re-wording of the questions for better understanding were provided when

required. When a respondent was unaware of something or could not recall correctly, she was suggested to consult the colleagues who could provide more reliable information and send the answers after the interview.

The interview conversations were expected to ideally find out what impacts of electronic invoice handling take place in the case organizations, how considerable they are, and what reasons may hinder the impacts to occur. The results of the case studies should be treated as case-specific, and are summarized in the conclusion part of the paper to only offer analytic, not statistical generalizations. Thus, any extrapolation of the results over larger number of organizations should be avoided.

## 5 CASE STUDIES

This chapter elaborates the study cases by presenting the companies, describing the transition to electronic invoice processing, and reporting the findings per e-invoicing impact area, referred to in Table 4.1. The chapter also suggests to what degree an impact takes place and why it occurs in a particular case. The cross-case result summary and analysis will be presented in Chapter 6.

### 5.1 E-INVOICING AT THE CITY OF TAMPERE

#### *5.1.1 Background information<sup>1</sup>*

Tampere is the third largest city in Finland and the largest inland centre in the Nordic countries. With a total population of over 340,000 inhabitants (approximately 210,000 inhabitants in the City and 130,000 in surrounding municipalities) Tampere and its sub-territory is one of the most rapidly developing regions in Finland. It is a modern educational city and a centre of know-how intensive entrepreneurship and industry. Out of the working population of the City 32% is employed in public services, 20% in manufacturing, 18% in financial, real-estate and other services, 15% in commerce, 7% in transport and communication, 6% in construction and the rest in electricity, water supply, forestry and agriculture. The unemployment rate has been stable around 10%, whereas in May 2009 it reached 13%<sup>2</sup> due to global economic recession.

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<sup>1</sup> Source: [www.tampere.fi](http://www.tampere.fi)

<sup>2</sup> Source: Tampere taskussa 2009, available at [www.tampere.fi](http://www.tampere.fi).

The largest employers in Tampere mostly come from the public sector, e.g. the City of Tampere (15,967 employees), Tampere University Hospital (3,954), Tampere University (2,550), Tampere University of Technology (2,137), Defence Administration (1,319), etc. Largest private employers are Nokia Plc (3,035 employees), Itella Plc (979), Pirkanmaan Osuuskauppa (939), Nokia Siemens Networks Ltd (855), Sandvik Mining and Construction Ltd (802) and a number of others.

The City is governed by the City Council, City Government and the Mayor. There are six order committees that establish service contracts and are responsible for purchasing services from the city units providing welfare services to Tampere inhabitants. In addition to the welfare service units the City of Tampere has internal and external enterprises. All city units are centrally served by group services, such as the central administration and Financial Shared Services Center. A complete organization chart is given in Exhibit 3.

The Financial Shared Service Center (the FSSC), established in 2005, provides invoice handling services to all different units within the City of Tampere. In practice this means that all purchase invoices for the services and goods acquired by the city units are directed to and processed by the FSSC.

### *5.1.2 Transition to invoice handling automation*

Before 2004 all purchase invoices were delivered to the City of Tampere solely in paper directly to the city units who made the purchases of goods or services. Each unit would have a dedicated worker, e.g. a bookkeeper or data entry clerk, who would be responsible for registering an incoming invoice and forwarding it for the approval to the person who made a purchase. The purchaser would check the invoice data, post the invoice, i.e. write down the project number, to what account the invoice should be taken to in the books, etc., and send it back to the

bookkeeper. All circulation of the invoices inside the city unit was carried out via the internal mail system in colour-coded envelopes. After receiving the approved and posted invoice, the unit's bookkeeper would save the invoice's data, such as VAT number, dates, sum, reference numbers, currency, etc., into the financial administration system AdeEko. The system did not allow electronic circulation, and served as pure administration and accounting application. As soon as the invoices were saved to AdeEko, they would be ready for payments that were centrally carried out in the City Administration Building. The invoices would be archived in cases in accordance with their receipt number and stored for ten years.

In 2002 the City of Tampere started considering implementation of some more advanced invoice handling methods to enhance control and transparency of invoice processing, and already in 2003 the Invoice Processing (IP) system by Basware Plc was introduced. The system allowed scanning and circulating invoices across the units electronically. During the testing period, first scanned invoices were sent via IP to one of the units and it took approximately 2 minutes to receive, approve and send the invoice back. Basic hands-on training was given to IP users, who found the system to be very user friendly.

At that time, main motivational factors for the City to turn to electronic invoice handling were not time savings or process costs, but rather the visibility of how many invoices the City actually receives and handles, how many of them fall overdue and how much interest is paid on those. Another reason was a possibility to better manage the liquidity.

The first incoming test e-invoice was received in late 2003 after Tampere University of Applied Sciences TAMK, Tampere Catering, and Fire & Rescue Departments implemented the IP and signed up for the pilot. Upon expanding the e-invoicing system across the organization, no special training was given to the invoice handling employees except for several benchmarking visits to one of

the City of Helsinki's units that had e-invoicing already in use. During the first year of the system's functioning there was approximately 8% of e-invoices out of the total invoice number received by the City. In 2004 Tampere sent the first letter to their suppliers recommending a switch to electronic invoicing. The second letter to suppliers was sent in 2006 reminding about the possibility to issue electronic invoices and suggesting the sources where the vendors can turn to for more information on e-invoicing implementation.

The idea to centralize financial services of the City originated in late 2003 and was approved by the City Administration in 2004. The centralization project started in 2004 and resulted in the establishment of the Financial Shared Services Center in 2005. Since that time all invoices addressed to different city units started to be forwarded to and processed by the FSSC. The FSSC arranged internal service contracts based on which it charges the units for handling their invoices. The price charged for processing one paper invoice is roughly twice higher than the one for an e-invoice.

The personnel to the FSSC were internally recruited among the employees who previously performed similar duties in the City's units. There were both people taking the change positively and those who preferred to remain working in the units, though the nature of their work would also change as the IP system was taken into use across all the organization. At the beginning the incoming invoice processing group had 32 employees divided into 3 teams. Average invoice processing employee would be in 45-55 years age group, having a permanent employment contract with the City service for already many years, and possessing either basic vocational or professional schooling.

The centralization went almost simultaneously with the City's transfer to the SAP system. Due to better compatibility with SAP, Basware's IP was changed for Siemens' ZOR invoice handling application as well as Liaison Technologies Ltd (then Anilinker Ltd) was chosen to act as e-invoicing operator. Siemens

customized ZOR according to the City's requirements, one of which was the similarity of the system's interface and working logic to IP so that there would not be much personnel's re-training needed. Chief users of SAP and ZOR had nevertheless regular lecture-type training sessions for three weeks in fall 2005.

The City performed no cost analysis of the SAP and ZOR implementations per city unit as the systems were implemented across all the organization. In comparison with IP, the implementation and annual costs of ZOR (yearly subscription plus per user license) have nevertheless turned higher, as the FSSC's management admits.

According to some of the invoice handling employees, first months after the implementation of the ZOR system were especially difficult. This stemmed from not only the change in working procedures as such, but rather from technological imperfections such as system's slowness in data processing, disruptions and some other faults of usability. It was still in 2006 that some functions of ZOR were under development and many employees were hesitating to use ZOR instead of IP due to frustration caused by their inability to solve the system's pitfalls. Since that time however there have been noticeable improvements in the technology and the user satisfaction has increased. Also the necessity to print out the invoice occurs very rarely nowadays.

Currently the invoice handling department has in total 40 employees who are divided into four teams<sup>1</sup>, each captained by a team leader. Two teams process incoming and another two teams outgoing invoices. The job rotation has been in the working strategy since 2005 as a means of protecting work processes against e.g. rush in high season, sick leaves, etc. In practice that means that duties are rotated within each team and, since 2009, also between incoming and outgoing invoice teams so that every employee could substitute a peer when required.

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<sup>1</sup> After the case interviews have been held in 2009, the City implemented further adjustments. From 1 February 2010 onwards there are three invoice handling teams, two processing incoming and one issuing outgoing invoices. The number of employees has though preserved.

However, the job rotation between incoming and outgoing invoice teams has not delighted every employee, according to the invoicing management. The disappointment has especially been stronger with outgoing invoice handling team, who consider their work duties more meaningful and interesting than those of more routine and mechanical nature performed in the incoming invoice team.

The introduction of electronic invoice handling technology has not greatly influenced the profile of an average invoice handling employee. The City's permanent employment arrangements safeguard an employee's workplace until the retirement, which complicates any changes in human resources. Some of the employees though took the opportunity to complete the vocational on-the-job schooling offered by the City lately. Due to public sector salary system, average fully loaded costs per invoice handling employee have also remained roughly the same over the past years, i.e. about €40,000 a year.

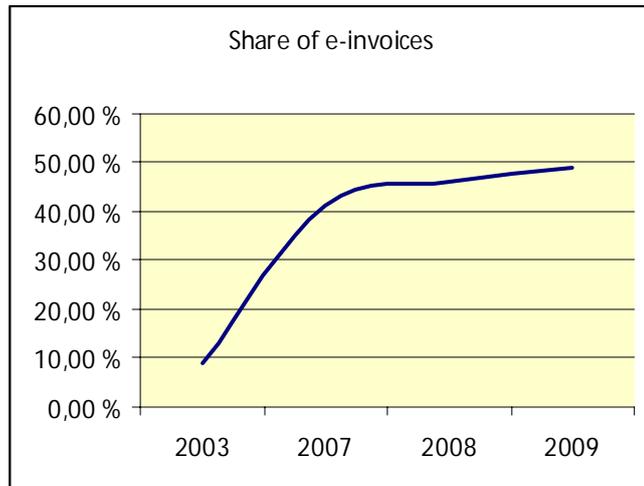
### *5.1.3 Processing incoming invoices*

There are over 300,000 invoices received by the City of Tampere annually. This number includes the internal invoices made out upon the provision of certain services by one city unit to another. For example, in year 2009 there were in total 334,000<sup>1</sup> invoices received where 70,000 invoices came from peer city units. Currently the invoices come either in true electronic structured format or in paper. The share of all e-invoices, including those supplied by external vendors and internal units, has grown from less than 10% in 2003 to almost 50% in 2009 as shown in Figure 5.1.

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<sup>1</sup> See Exhibit 6 for basic data on incoming invoicing given by the case companies.

Figure 5.1 E-invoice penetration in time line: The City of Tampere



Those invoices that are delivered to the FSSC in paper have to be scanned into the electronic invoice handling system. There is a special scanning room where the incoming mail is forwarded to, opened and sorted out, and the invoices are scanned with two large capacity scanners<sup>1</sup>. One of the scanners is an older version and the newer one was acquired in 2008 at about €7,000. The maintenance of the scanners is fairly high. Minor function disorders may occur on average ones a month and each visit of the technology support service costs the City several hundreds euro as the service should be ordered from the scanner manufacturer located in Helsinki.

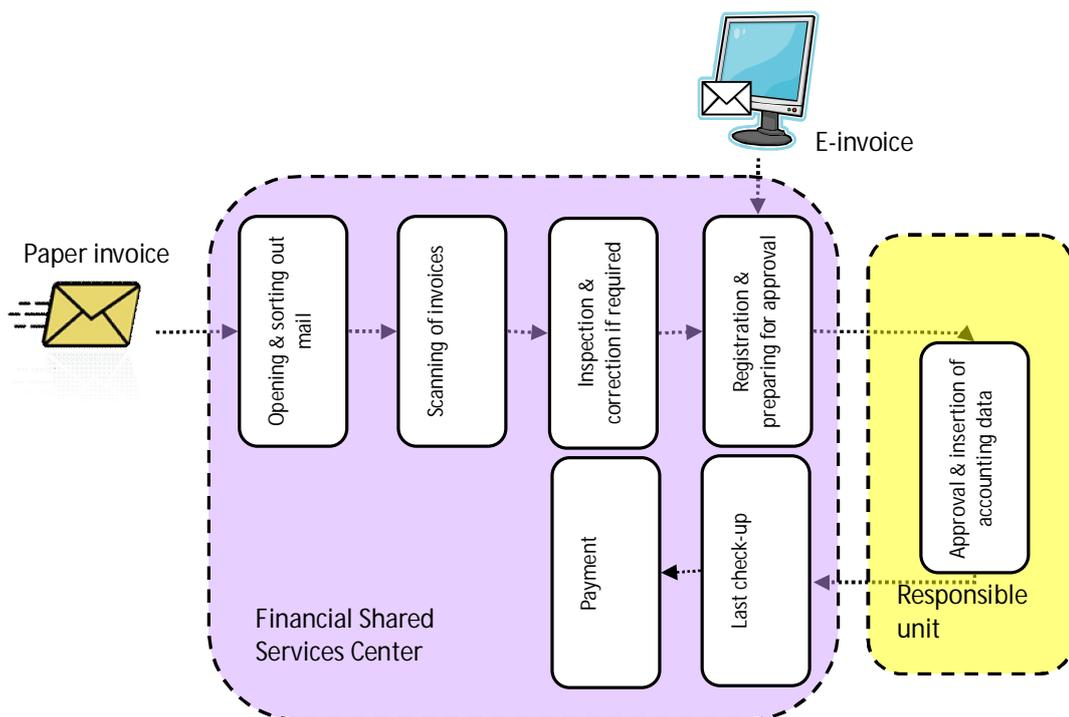
Nowadays the two incoming invoice teams have in total 22 employees. There are 4 hours a day from 10am to 2pm reserved for scanning and inspection of invoices each (see Figure 5.2 below for a complete handling cycle of incoming invoices). A pair of employees does the scanning and another two do the inspection. These stages are performed on one hour rotation basis by all incoming invoice employees except for the two team leaders who concentrate on invoice registration and team administration duties.

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<sup>1</sup> After the case interviews have been held in 2009, the City implemented further adjustments. From 1 February 2010 onwards the older scanner was discontinued and all incoming paper invoices are nowadays scanned with solely one newer scanner.

Thanks to the improvements in the scanning technology, the average time needed to scan the daily volume of incoming invoices is around 2h 30min instead of the reserved four.

Figure 5.2 Incoming invoice full processing cycle: The City of Tampere



Upon the scanning, the software converts the information in the invoice into a structured form that then appears on the computer screen in a dedicated inspection room. Due to large scanning volumes and limitations of the technology there is an observed delay of approximately 15 min before an invoice comes out on the screen and becomes available for further processing. An employee then checks the fields of the invoice form for correctness, i.e. that the scanner and software have functioned flawlessly. After this initial check-up, she forwards the invoice to the account box of one of the incoming invoice handling

clerks. True electronic invoices come straight to the account boxes. There is no difference in further processing between e-invoices and the paper ones that have been scanned into the system. The clerk registers the invoice, prepares it for approval and forwards it to the person in a city unit who purchased the goods or services.

The purchaser receives an email with a link to the approval page of ZOR application where she can see an invoice awaiting her approval. The stage of approval may linger as people at the business units are often busy with their main duties and travel a lot. Though the approval via mobile phones is not currently possible, it can anyway be made from one's laptop in any place with an Internet connection. The system also submits the reminders as the due date of the invoice approaches closer. Regardless of this, there are always people who hesitate to make an approval on time.

Finally when an invoice is approved, it is shortly checked up again by an invoice handling clerk, and then forwarded for payment to the accounting department. The payments of invoices are done once per day.

According to the FSSC's management, 60-65% of incoming invoice processing costs take place upon processing an invoice in the FSSC, i.e. initial handling stages and payment, and the rest is ascribed to the approval stage in a city unit. The golden rule Tampere uses for valuing the handling costs of paper invoices is €30, whereas a corresponding cost for a pure e-invoice is about €3.

The archiving system of invoices is currently under development. No specific archiving system is yet in use, but the system can generate a report on all invoices with relevant information included. Back-up copies of invoices are also stored in the IT department. Paper copies of invoices that were processed are either forwarded to the recycling or destroyed, depending on their confidentiality, in about one month after the scanning took place.

#### *5.1.4 Findings per impact area*

According to the FSSC management, the expectations for the electronic invoice processing technology have in general been met better than expected. A key goal settled upon the implementation of the electronic invoice circulation system, i.e. better control over the City's payables and liquidity, has been achieved, as nowadays there are basically no missing invoices, all outstanding payables are visible, the due dates are well manageable, and the invoices can be taken to the accounts for the right month.

The true e-invoice penetration started off with about 9% in late 2003 and reached 49% in 2009. Being the largest client in Tampere's health, social and communal sectors, the City took the initiative to evangelize its vendors to move to electronic invoicing. So far it twice sent a call to all its subcontractors and partners informing them about the City's transfer to e-invoicing, appealing to its benefits and recommending to turn to the e-invoice solution providers for more information. The web pages of Tampere also contain a subsection telling about e-invoicing procedures, possible providers, instructions how to best submit invoices, etc.

The growth of e-invoice share among annual invoice volumes has been firm, however lately it slowed down from 12% in 2008 to 5,6% in 2009. The FSSC management expects that, due to the nature and composition of the public and communal sectors, 100% electronic invoicing at the City of Tampere can not be foreseen in some next twenty years. While the City has a goal to approach full e-invoicing percentage in transactions among the city units, a corresponding target for external subcontractors and vendors is realistically 70-80%.

### *Invoice processing time*

The data on invoice processing time, i.e. human labour time required to process an invoice from receiving until the payment, have been compared for 2002, i.e. a year before the City acquired the invoice processing system that allowed scanning and electronic circulation of invoices, 2005 when the FSSC was established and the electronic invoice handling system had been in use for over a year, and present situation in 2009. For example, the monthly throughput of incoming invoices per worker has increased considerably. Namely one invoice handling employee nowadays processes almost 60% purchase invoices per month more than in 2005, and almost 200% purchase invoices more than in 2002. In daily equivalents these figures mean that on average one worker handled 20 incoming invoices in 2002, about 40 in 2005 and over 60 in 2009.

Table 5.1 summarizes the processing times of invoices in 2002, 2005 and 2009. Average man-hour time spent on handling one incoming invoice in 2009 has decreased by four minutes as compared against 2005 and by twelve minutes against 2002. This time reduction can be attributed to the increasing penetration of e-invoices that demand less time for processing as well as to the reported improvements in the scanning technology and software that converts the scanned data into structured electronic invoice form.

Table 5.1 Incoming invoice processing times: The City of Tampere

	2002	2005	2009	
Amount of employees in the incoming invoice team	45	32	22	
Monthly average throughput of incoming invoices per worker	391,0	781,3	1265,2	
Daily average throughput of incoming invoices per worker	19,6	39,1	63,3	
Average processing man-hour time per one incoming invoice (estimate for an employee at the invoice handling department)	15,2	11,1	6,9	(min)
Average processing man-hour time per one incoming invoice (estimate for a business unit employee who insert the accounting data and approves an invoice)	7	3	3	(min)
Total average processing man-hour time per one incoming invoice	22,2	14,1	9,9	(min)
Average time for scanning & inspection stages per one incoming paper invoice	N/A	4,9	1,3	(min)
Total average man-hour time for processing one paper invoice	22,2	15,4	10,5	(min)
Total average man-hour time for processing one e-invoice	N/A	10,5	9,2	(min)

As current invoice handling system allows two processing modes (i.e. semi-automated and electronic) and involves labour at both the invoice handling and business units, the total average processing time of one incoming invoice is basically an aggregate estimate of average labour contribution when both processing ways and both processing parties are taken into consideration. Nowadays, in terms of man-hours, processing of one incoming paper invoice, that has to be first scanned to the system, at the side of FSSC takes on average 7,5 minutes, whereas processing of incoming true e-invoice takes about 6,2 minutes. This means that on average scanning and inspection stages nowadays take together about 1,35 minutes per invoice, whereas yet in 2005 they would take about 5 minutes. 7 and 3 minutes of processing, i.e. insertion of accounting information and approval stages, is an aggregate estimate of what it may take a business unit employee who made a purchase to find correct accounting data, insert it into the invoice form, confirm the invoice's accuracy and forward it back to the FSSC. Approval stage may definitely take less than 3 minutes nowadays, if the received invoice has come with the pre-inserted posting information. Again,

all these processing time estimates include only human labour contribution, and no delays in between the processing stages are counted.

If the City of Tampere reaches its goal of 80% e-invoice penetration rate, it will be able to permanently release at least one more person from the incoming invoice team and transfer her to some other duties within the organization.

### *Invoice handling cycle*

Before the introduction of electronic invoice processing system in 2003, major hindrances in purchase invoice handling cycle, i.e. the time from receiving an invoice until its payment, were circulation times of invoices via internal mail and delays in approval at the units. As nowadays the invoices are made available for approval at the units right away after having been processed in the FSSC, insertion of posting data and approval can potentially be done within minutes, and then be automatically sent for payment. In practice, however, people in the business units may not be available or even willing to distract from their main duties in order to spend time on handling the invoices. Another issue is that they sometimes insert accounting information to the invoices incorrectly, the system rejects erroneous data and the whole handling cycle lingers. Taking these findings into account, it is not the technology, but a human factor that affects the total handling time of an invoice. The FSSC management partially confirm this with their assumption that out of total attributed costs of invoice processing up to 40% arise from the business units' side.

Though a dramatic time difference in the total invoice handling cycle cannot be observed and it can still take up to several weeks, one nonetheless can say that the change was enough, because the interest paid on overdue invoices has fallen considerably.

### *Interest on overdue payments*

Centralization of invoice handling and the launch of electronic invoice processing system favoured the decrease in the interest paid on overdue invoices (P5.1) and allowed better utilization of settlement discounts. While there were no exact data available on received settlement discounts, the overdue interest was registered to drop from about €8,300 in 2002 to a couple of thousands in 2009. According to the FSSC management, years back the annual interest charged could even reach FIM100,000 (approximately €17,000), therefore today's figure is almost non-existent for such a big organization. Reduced handling cycle of invoices as well as the utilities of the electronic invoice handling system, such as instant availability of all received invoices, data circulation, automated control for due dates, electronic reminders, etc. can be considered as main contributors to the cut in overdue interest payments. However, the decrease may also be partially attributed to the fact that payment due times have commonly dropped in Finland from 30 days in the past to 14 days nowadays, which might also have prompted companies to faster react to their payables.

### *Processing errors*

According to the invoice processing personnel, processing errors are becoming very rare nowadays as compared with manual invoice processing years back. At present errors may occur during the scanning stage of paper invoices as the technology may not sometimes recognize the data correctly and inserts sums and numbers into wrong data fields. The invoice handling clerk has to then correct the data manually upon the inspection. Since the technology is gradually developing, such error cases happen fairly seldom and are not usually reported.

Another kind of processing errors may take place when a person in the business unit, who is responsible for approving an invoice, inputs posting data incorrectly.

Though such errors are also low in number, the phenomenon is permanent and occurs mostly due to work haste and negligence to check for correctness of data.

The decrease in processing errors and required re-work is favoured by higher e-invoice penetration, because e-invoices virtually come with no errors, and improvements in the technology for converting paper invoices into digital format.

### *Invoice processing costs*

The City of Tampere has not done official assessments of costs for separate work processes. Instead, for own purposes, they use generally accepted cost estimates for manual handling of paper invoices and processing of e-invoices, that is €30 for the former and €3 for the latter. In practice, however, purely manual processing of invoices discontinued as soon as the City acquired the invoice processing technology in 2003. Since that time the handling of paper invoices is carried out in semi-automated mode, i.e. invoices are opened and put to scan manually, but further processing does not dramatically differ from processing true e-invoices.

Table 5.2 only gives an idea of cost estimates of human labour invested in processing of one incoming invoices. At present level of technology capacity a FSSC invoice handling employee spends on average 1,3 minutes on scanning of a paper invoice into the system, which translates into the labour cost difference between semi-automated and true electronic handling of about €0,50 per invoice. At current 48,87% e-invoice penetration rate this means over €80,000 of annual savings. If the City manages to reach its goal of 80% e-invoice penetration rate, it can additionally save about €50,000 per year which is a more than one man-year at the FSSC's side.

Table 5.2 Labour costs per incoming invoice processed: The City of Tampere

	manual 2002	semi-automated 2005	+ e-invoices 2009	
Average costs of one man-minute of work at the invoice handling department (€35.000-40.000 a year)	0,34	0,38	0,38	(€)
Average costs of one man-minute of work at the business units (€55.000-60.000 a year)	0,53	0,57	0,57	(€)
Total aggregate processing man-hour time per one incoming invoice	22,2	14,1	9,9	(min)
Total aggregate costs per one incoming invoice processed	8,9	5,9	4,3	(€)
Average time for scanning & inspection stages	N/A	4,9	1,3	(min)
Average man-hour costs of scanning & inspection		1,9	0,5	(€)
Average man-hour time for processing one paper invoice	22,2	15,4	10,5	(min)
Average man-hour costs of processing one paper invoice	8,9	6,0	4,56	(€)
Average man-hour time for processing e-invoice	N/A	10,5	9,2	(min)
Average man-hour costs of processing one e-invoice		5,0	4,0	(€)

The discrepancy between the processing costs estimates used by the City and the ones obtained in this study is relatively high when it comes to paper invoice handling. This may be explained by different variables used for calculations. This thesis' estimate only includes human labour expenditures, while the City might also have used other non-human labour summands for their calculations. For example, to account for more complete costs of handling an incoming invoice nowadays, one may load the formula with e.g. amount of overdue interest paid, fees charged by the operator for delivering e-invoices, maintenance costs of printers, annual license of the invoice processing software, etc.

The pattern is anyway inspiring as the costs of processing invoices are indeed decreasing thanks to that the e-invoice penetration grows and the processing times decrease.

### *Utilization of released labour resources*

When the FSSC was established in 2005, there were 32 employees recruited for the incoming invoice handling department. Before that the invoices were processed separately across the business units and the number of employees involved in invoice processing is hard to estimate. Until 2009 the incoming invoice personnel has gradually decreased to 22 persons.

Out of the released ten, three employees were relocated to the payroll team within past 18 months. When the FSSC was planning a personnel cut in the invoice handling department, it negotiated the possibility of transferring people to other departments and the payroll department had vacant positions due to soon retirement of several of its employees. The FSSC made an announcement inviting to apply for the transfer to the payroll, and the three volunteers were relocated. There were no special selection process who of the employees should stay and who should be relocated, but employees had a chance to volunteer themselves. Thanks to the occasional job rotation carried out between the invoice handling and payroll departments since 2005, the relocated employees only required basic hands-on training for taking over their new duties.

The fates of the rest of the released workers are not exactly known, but it is confirmed that none of them stayed in the FSSC. According to the invoice handling personnel, one of their former colleagues found a secretarial job in one of the business units of the City and moved there, another naturally retired and the third voluntarily resigned, and there is no information about the rest four. The FSSC management says that there have been no regular layoffs, but it can rather be assumed that these people naturally retired or, if under fixed terms, their contracts were not continued.

Normally the City employs under "for life" offices, which protects the work places, but makes the organization very inflexible in response to organizational

changes. Firing people and recruiting new ones would be very difficult in practice as the City has to offer a worker a new work place if her present position becomes redundant. This condition does not allow seeing whether the City would be acting in the same way, i.e. keeping the released labour, if it would have had a different contract system. However, the non-continued contracts may signal that the City did not actually require extra work force and did not have any openings that were understaffed.

### *Work moral*

The introduction of new technology that necessitated the change of familiar routines and learning new ways of doing work as well as challenged one's current technology skills has not been accepted positively by everyone. The rigidness to adopt the new invoice handling system would grow especially strong during the implementation stage because the system would regularly misdeliver and work very slowly at times. Even nowadays, several years after the transfer to the new system, some employees use to say that the old technology was more user-friendly. Nevertheless, the employees have given positive feedback about the convenience to process true e-invoices and wish their volumes would increase and the paper invoices would get less.

Since autumn 2009 the FSSC has launched the job rotation between the incoming and outgoing invoice processing teams in order to secure smooth work flow during pick times. This change again did not please everyone. Some people in the incoming invoice team preferred to safely do familiar routine, whereas employees of the outgoing invoice team generally consider the duties in the incoming invoice department more mechanical and less versatile.

The interviews with the invoice handling employees gave mixed feelings regarding whether the new technology has brought more value to their job, but general perception is that the employees would not like nonetheless to return to

the past when invoices were processed manually. According to the official employee satisfaction regularly rated by the City, job satisfaction has been growing slowly over the past years and is now a little over the average. No steeper upturns associated with the implementation of the electronic invoice processing were recorded.

### *Consumption of paper and energy*

The recorded data on paper use in the FSSC was not available, but according to the management's perception the paper waste has somewhat decreased. In case of purchase invoices, roughly 50% of them come electronically and a necessity to print out an invoice comes very rare. Nevertheless, by old practice the workers still tend to print out many other documents and files even when it is possible to use them on the screen, which hinders possible savings in paper costs.

Energy costs were not noticed to change distinctly, according to the FSSC management. This can be explained by the fact that the electricity is in continuous usage regardless of whether a particular technology is implemented or discontinued. The management also thinks that increasing use of electronic equipment would not let the energy costs to drop noticeably.

### *Organizational image*

The adoption of e-invoicing technology has harmoniously supplemented a larger project of the City of Tampere that had an objective to modernize the City and adjust its provision of services to contemporary life. eTampere project started in 2000 and its focal areas were the development of public online services and their placement within reach of the citizens, strengthening of the knowledge base in research and education, and the emergence and practical application of new, knowledge-society related business.

Tampere has not done any specific organizational image or media research so far, that is why it is hard to find grounded evidence that the image has indeed improved. In terms of popularity as an employer, the City did not control for whether an opening attracts more applicants than usually. Besides, due to the permanent contract system there were only occasional recruiting cases. Herewith, it is hard to trace the contribution of e-invoicing technology to the image of Tampere due to the lack of required data and parallel efforts in modernizing the City.

## 5.2 E-INVOCING AT FINNAIR PLC

### 5.2.1 *Background information*<sup>1</sup>

Finnair is one of the world's oldest operating airlines. Its establishment dates back to 1st November 1923. Its current operations focus on transporting passengers between Europe and Asia, via Helsinki. Today, Finnair's position in the market is well established and growing strongly. In its Asian expansion, the company is supported in particular by Finland's favourable geographical position: the shortest routes from Europe to the Far East pass through Helsinki.

Finnair Plc is a listed company that has about 7,000 shareholders. Its major shareholder is the Finnish government with a 55.8% holding. Other shareholders include insurance companies, various companies and private individuals. Approximately 20% of the shares are owned by foreign shareholders.

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<sup>1</sup> Source: [www.finnairgroup.com](http://www.finnairgroup.com)

The Finnair Group consists of a parent company Finnair Plc dealing in scheduled passenger and leisure flight business and 17 business units and subsidiaries that operate in technical support, ground handling services, catering, travel agency sector and travel sector information and reservation services. The business units and subsidiaries are grouped into three business fields - Airline Business, Aviation Services and Travel Services (see Exhibit 4 for Finnair Group's organization chart), and are served by the Group Management, Shared Services and FTS Financial Services Ltd. The latter provides invoice handling services to all Finnair Group's units and subsidiaries except for the two catering companies. In total there are around 9,500 employees working in the Finnair Group.

#### *5.2.2 Transition to invoice handling automation*

Up to 2004 all incoming invoices would be received in paper and handled manually. Finnair's vendors would send the invoices directly to the units that made a purchase of services or goods. A book-keeping clerk in the business unit would check an invoice, mark it with a posting stamp and forward it to a person responsible for the purchase of services or goods stated in the invoice. This person would approve the invoice, insert the posting data in the fields of the stamp, and send it to the Finnair's financial administration center to be registered to the accounting system and paid. At that time the financial administration center served Finnair Plc and several of its companies, e.g. Finnair Cargo Ltd and Northport Ltd. The center's incoming invoice team had 26 employees. Invoices of the travel divisions as well as the catering companies in Finnair Group were handled separately, by FTS Ltd and own financial departments respectively.

The facts that the invoices were widely scattered across the organization and the financial center could not know where and how many invoices are pending for approval and payment were among main motivation factors to reconsider then existing invoice management procedures. Also, long and non-transparent

processing of incoming invoices was often a cause for the vendors' complaints that due dates of their invoices were missed. According to the management of accounts payable, honest and timely payment transactions can be very important competitive advantages for a relatively small airline building relationships with vendors and partners in the world's airline business. Thus, the need for control and monitoring prompted the decision to introduce a new automated invoice processing system.

In 2004 Finnair and Basware Plc agreed on the implementation of Basware's e-Flow invoice handling solution that enabled not only circulation of invoices, but also management of true e-invoices. To prepare for the launch, Finnair changed all hardware according to the specifications given by Basware. The system was launched in all Finnair's companies except for the catering ones who have had their own invoice management system. Upon the introduction, basic hand-on training was given to main e-Flow users.

At the beginning of 2007 the Group's financial services were further centralized. The Finnair's financial center and FTS Ltd merged to form FTS Financial Services Ltd that started providing financial services to all Finnair companies excluding the catering sector. FTS Financial Services charges a certain amount of annual service fees based on general agreements between FTS Financial Services and the business units. Nowadays the Group considers introduction of more detailed SLAs for service provision among the business units.

Neither introduction of electronic invoice processing nor the restructuring of financial services have changed the composition of the personnel responsible for invoice handling, mainly due to the permanent contract system at Finnair. Average employee occupied in invoice processing at FTS Financial Services, e.g. in the Accounts Payable unit that handles solely incoming invoices, would be a person of 45-50 years old with a basic professional degree and a lengthy work

record with Finnair. Average fully loaded employee costs are approximately €3.600 per month. About fifty per cent of the employees in FTS Financial Service will be retiring in next 4-5 years.

The reception of the software and new working procedures by employees had been divergent. Natural resistance to changes was observed not only in the financial center, but also in the business units where some employees would say that e-Flow actually increases the work to be done and still make errors in invoice approval and insertion of posting data. As the management believes, this partially can be explained by the culture and psychological aspects of older generations. Many of senior employees feel safer working with paper invoices, are reluctant to use computer and slow to change the accustomed paradigm. The management admit, though, that Finnair might not have done enough to influence the mentality.

Another factor that favours the reluctance to use computer and new systems, according to the management, is the system imperfections and technical problems that occur at times. For example, the programme can be very slow sometimes so that it takes about five to ten minutes to return to the list of invoices from the current invoice view. Also situations where the software fails to read and convert data from PDF files to the compatible invoice format, workers usually prefer to print out the PDF invoices and afterwards scan them again to the system because this way the procedure always works. Though, as the management says, the technology has been improving over time, there is still a long way for development and fine-tuning, and the competition in the field of electronic invoice management software is regrettably scarce.

In spring 2010 Finnair is switching to a later version of e-Flow. This is a common project for all Finnair companies, including the catering sector companies who used to run their own stand-alone systems. The management believe that the success of a new system's implementation can be very much subject to the users'

adherence to learning and accepting changes. This time, however, employees are hardly expected to extend much of their support due to the on-going re-organization processes and likely layoffs, prompted both by global economic downturn and restructuring in the business processes being on the agenda of the Group's leadership.

### *5.2.3 Processing incoming invoices*

In 2009 the FTS Finance Services received approximately 163,000<sup>1</sup> purchase invoices addressed to different business units. Almost 66% of all incoming invoices came from international vendors, which is a regular pattern due to the airline business specifics. Invoices are usually received in paper, email attachments or true electronic format. The total share of true e-invoices was 11,2% in 2008 and 12% in 2009. The percentage of the e-invoices delivered by domestic suppliers is approximately 34%, and the management believes it can be improved up to 60-80% over the course of time. At the moment Finnair has only three international vendors who are able to issue electronic invoices, i.e. JF Kennedy's Airport, Statoil Plc, and British Airport Authorities.

Normal procedure of handling paper invoices in Finnair starts from collecting the mail addressed directly to the Accounts Payable department as the vendors are informed to forward their invoices to here directly. There are currently 22 employees in the Accounts Payable, two of which are on part-time retirement. The clerks open envelopes and sort out the invoices from other correspondence. Then paper invoices are scanned and sent to the floor circulation for the posting and approval from the related business units. After the person in charge for the purchase presses the approval button, the system marks the invoice as ready for

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<sup>1</sup> See Exhibit 6 for basic data on incoming invoicing given by the case companies.

the transfer to SAP system. Before the transfer, an Accounts Payable clerk would still check the correctness of VAT. In the SAP the invoices are automatically picked up for payment on their due date or little before.

True e-invoices sent by vendors go through the systems at Basware and in 50-60 min the invoice can be seen in e-Flow at Finnair's side. The Accounts Payable clerks input the rest of basic data if required, and then submit the invoices to the circulation. From this point in time, there is no difference in further processing between the scanned and pure e-invoices. An invoice reaches the person responsible for the purchases, whereupon she posts and approves it. After this, the invoice is checked once again for correctness of VAT by the Accounts Payable people and transferred to the SAP software for payment. So the stages of opening and sorting out mail, scanning, inspection and adding some basic data are dropped off. The handling process depicted in Figure 5.2 is analogous with the one at the Finnair.

Inserting posting information into the system sometimes causes difficulties at the business units' side, and the posting data then contain errors. For recurrent invoices from same vendors where only the sum of payment differs, it is though possible to create templates. So a person at a business unit chooses a template and the system automatically posts it. If recurrent invoices from the same vendor are also same in sum of payment, e.g. rent invoices, it is also possible to build in "contracts" where such an invoice would be processed totally automatically up to the payment stage. According to the Accounts Payable management, if the business units were able to post and approve an invoice without a delay, the processing of an invoice would then be done in a matter of a couple of hours or even half an hour as in case of rent invoices.

In reality the employees who are responsible for buying goods and service travel a lot, and often linger to check, post and approve the invoices sent to them. In 2009 the interest paid on overdue invoices was about €10,000, which is though,

as the management say, a modest sum for this kind of business. There is no mobile version for invoice approval available, but the business units' people usually carry their laptops on all travels and, thus, are able to manage the incoming invoice approval requests when the Internet connection is available. There are also back-up persons who can take over the duties in case of illness, holidays, etc.

There have been no official calculations made at Finnair to assess the processing costs per an invoice, but the rough estimates they use are €50-60 per invoice. For a true electronic invoice the figure is several times less.

#### *5.2.4 Findings per impact area*

According to the management of the FTS Finance Services, major success of the electronic invoice handling system comes from the visibility and enhanced control of all incoming invoices. The system allows monitoring of what stage of processing an invoice is at, at whose desk the invoice is pending, how soon the due dates are, etc. This transparency gives an opportunity to manage the payables better, accrue invoices for a certain cost center for accounting purposes, and assist the employees in the business units if having difficulties with invoice approval and posting, i.e. main implementation goals for the system have been successfully achieved.

The true e-invoice penetration has been growing steadily since the introduction of e-Flow in 2004, where the growth has been mostly in domestic transactions as there are currently very few foreign vendors who can submit e-invoices. In 2008 approximately 28% of domestic suppliers sent e-invoices, a year later in 2009 the number grew up to 34%. However, due to the fact that over 60% of Finnair's vendors reside all over the world, the total share of e-invoices was about 11% in 2008 and 12% in 2009. As the management say, influencing the international

suppliers to transfer to e-invoicing appears very challenging due to the level of technological development in many countries as well as the fact that Finnair is a relatively small player in the world's airline business and has limited bargaining power.

Nevertheless, Finnair keeps on working on increasing the share of e-invoices. For example, the company has acquired user license for the e-invoice web portal that would allow Finnair's vendors to submit true e-invoices to Finnair. Currently this technology is still under technical testing with a couple of the vendors, but as soon as it is in suitable condition for massive usage Finnair will invite the rest of its suppliers to use it.

#### *Invoice processing time*

Due to the lack of data, the comparison of invoice processing times was made only between 2003, i.e. a year before the e-Flow invoice handling system was taken into use, and present 2009. The average monthly throughput of handled invoices per worker has increased by over 20%, which means that an invoice handling employee processes 32 invoices today as opposed to 26 invoices in 2003 even though the amount of employees in the incoming invoice team decreased by five.

As shown in the Table 5.3, the average human labour time spent on processing one incoming invoice from opening till the transfer for payment has decreased from 24 to 17 minutes. These numbers are aggregate estimates of average labour contribution when both processing parties, i.e. invoice handling department and business unit employees, and both processing ways, i.e. semi-automated and truly electronic, are taken into consideration. This decrease can be accounted for the system's functionality that allows time savings in semi-automated handling as compared against conventional manual processing as well as for increasing share of true e-invoices.

Table 5.3 Incoming invoice processing times: Finnair Plc

	2003	2009	
Amount of employees in the incoming invoice team (FTE)	26	21	
Monthly average throughput of incoming invoices per worker	528,8	646,6	
Daily average throughput of incoming invoices per worker	26,4	32,3	
Average processing man-hour time per one incoming invoice (estimate for an employee at the invoice handling department)	17,0	13,9	(min)
Average processing man-hour time per one incoming invoice (estimate for a business unit employee who insert the accounting data and approves an invoice)	7	3	(min)
Total average processing man-hour time per one incoming invoice	24,0	16,9	(min)
Average time for scanning & inspection stages per one incoming paper invoice	N/A	5,0	(min)
Average man-hour time for processing paper invoice	24,0	17,5	(min)
Average man-hour time for processing e-invoice	N/A	12,5	(min)

The difference between average time of manual invoice handling and average handling time of e-invoice is about 11,5 minutes, whereas the man-hour time difference of five minutes between semi-automated and e-invoice handling is roughly the time needed for opening, sorting out, scanning and inspection. In general, the decrease in processing times can be ascribed to the efficiencies brought by the launch of the electronic invoice handling system as well as to the share of incoming e-invoices that demand less processing time.

Processing times at the business side of 7 and 3 minutes are aggregate estimates of what it may take a business unit employee who made a purchase to find correct accounting data, insert it into the invoice form, confirm the invoice's accuracy and forward it back to the FTS Financial Services. The management say that the processing time difference is especially observable in case where it is possible to insert the posting data into invoices before sending it for approval to

the unit, e.g. hotel invoices where only the dates change. In this situation the only thing that the person in the business unit has to do is to push approval button should the invoice information be otherwise correct. Otherwise approval stage may linger and accounting information may contain errors as business people do not normally want to distract from their main duties and try to post and approve invoices quickly.

If Finnair manages to reach its goal of 80% e-invoice penetration rate among the domestic transactions, it will be able to permanently release one more full-time worker from the incoming invoice team and possibly transfer her to other duties.

#### *Invoice handling cycle*

There is no exact record how long on average it took to handle one invoice from receiving until payment back in 2003, but according to the management's perception the full handling cycle was quite long due to the floor circulation via internal mail as well as approval delays in the units. Since the launch of e-Flow no circulation of invoices via internal mail became needed, as the system makes an invoice available for the approval virtually right away after the initial processing stages. However, the approval stage today is what still affects the handling cycle time most. Business people in the units tend to linger checking, finding and adding accounting data, and approving the incoming invoices so that the handling cycle has not decreased dramatically. Nevertheless, thanks to decreased times of initial processing stages and electronic reminders sent by the system as the due date approaches, the handling cycle has decreased adequately so that the amount of overdue payments went noticeably down.

#### *Interest on overdue payments*

In 2009 the interest on overdue invoices was approximately €10,000 that is 3-5 times smaller what the amount used to be in the past. The management confirm

that, thanks to the improved speed of invoice circulation and, thus, mostly timely payments, the difference in interest sums became very obvious already during the first years of e-Flow usage. Today's amount of the interest can be considered non-existent when speaking about the sums involved in the international airline business.

### *Processing errors*

According to the management there are virtually no errors in processing true e-invoices. However, since the overall share of e-invoices in the whole volume of incoming invoices is not currently big, it had little impact on total amount of processing errors. Processing errors usually happen when the scanned invoices have to be complemented with the required data inputted manually to the system. It can be assumed that as soon as the e-invoice penetration rate will grow the amount of errors will decrease, but as of now the change in a number of processing errors is not very noticeable.

### *Invoice processing costs*

Table 5.4 gives an idea of labour costs related to processing of incoming invoices back in 2003, when all invoices were handled manually, and in 2009 when the invoices are processed in either semi-automated way, if delivered in paper, or electronically in case of true e-invoices.

Table 5.4 Labour costs per incoming invoice processed: Finnair Plc

	manual	semi-automated + e-invoices	
	2003	2009	
Average costs of one man-minute of work at the invoice handling department (€40.800-43.200 a year)	0,38	0,40	(€)
Average costs of one man-minute of work at the business units (€55.000-60.000 a year)	0,53	0,57	(€)
Total aggregate processing man-hour time per one incoming invoice	24,0	16,9	(min)
<b>Total aggregate costs per one incoming invoice processed</b>	<b>10,17</b>	<b>7,27</b>	<b>(€)</b>
Average time for scanning & inspection stages	N/A	5,0	(min)
Average man-hour costs of scanning & inspection	N/A	2,0	(€)
Average man-hour time for processing one paper invoice	24,0	17,5	(min)
<b>Average man-hour costs of processing one paper invoice</b>	<b>10,17</b>	<b>7,51</b>	<b>(€)</b>
Average man-hour time for processing one e-invoice	N/A	12,5	(min)
<b>Average man-hour costs of processing one e-invoice</b>		<b>5,51</b>	<b>(€)</b>

It can well be seen from these estimates that the labour costs of purchase paper invoice processing have gone down thanks to the introduction of e-Flow, and they can be further decreased by higher penetration of true electronic invoices.

Currently the cost of opening and scanning paper invoices is about two euro per paper invoice, which means that with the present e-invoice penetration rate of 12% the company saves about €39,000 annually. If the e-invoice penetration rate grows at least among the domestic suppliers up to the wishful 80%, the company could additionally save approximately €52,000 that is fairly more than the costs of one man-year.

A difference between the estimates of invoice processing costs used by Finnair and received in this study may again be explained by the fact that calculations can include many other variables. While this study only assesses invoice processing costs through the man-hour rate, Finnair might also have added other non-labour summands to their estimates to arrive at more complete costs of handling an incoming invoice.

### *Utilization of released labour resources*

Before 2004, the year when e-Flow was implemented, there were 26 employees working with accounts payable. Nowadays it is 22, but two of the employees are on part-time retirement, which makes approximately 21 full time equivalent workers. None of the rest four has stayed in the organization after her position was discontinued. One person naturally retired, another's fixed term contract was not continued, the third left the organization for family reasons and the fourth had to be fired for inappropriate behaviour. During the rush periods or summers the Accounts Payable also uses temporary workers, who are usually students borrowed from the Finnair's pilot school.

Though almost fifty percent of the 82 FTS Financial Services workers will be retiring within next four years and new automated office technologies pose new requirements over the employees' computer skills, recruiting new workers at the moment appears hardly feasible. Layering off senior employees or prompting them to leave on retirement earlier is not only ethically difficult, but also contractually and legally protected against. In addition, cost management due to the global economic downturn as well as ongoing re-organization procedures take currently the priority on the agenda as opposed to recruitment.

Since it was only four people who left the Accounts Payable and Finnair contractual system has long been on permanent basis, it is hard to make an assumption whether the company would voluntarily keep inside the released labour if there would be more of the positions made redundant. However, the fact that Finnair is now undertaking studies how to make work processes more efficient as well as does not advertise open positions, might evidence the opposite.

### *Work moral*

According to the yearly measured employee satisfaction, it has been gradually improving over the past years. This year, however, it was decided not to measure the job satisfaction due to the ongoing lay-offs at some departments across Finnair that considerably affect the work atmosphere at the present.

The management also relates the overall rigidity of older generation employees to use new technologies to their fear of becoming redundant and therefore fired. This fear may overwhelm the benefits related to the improvements in work routines, such as e.g. less manual work, and make the adoption of the technology induced, but not cherished.

The attitude of employees in the business units towards e-invoicing is rather neutral. The management assumes this is because neither the business employees' job nor the units' financials are affected by a level of e-invoice penetration. This could be changed, for example, by introduction of stricter service level agreements between the business units and the FTS Financial Services where the latter would charge the units much less for processing their e-invoices and noticeably more for paper invoices. This arrangement could motivate the business units to be more interested in negotiating the transfer to e-invoicing with the vendors whose services they buy.

### *Consumption of paper and energy*

There have been no noticeable paper and energy savings, as the management of the FTS Financial Services affirms. In situations where the software fails to withdraw and convert data from PDF attachments to the compatible invoice format, the workers tend not to seek a solution, but print out the PDF invoices and scan them back to the system, because they feel this way is faster and safer.

Little change in energy costs may be attributed to the fact that the computerised equipment is even in greater use nowadays, than it used to be years back.

### *Organizational image*

The management's attitude towards the steps the company takes in making the business processes more efficient is positive, and they are looking forward to the possibilities to modernize the organization and make its standing in today's market even more solid. Nevertheless, contribution of the launch of e-invoicing to the company's image is hard to trace due to many surrounding facts and insufficiency of the proposed control variables. For example, Finnair has not widely advertised its new "greener" system to process invoices, but it is a big and famous company in Finland and can often be met in the media otherwise. The employer image of Finnair over years has also been fairly strong, and the company has not controlled for whether the number of applicants per an open position has grown after the introduction of E-Flow as it has always been high.

## 5.3 E-INVOICING AT LINDSTRÖM LTD

### *5.3.1 Background information<sup>1</sup>*

Lindström Group is a Finnish business-to-business textile services provider. Founded in 1848, the company has grown from a dye house operation to a laundry and from there to a professional textile rental firm. More than 160 year old family business is not only one of the oldest existing companies in Finland, but has preserved a pioneer in its field since its establishment.

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<sup>1</sup> Source: [www.lindstromgroup.com](http://www.lindstromgroup.com), Lindström Sustainability Report 2008

While headquartered in Helsinki, the company has 11 offices in Finland and 26 offices abroad. All together Lindström operates in 18 countries, i.e. Finland, Bulgaria, Estonia, Great Britain, China, India, Latvia, Lithuania, Poland, Romania, Sweden, Germany, Slovakia, Slovenia, the Czech Republic, Turkey, Ukraine, Hungary and Russia. In all of the above countries Lindström provides work wear services, and also offers mat services in the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia and Slovenia. In Finland the company's service range includes work wear and mats as well as hygiene, industrial towel, restaurant textile, personal protective equipment, and corporate gift services. Lindström's daughter company Comforta Ltd deals in bed textile services for the hotel, accommodation and nursing sectors in Finland, Sweden, Estonia and St. Petersburg in Russia.

Lindström's organisation comprises of geographical business units – Finland, Europe and Asia, and those of Comforta Ltd. There are seven service centres, design department of the parent company's administration, and six competence centres that are responsible for developing and bringing their specific competence to enhance business operations (see Exhibit 5 for Lindström Group's organization chart). At the turn of the year 2008 the Lindström Group had over 200,000 customers in Europe and Asia, almost 2,500 employees and the turnover of €250 million.

### *5.3.2 Transition to invoice handling automation*

Lindström has always had a centralized system for handling invoices. All purchase invoices addressed to its branch offices across Finland would come directly to the head office in Helsinki. Until 2004 a normal procedure of processing an invoice would start from collecting, opening and sorting out the incoming mail by a ledger clerk. Processing incoming invoices was her main duty and she was the only employee responsible for doing this. Having handled the mail, she would

mark all the invoices with a stamp containing empty fields for inserting posting data, such a project number, cost center, etc., and forward it for approval to the branch office that acquired the goods or services stated in the invoice. A branch employee responsible for the purchase would check the invoice against the delivered services or goods, insert the required posting information, approve it and send back to the ledger clerk at the head office. After the approved invoice had been received, the ledger clerk would register the invoice into the accounting system. The cycling time of an incoming invoice would take up to three weeks, which stemmed from the fact that sending an invoice for approval to a branch in the other city would consume time and the person responsible for the approval might linger to approve the invoice for some reason.

Sales invoices were handled by an internal IT department that Lindström used to have earlier. The IT employees would receive registered events of service or goods sales that the workers in the service units across the country were inserting into the system. Every week IT department would pick up registered sales events and send invoices to the buyers. The process, according to the management, was labour-consuming and inconvenient. After reorganizing their carpet wash services, Lindström also decided to change the accounting system and pass over the handling of sales invoices to the financial administration.

For archival purposes, since 1980s and up to the introduction of electronic handling of invoices, all invoices would be scanned and stored in electronic format. The scanning used to be done in summers by a summer worker.

In 2003 Lindström started planning the modernization of the invoice management system. Better accountability and easier monitoring were among main motivation factors influencing the decision to implement electronic invoice handling. At that time there was little competition among the providers of electronic invoice handling solutions and Lindström went through purchase negotiations with the three major, BasWare Plc, Tieto Plc and WM Data Plc

(nowadays Logica Finland Ltd). Tieto's software was preferred because it allowed not only circulation of purchase invoices and reception of true e-invoices, but also sending outgoing electronic invoices to the clients. In the beginning of 2004 Tieto's Economa WorkFlow was taken into use. Since the whole system for invoice handling had to be changed, the technology expenditures were high. Altogether, the costs of implementing WorkFlow and outgoing invoice handling system Proteus by Logia Systems Ltd came close to €50,000.

It took approximately one year until all Lindström's offices in Finland started using WorkFlow. The ledger officer was travelling to the branches across the country and giving trainings to the local personnel. There were approximately 50 people across the branch units who were responsible for posting and approving purchase invoices. Also, the innovative working procedures were advertised in the company's intranet and personnel magazine. Lindström's suppliers and clients were informed mostly upon the sales or maintenance visits where service or sales people would explain to the counterparty how the new invoicing system works.

According to the management, the penetration of the new system and its adoption by users went surprisingly easy and with little trouble, and the initial rigidity and mistrust were overcome relatively fast. Some employees did not like the idea of increased control, but overall feedback soon changed to positive. Lindström had encouraging experiences with the technical guidance and support of the software provider, and the malfunctions of the technology during the implementation period were normally taken care of efficiently.

As the management asserts, the launch of electronic invoice processing has not had any major impact on the labour costs. The processing of incoming invoices is still carried out by one ledger officer, whose educational profile, i.e. basic professional degree, and pay remained roughly the same.

Currently Lindström is considering the change of their accounting software and planning a re-design of the invoice circulation system so that to make it possibly even more automated.

### *5.3.3 Processing incoming invoices*

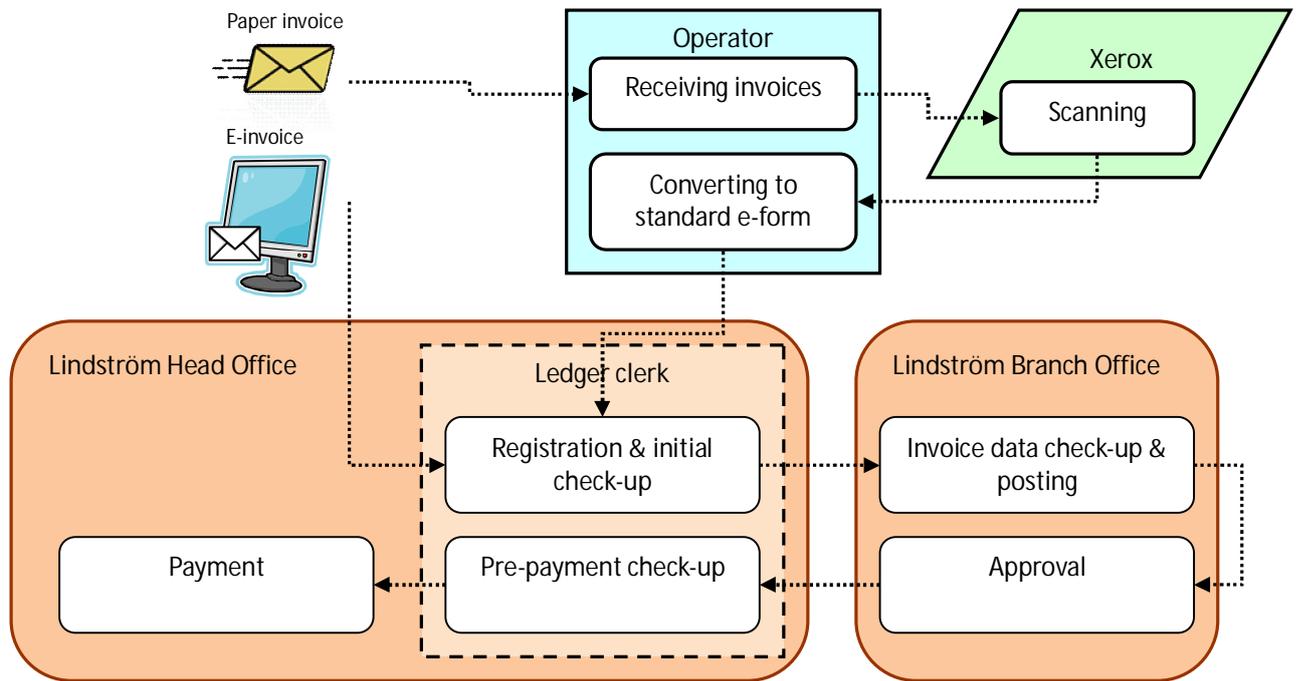
Due to the nature of its business, Lindström's invoicing is more outgoing, than incoming. The company has about 40,000 clients only in Finland, whom they regularly provide maintenance services and, thus, issue recurrent invoices. Nowadays it is approximately 50,000 outgoing invoices sent out per month, i.e. 600,000 invoices a year. The share of e-invoices is around 39% as compared to 24-25% a couple of years ago, and only 6% in the beginning of 2004. According to the management, e-invoices are now accepted by the client companies of different sizes, and there have also been requests for providing only e-invoices.

The annual amount of purchase invoices is around 20,000<sup>1</sup> which is twice less when compared to the volumes received years ago. The decrease stems from the reorganizational procedures and centralization of purchasing activities within the company. The penetration of true e-invoices among the incoming ones is approximately 50%. The rest is received in paper and has to be scanned into the system. The scanning is however outsourced to the e-invoice operator, Tieto Plc, who uses services of Xerox Ltd. After receiving a scanned invoice from Xerox, the operator transfers the invoice into electronic format, and then forwards it to Lindström. Full invoice processing cycle at Lindström is depicted in Figure 5.3.

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<sup>1</sup> See Exhibit 6 for basic data on incoming invoicing given by the case companies.

Figure 5.3 Incoming invoice full processing cycle: Lindström Ltd



All posting data is normally inserted at a branch office, however, some recurrent invoices, e.g. phone bills, have posting information already included and need only be approved. For the purposes of internal control, an invoice is checked and posted by one person and approved by another. Except for the ledger officer, who processes all the incoming invoices and can see whether they have come straight from the vendors or been forwarded from the operator, other users of electronic invoice handling system cannot distinguish the differences while processing the received invoices.

Receiving all of incoming invoices as true e-invoices is on the priority list, largely due to the costs of scanning services. Xerox charges the operator €1 per paper sheet of the invoice scanned. When an invoice arrives straight from a supplier in standard electronic format, the operator charges Lindström only €0,20 per invoice. Average full costs estimate for processing an incoming invoice, as

approximated by Lindström, is €20-30, where the sum varies depending on whether the invoice originally came in paper or in electronic format and the difficultness of a case, i.e. time spent to process the invoice.

Also direct costs for sending electronic and paper invoices to the clients differ considerably. The latter involve post charges, envelopes, paper used, etc. The difference is particularly noticeable when sending multipage paper invoices, e.g. €3 for a paper invoice vs €0,20-€0,30 for its electronic version.

#### *5.3.4 Findings per impact area*

The management of Lindström are generally satisfied with how the transition to e-invoicing went and those advantages it has brought. Monitoring and management of invoices have considerably improved, which means that main goals set when implementing WorkFlow have been achieved. Besides these, the management says the system allows better planning of resource investment and concentrating on the core business. Another practical benefit in terms of accounting is that all purchase invoices, even if they are still pending for approval, are visible and possible to register for right time period.

According to the management, e-invoice penetration growth has been developing as expected. In early 2004 only 6% of sales invoices and a similar percentage of purchase invoices were in true electronic format, and by 2009 reached 39% and 50% respectively. Lindström is looking forward to increasing the share of e-invoices up to 80% among outgoing and even 100% among incoming invoices. To achieve the desired rates, Lindström will be further reminding through the sales representatives and otherwise motivating its clients and vendors to undertake the possibility to have faster, more efficient and less expensive transactions. However, the management admits that in practice paper invoices will still be emerging time after time. For example, Lindström branches

use occasionally local service providers, often small private firms like dressmakers and clothes repair shops, to solve some urgent situation a client faces. Such small firms may not be using e-invoicing technology for various reasons and usually issue invoices otherwise.

Due to different level of technology advancement in the countries where Lindström operates, there are currently no goals for e-invoice penetration for the company branches abroad.

### *Invoice processing time*

The throughput of incoming invoices has stayed roughly the same over the past years, i.e. 20,000 purchase invoices per year. All these have been handled by one ledger employee, who has remained in her position after the introduction of WorkFlow. Nowadays, however, she is able to spend about 2 hours per day helping the accounting team while handling the same volume of purchase invoices as before 2004.

Since opening and scanning of paper invoices is outsourced, Lindström practically receives all incoming invoices in electronic format: some arrive straight from the vendors while others are delivered by the e-invoicing operator after having been scanned and converted to a standard e-invoice layout. Nowadays it takes approximately four minutes for a ledger worker to handle one incoming invoice and roughly three minutes of a business unit employee to check the invoice, insert accounting data and forward for payment, as shown in Table 4.5. The processing time in reality depends on sufficiency of invoice data. For example, handling and approval of recurrent telephone bills could be done in a couple of minutes because the accounting information can be pre-inserted into the system, whereas other invoice may require more clarifications and, thus, consume more of one's time. This means that further time savings in processing can be achieved if only there will be more of the invoices with complete information.

It would be interesting to see how long on average the processing of one purchase invoice would take, if Lindström were receiving and processing paper invoices itself. Currently the time difference between manual and electronic processing performed by the ledger is only 1,5 minutes. It might well be that this time would be roughly equal to scanning time, and then there would be almost no savings in human labour time. This thought was actually voiced by the Lindström's management who said that the job itself has not gone, but changed its shape.

Table 5.5 Incoming invoice processing times: Lindström Ltd

	Paper 2003	E-invoices 2009	
Amount of employees in the incoming invoice team (FTE)	1	0,7	
Monthly average throughput of incoming invoices per worker	1650,0	1650,0	
Daily average throughput of incoming invoices per worker	82,5	82,5	
Average processing man-hour time per one incoming invoice (estimate for an invoice handling ledger employee)	5,5	4,0	(min)
Average processing man-hour time per one incoming invoice (estimate for a business unit employee who insert the accounting data and approves an invoice)	7	3	(min)
Total average processing man-hour time per one incoming invoice	12,5	7	(min)
Average time for scanning & inspection stages	N/A	outsourced	(min)

These processing times include only human labour time, whereas in practice there are also delays in between the stages which extend the full invoice handling cycle considerably.

### *Invoice handling cycle*

Before the introduction of WorkFlow, the handling cycle of an incoming invoice, i.e. total time consumed from receiving until the payment, would take approximately three weeks. Most of this time an invoice would be travelling via internal mail between the head office and the business unit as well as pending at

one's table for posting and approval. There have been approximately 50 employees who are responsible for doing posting and approval across the branches in Finland.

At present the circulation time for incoming invoice is at average two weeks, though the invoices are immediately forwarded for approval after having been checked. The approval stage is what takes most of time nowadays, because people in the units usually have many other things to do besides the invoices' posting and approval. The system sends reminders upon the due dates getting closer, and normally the invoices are nevertheless paid on time.

#### *Interest on overdue payments*

Thanks to the improved control and availability of outstanding invoices, automated reminders and decreased circulation times, Lindström has managed to considerably reduce the amount of interest paid on overdue invoices. Over the past years the interest sum has decreased from several thousands to some €200 in 2009.

#### *Processing errors*

Since all invoices arrive in electronic format, there are no errors originated from manual insertion of data anymore. However, according to the management, some erroneous invoices with incomplete data may occur due to occasional malfunctions of the technology. Their amount is fairly small, but permanent. Tracing incomplete invoices and clearing up the difficulties is relatively uncomplicated, because the invoices are visible in the system and the sending party is always known.

## Invoice processing costs

The introduction of WorkFlow has not had any impact on total employee costs as there is still one same ledger worker processing all incoming invoices whose pay has roughly remained at the same level. However, man-hour processing costs per invoice decreased thanks to reduced handling time. Average human labour costs for processing one incoming invoice in 2003 and 2009 are shown in Table 5.6.

Table 5.6 Labour costs per incoming invoice processed: Lindström Ltd

	manual 2003	e-invoices 2009	
Average costs of one man-minute of the ledger worker (€38.000-40.000 a year)	0,35	0,37	(€)
Average costs of one man-minute of work at the business units (€55.000-60.000 a year)	0,53	0,57	(€)
Total aggregate processing man-hour time per one incoming invoice	12,5	7,0	(min)
<b>Total aggregate costs per one incoming invoice processed</b>	<b>5,6</b>	<b>3,19</b>	<b>(€)</b>
Average time for scanning & inspection stages	N/A	outsourced	(min)
Costs per one sheet of scanned invoice charged by the operator		1	(€)
e-invoice delivery fees charged by the operator		0,2	(€)

These calculations only include human labour costs, which may explain the dissimilarity with commonly used estimates for incoming invoice handling which are €20-30 per invoice. One would definitely arrive at more comprehensive invoice processing estimates, if also non-labour costs would be added, e.g. the costs of outsourced scanning services, e-invoice delivery fees charged by the operator, overdue interest paid, the technology's license fees, etc.

According to the received numbers in Table 5.6, the labour costs per one incoming invoice went down. However, it would also be interesting to see how high the current processing costs would be if all the handling stages of paper invoices were carried out internally. This would give a better picture of the

difference between manual and contemporary modes of incoming invoice handling.

Since nowadays the ledger worker practically receives all incoming invoices in structured electronic format, further monetary savings can be achieved not through the decrease in man-hour processing costs, but rather through the growth of true e-invoices share. This would spare the expenditures on outsourced scanning services. For example, if Lindström reaches the wishful 100% incoming e-invoice penetration, it would be able to additionally save €8,000 per year.

#### *Utilization of released labour resources*

Nowadays the ledger worker, who has been handling the whole volume of incoming invoice alone, is able to dedicate on average two hours of her working day to assisting the accounting team. This translates into over 500 man-hours that can be saved or utilized in other duties in the company. There might be further time savings if the incoming invoices would be more complete, that is they would contain the pre-inserted posting data, thus, making the approval and other processing stages faster and easier.

#### *Work moral*

According to the management, the transition to new invoicing system has been happening without major resistance from the personnel's side. Initially the major complaints were only about the increased control over one's duties, i.e. thanks to the visibility of invoices it became possible to see how many pending invoices a certain person has and to remind her to do the approval and posting on certain date. Nevertheless, the business employees in the units did soon value a greater mobility offered by WorkFlow as the invoices can nowadays be approved from virtually whatever location they travel.

The overall feedback for the system usability has also been fairly positive. The management attribute this to the fact that the technology was tailored to meet the needs of Lindström's accountings as well as that the software provider has usually been very responsive and fast to correct any occasionally occurring technology faults. In general it can be said that the modernization of the work processes has improved the quality of routine work and been adopted by the employees with growing consent.

### *Consumption of paper and energy*

In case of processing incoming invoices, the paper waste has decreased thanks to that all incoming invoices are nowadays received in electronic format and the necessity to print out an invoice occurs rather seldom. Energy consumption costs have not been noticed to reduce, which can be explained, as the management say, by even increased usage of computerized technologies.

### *Organizational image*

Lindström has performed no special studies whether and how the organizational image has been changing over the past years. Right after the introduction of the e-invoicing technology there has been an increased interest by the media towards the company, but the situation returned to normal as soon as e-invoicing has been spreading over more and more firms in Finland.

The launch of WorkFlow has not also been noticed to cause irregular amount of applicants per open position or peaking employee satisfaction rate. Nevertheless, according to the management, the company sees itself as keeping pace with the current century and tries to promote this attitude across the organization through internal magazines and other communication means.

## 6 DISCUSSION

Here in this chapter, the subsection 6.1 will sum up the results over all three cases, whereas the subsections 6.2 and 6.3 discuss the compliance of case results with the theoretical framework of the study and offer more practical issues to discuss, such as e.g. challenges and success boosters when implementing e-invoicing technology, respectively. The paper concludes with the limitations of the obtained results and offers further research ideas.

### 6.1 CROSS-CASE SUMMARY OF THE RESULTS

The cross-case results indicate that over the past six years, i.e. since the year 2004 when the three case organizations launched the electronic invoice circulation and processing technology, the incoming e-invoice penetration rate has grown up to 30-50%. This percentage is however true to only domestic transactions. The companies that are engaged in international operations, i.e. Finnair Plc and Lindström Ltd, have a negligible amount of the suppliers abroad who are able to issue e-invoices. Thus, if the whole volume of incoming invoices is taken into calculations, the penetration of true e-invoices in such companies drops significantly, e.g. only to 12% in case of Finnair Plc. This clearly shows that the overall technological progress of a country, penetration of information technologies in the routine office duties as well as the working culture can be core factors either favouring or hindering the expansion of e-invoicing in that country. Currently Finnish companies that have extensive international relationships with foreign vendors can not expect same level of efficiencies and benefits as the companies who solely or mainly operate domestically in Finland.

Bargaining power and an active position in promotion of e-invoicing among the suppliers are also deemed to be critical in e-invoice penetration growth. Having an influential market presence can additionally help to motivate the vendors to transfer to electronic invoicing. For example, the City of Tampere is the largest organization in Tampere region and is one of the most important buyers of social, health and communal services. Many local service providers are in direct dependence on the City and, thus, are more likely to adhere to Tampere's recommendation to only issue e-invoices, as opposed to Finnair who is only one of the buyers in airline business and has to often accept local ways of doing business. Nevertheless, promotional activities and education of vendors are also found to bring good results. Almost 50% incoming e-invoice penetration in Lindström, as they testify themselves, is the result of close collaboration with their suppliers and partners who have been informed, educated, reminded and otherwise motivated to switch to e-invoices.

Comparing manual processing years ago against the computer-aided handling of incoming invoices today, the throughput of processed invoices per worker, i.e. labour productivity in other words, has increased in all three cases. For example, in the City of Tampere the difference of monthly invoice throughput per worker between 2002 and 2009 is found to be over 180%, that is one worker in 2002 manually handled 440 incoming invoices per month whereas nowadays she manages to process over 1260 incoming invoices. In Finnair and Lindström the monthly throughput of processed incoming invoices per worker grew from the times of manual handling to today by over 20% and about 45% respectively. The average man-hour time required to process one incoming invoice nowadays is about 10 minutes in case of Tampere where the e-invoice penetration is about 50%, around 17 minutes in Finnair where only 12% of the incoming invoice volume are true e-invoices, and it is approximately 7 minutes processing time in case of Lindström. Actually Lindström's receives all purchase invoice in electronic format: one half of which come straight from the vendors as true e-invoices and the other half arrives formatted through the operator as Lindström outsourced

the scanning and pre-formatting of paper invoices to Tieto Plc. Table 6.1 presents the man-hour time needed for manual processing before the electronic invoice handling system was taken into use, semi-automated processing, i.e. where scanning is used to convert paper invoices into electronic form, and purely e-invoice handling.

Table 6.1 Cross-case summary of processing man-time per one incoming invoice

	Processing mode	2002 - 2003	2009	
		man-time (min)	man-time (min)	total e-invoice %
City of Tampere	average time	22,2	9,9	48,87 %
	manual	22,2	-"	
	semi-automated	-"	10,5	
	e-invoice	-"	9,2	
Finnair Plc	average time	24,0	16,9	12 %
	manual	24,0	-"	
	semi-automated	-"	17,5	
	e-invoice	-"	12,5	
Lindström Ltd	average time	12,5	7,0	100 % <sup>1</sup>
	manual	12,5	-"	
	semi-automated	-"	-"	
	e-invoice	-"	7,0	

These findings only indicate the average human labour time required per one incoming invoice, no possible delays, such as technology performance lags and human factor lingering, in between the processing stages are included. The estimates are merely directional as the true time required to process an invoice is subject to the completeness of invoice data, and availability and correctness of required posting information.

As it can be seen from the table, since the era of manual invoice processing the human labour time required for incoming invoice handling has clearly gone downwards. The decrease can be attributed to the efficiencies, e.g. electronic

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<sup>1</sup> A real percentage of true e-invoices coming straight to the company is roughly 50%. The rest arrives through the e-invoicing operator who receives all the company's paper invoices, scans and converts them to standardized electronic format.

circulation and instant availability to stakeholders, offered by the introduced electronic invoice handling systems, grown share of true e-invoices which need less time for being processed as well as to overall organizational learning and adjustments to new work processes. Lindström's figures for manual and electronic processing have the least difference. One may also ask that, if Lindström were doing mail opening and scanning internally, would there even be a time difference? Though the Lindström's ledger, who has been handling for years all of the company's incoming invoices alone, could possibly work manually as productively as she does nowadays solely electronically, there might be another cause why there is such a small processing time change. There were no recorded data on incoming invoice numbers available, and only a rough estimate recalled by the management was used in calculations instead. So the real numbers could be somewhat different, if the registered data were provided.

It may well be assumed that to achieve even superior man-hour savings, the case companies should be pursuing greater e-invoice penetration. Indeed, if the City of Tampere and Finnair were able to increase the share of incoming e-invoices up to realistic 80%, they could additionally save more than one man-year. However, in case of Lindström, as it practically receives all incoming invoice volume in structured electronic format, further man-hour savings can only be achieved through better completeness of invoice data. This is actually evidenced by all the three companies that, when an incoming invoice has pre-inserted posting information, the processing time significantly reduces. Thus, it can be hypothesized that for achieving considerable man-hour savings, the efforts should come from two sources: companies should take a harder try to promote e-invoicing to their suppliers whereas policy-makers in Finland may consider the transfer to unified chart of bookkeeping accounts that would aid the posting and the whole accounting system.

While the man-hour handling of invoices has reduced, it was not found to substantially affect the whole processing cycle, i.e. the time from receiving an

invoice until it is paid. Though there is no circulation via ordinary mail anymore and all invoices are almost instantly accessible after being registered into the system, delays at the approval stage are still somewhat long. Across the case companies the average processing cycle of an invoice is about two week, where most of the time an invoice resides pending for accounting data insertion and approval. The employees from the business units, who are often on business travel, can nowadays make an approval from any location where the Internet connection is available. However, they usually prioritise own direct duties over the invoice processing and invoices are lingering until the employees are reminded by an automatic message from the system.

There are also other kinds of delays in between the stages. According to the case companies, the technology itself is not yet at its best development condition. It may get very slow and hang over some operation. For example, the system may process the data up to fifteen minutes after scanning before an invoice is accessible for further processing, or after having handled an invoice, a worker may have to wait up to ten minutes before the system returns her to the list of pending invoices, etc.

Nonetheless, the usage of electronic invoice handling system is found to greatly affect the amount of interest paid on overdue invoices. Better visibility and accessibility, shortened handling time as well as the technology's utilities, such as electronic reminders, are voiced to be main factors why purchase invoices nowadays are not missing anymore and the due dates are largely met. Across all the case companies the decrease in the interest paid is up to several times what it used to be before the electronic invoice handling systems were introduced. There might also be another factor that prompted the companies to better control their payables, as was suggested by one of the interviewees. The invoice payment periods have commonly changed in Finland from 30 days to 14 days, which increased the risk of overdue fees and, thus, stimulated the businesses to be more cautious in relation to their purchase invoices.

As the companies testify, processing errors stemming from manual data input do not constitute a major worry for the invoice handling departments anymore, because such cases are very rare. Nowadays processing errors may occur due to occasional faults of the scanning technology if the system fails to correctly read and convert the data in a paper invoice into the digital format. However, such malfunctions are also getting rare as the technology is gradually improving.

Another, more permanent type of error that necessitates the re-work and extends the processing cycle is incorrect posting of invoices. Inaccurate insertion of posting data may stem from the work haste or likely negligence towards the invoices as the business people do not consider posting as important and feel it distracts them from their main duties. On the other hand, permanent errors in posting may be a sign of that more training is needed to be given to the employees in the business units.

Invoice processing costs in this paper were only assessed as the costs of human labour invested into the handling of one incoming invoice. The average man-hour difference between manual and electronic processing is over 10 minutes, as given in Table 6.1, whereas the difference between semi-automated and purely electronic is much less. Currently the human labour costs of processing one true e-invoice across the case organizations fall in between €3,19 - €5,51 as opposed to manual processing costs of €5,6 - €10,17. For semi-automated method of processing, today's labour costs per one incoming invoice are €4,56 – 7,51€. The labour costs per individual invoice can be somewhat higher in reality, as they are subject to the employee costs and time spent per invoice. More time is spent on those invoices that are incomplete, erroneous, need additional documents to be approved and written for correct accounts, etc.

The estimates of paper invoice handling costs obtained in this study are considerably lower than commonly attributed ones, i.e. about 30€. One possible explanation of it may be the fact that the calculations done by different sources may include different variables. To repeat, this study is only interested in and accounts for direct human labour contribution in invoice handling process, whereas other estimates may also have included non-labour costs, i.e. e.g. interest paid on overdue invoices, technology license fees, equipment maintenance costs, e-invoice delivery fees charged by the operator, management costs, archival space, etc. Even waiting time, when the system hangs over some operation and an employee has to wait in between the processing stages, could also be taken into the formula as a sort of opportunity costs.

Another possible explanation of high cost difference with other studies is that the calculations may build on different employee cost data. For example, while Penttinen (2008) obtains roughly similar contribution of human labour time per an incoming invoice in his case study of a mini company, he uses a much higher man-hour rate, i.e. €100. The fully loaded employee hour costs used in this paper are of about €22 and €33 for an invoice handling clerk and a business unit officer, who approves an invoice, respectively. Actually, the case study of invoicing at Jyväskylä City Housing Department (Voutilainen & Pentto 2003) applies similar public sector employee costs and arrives at the estimates of incoming invoice processing costs that are comparable to the ones received in this thesis. Namely, handling of one incoming invoice costs the Housing Department €8,60 when a paper invoice is processed manually, €2,11 when an invoice is first scanned to the system, and €1,89 in case of a true e-invoice. The pattern is nevertheless same across all the studies and cost estimates: it can be seen that the processing costs per invoice go considerably downwards as its handling time decreases.

Energy consumption and paper waste are another kind of non-labour costs, and these were not noticed to be significantly reduced in incoming invoice departments across the case companies. Increased use of technology and computerized equipment would not make it possible, as suggested by the case companies. Paper waste in incoming invoice departments somewhat reduced as there are less paper invoices arriving every day, but the effect is unfortunately cancelled out by the fact that many employees, by old habit, do print many other documents even when it can be avoided. As testified by one of the companies, workers prefer to print out an enclosed PDF-invoice and scan it back to the system, because the technology reading straight from the PDF documents may occasionally fail doing that. E-invoicing can be posited to bring more substantial paper costs reductions for outgoing invoicing, as there are not only the costs of paper, but also mailing expenditures involved.

Since the launch of electronic invoice handling system, the labour requirements for processing annual volumes of incoming invoices have reduced thanks to decreased handling time per invoice. From the incoming invoice team the City of Tampere has managed to release ten employees, Finnair five, and the only incoming invoice processing employee at Lindström is nowadays able to dedicate one fourth of her time to assisting in other departments. As suggested in a few paragraphs above, further releases are possible if both the e-invoice penetration becomes higher and the posting data is pre-inserted in the invoices.

Most of the released employees, whose positions were discontinued, have not stayed in the companies. They either naturally retired or, if under fixed terms, their contracts were not continued. The rest were voluntarily relocated to mainly accounting duties and some switched to secretarial type of work within the organization. These findings are subject to the fact that invoicing handling positions are typically staffed with employees of older generations who were employed by companies years ago when permanent contract system was more popular than it is nowadays. This means that if one's position becomes

redundant, she may go on retirement, if her age is close to that, or has to be relocated to some other duties within a company in accordance with the labour protection law. Since there are not many cases of internal relocation, it is not possible to see what could be a whole range of likely duties the released labour force could take over. Due to the obligation to relocate, it is not also possible to check whether the companies would be voluntarily interested in relocation or rather prefer simply cut the redundant costs.

Upon implementation of the electronic invoice handling system, all case companies faced the initial change resistance from invoice handling employees and some business unit people. The rigidity to use the new technology became weaker over the course of time as the system was getting more familiar and its advantages started showing up. Nowadays the user feedback is getting more and more positive. However, as emerged from the interviews with the case companies, main hindrances to adopting new work routines stem from several reasons: older generations' inflexibility to change the old paradigm of work processes, certain fright of computerized technologies due to lack of computer skills and experience, fear of becoming incompetent and losing the work place, and occasional faults and imperfections of the technology itself. The latter factor is very crucial as it adds to overall frustration and job satisfaction, and strongly affects all the former above.

The contribution of the new invoicing technology to work moral as well as to the organizational image is hardly possible to adequately assess through several interviews with selected workers. Instead a more comprehensive study, including multiple sources of evidence, would be required for every case company separately. The case companies themselves have not performed such analyses either. Nevertheless, according to the interview data, employee satisfaction in all three companies has been steadily improving over the past years, but no upturns associated with the launch of e-invoicing has been registered. There have also been no abnormalities noticed in interest by the media, in volumes of

applications per open position or other indicators of changes in the organization image. Nowadays, when the economy is still suffering from the recent decline, many people have lost their work places and the rest are not safe as well, both work moral and organizational image are even under greater pressure.

None of the companies has done a comprehensive analysis of the return to investment so far. Computerization of invoicing and other office routines is taken more as a necessary cost of doing business today and in the future.

To sum up this subsection, it can be added that the results in all three cases were found to show considerable convergence over most of the e-invoicing impact areas summarized in Table 4.1. This may testify that the cases were chosen correctly in accordance with the replication logic requirements in academic case study research (Yin 2003). Theoretical and practical implications of the results as well as supplementing findings obtained during the interviews are discussed in the two following subsections.

## 6.2 THEORETICAL IMPLICATIONS

By substantiating work processes where electronic technology has had an impact on, it became possible to more correctly assess its significance for case companies (Mukhopadhyay et al. 1995).

Back in yearly 2000s, upon planning the transfer to a more sophisticated invoice processing, the case companies have set primary goals that the technology investment should attain: control over the volumes of incoming invoices, transparency and monitoring of invoice processing, easier accessibility and better management of outstanding payables. These refer more to characteristics of infrastructure investment, i.e. costs of doing business, rather than a strategic

resource allocation. In the case interviews, when asked about the realized value of the system, the management in first place mentioned the value dimensions that allow the company to have smoother work in supporting functions and, thus, better concentrate on the core of the business. Productivity enhancements and costs reductions were voiced in the second place, whereas the impact on external standing of the company, e.g. competitive advantage, market share, etc., was not attributed to the system at all. Indeed, the findings of the case studies confirm the interviewees' perception of the value of electronic invoice handling technology. The introduction of the technology has managed at the first place to fulfil the main goals: invoice management became very accurate and harmoniously supports other functions in the case companies. There are, for example, no missing invoices anymore, payments are mostly done on time, the work of accountants and controllers is eased, and budgeting and financial planning are favoured.

The costs of incoming invoicing procedures are also found to be reduced, which is principally realized thanks to increased labour productivity and, thus, reduced man-hour costs per invoice. However, the system of electronic invoice brought not only direct costs reductions, but also reduction of related non-labour costs, e.g. interest paid on overdue invoices. In one of the case companies, transmission charges for receiving a true e-invoice were also registered to be fairly lower than receiving a scanned paper one. Labour productivity increase recorded across the cases support the earlier productivity research that dismantles the productivity paradox (e.g. Brynjofsson 1993, 1996). The productivity enhancements, realized thanks to electronic invoice handling, are also consistent with Weill (1992) who found that transactional type of IT, e.g. data interchange, is most strongly associated with gains in labour productivity as opposed to strategic and informational IT.

At the same time, another source of productivity, i.e. utilization of released labour in other functions across the company (Penttinen 2008), was not found to

strictly confirm. The cases yielded mixed findings biased to the labour protection law in Finland and to the fact that back-office positions are chiefly staffed with older generation workers, who rather shift to retirement than other duties when the positions are no longer needed. While there is no definite evidence of productivity gains thanks re-utilization of freed labour resources in the three e-invoicing cases of this thesis, it can be nonetheless posited that on higher levels, i.e. industry and economy on the whole, higher automation of manual work will be releasing more labour force that can be utilized in other functions across different businesses and, thus, maintain an industry's productivity. For-profit companies normally tend to cut redundant labour and staff openings with competent people, thus, the question of labour re-utilization for an individual company may not be as significant as it can be in terms of national economy.

There is also not enough evidence to show that electronic invoicing technology considerably contributes to the organizational image (Penttinen 2008) and better competitive position. Organizational image and competitiveness include a complex range of strategic steps and competitive activities, where the implementation of any technology may be influential only in combination with other factors.

E-invoicing impact on revenues is also fairly uncertain, as this technology influences only a tiny non-sales related process. Additionally, any possible monetary benefits in relation to IT are normally prone to the so-called rent dissipation (Brynjofsson 1993), which also became obvious while working on this thesis: e-invoicing benefits move more towards the suppliers and society, than the company itself. Besides that, electronic invoicing technology is nowadays struggling to make more and more common across the businesses. This means e-invoicing is not meant and cannot be kept as proprietary system, and, thus, does not inherently add to competitive advantage and better sales.

The findings, nevertheless, support Byrd et al. (2006) in that the electronic invoice handling technology aids the financials and the company image through the contraction of the bottom lines, i.e. thanks to squeezing out the slack from work processes and reducing the costs. Unfortunately, but commonly, none of the case companies performed comprehensive post-implementation analysis of investment returns and benefits so far. It can be assumed that if the analysis were done, the companies would better perceive the value realized as well as would have been able to better learn from the implementation experiences (Tallon et al. 2000).

Returning to proprietorship of IT, the success of e-invoicing is, on the contrary, dependent on network externalities. The more users there are, the greater the benefits are: more automated work, less labour and complementary costs. In this sense, 'the first mover advantage' appears to be failing, because the companies adopting e-invoicing after the majority has already done so, will reap the benefits most. The technology may by then develop further and decrease in price, and the network will be mature. In practice this means a 'late mover' will start exchanging purchase and sales invoices mainly electronically right after the system's implementation. The extra costs paid by early adopters are in this case a necessary burden to initiate the change.

The implementation of the electronic invoicing technology is also found to be consistent with the hypothesis of lags in value realization of information technologies. All three case companies had to follow a lengthy learning curve before they could start withdrawing the benefits associated with electronic invoice circulation (e.g. Brynjolfsson and Hitt 2003). Organizational adjustments took months before the technology was tailored to a company's needs, initial user rejection and mistrust were overcome, first e-invoices from vendors began to arrive and the system started delivering up to the expectations. There should

be an obvious lag in value realization at society level as well: more benefits will start showing up as soon as the e-invoicing adopters' network grows and the technology becomes an ordinary business routine.

Consistent with e.g. Weill (1992) and Brynjolsson & Hitt (2000), efforts complementing the IT investment, such as trainings and promotion of e-invoicing internally to the employees and externally to the vendors, are recorded to be in positive relationship with the success of technology adoption and growth of e-invoice penetration. However, the latter is also bounded to technologically developed environment, meaning that a company with extensive global operations may not expect same benefits as the companies working mostly in the countries where regular business processes are highly computerized.

In overall, the study cases revealed that electronic invoice handling technology has followed similar pattern of value generating as in the studies of background IT value literature used in this paper. Being a transactional type of IT, the technology has brought noticeable gains in labour productivity in all case organizations. Nonetheless, the phenomenon of "productivity without profits" posited by Brynjolfsson (1993) still remain actual. The results are also conforming to the idea that companies-adopters, as well as the society on the whole, will be able to withdraw more value as the technology gets more ubiquitous across the businesses.

At the same time, it was hard to find evidence the e-invoicing impact on relocation of redundant labour, employee work moral, organizational image, and energy and paper savings (Penttinen 2008, Lempinen & Penttinen 2009). This can be explained by e.g. the lack of recorded data, insufficiency of control variables and data gathering modes. For example, organizational image and employee work moral should have been studied by means of more comprehensive and sophisticated methods than the interviews of selected company representatives. The study of labour relocation patterns should be repeated in some five-ten

years. By that time there will be more and more fixed term contract arrangements allowing the companies to be more flexible with the redundant labour force, as well as the labour market deficiency will be more obvious as forecasted.

### 6.3 MANAGERIAL IMPLICATIONS

Interpreting the study findings in terms of managerial implications, practical questions and challenges should also be discussed to give a more complete picture of what the implementation of electronic invoice handling involves.

As testified by the case companies, the costs of transition from old invoicing methods to the new system were considerably high, primarily due to the acquisition and tailoring of the technology to company needs. Other costs include annual technology licence fees, internal promotion and user trainings, and raising awareness among vendors. The difference of implementation and license costs between the older system and electronic invoice technology has been, according to the case interviewees, in tens thousand euro. Additional costs were incurred by the companies who acquired a license to provider's online services that enable issuing true e-invoices via a web portal. For example, Finnair Plc bought the portal license for its vendors, who cannot for some reason implement their own electronic invoicing technology. The vendors can now send purchase invoices online straight to Finnair's invoicing system. This arrangement allows Finnair to save on incoming paper invoice processing costs, but nonetheless most benefits go towards the vendors who need no own software neither pay paper invoice mailing costs.

Due to the fact that none of the case companies had the return to investment analysis done, there is no data how soon the investment reached or is expected to reach the break-even point. Nevertheless, as suggested in the previous

subchapter, the costs of transition to e-invoicing will come less expensive for companies who are planning to implement the technology nowadays. The competition among the providers of e-invoicing technology is becoming tighter, which will eventually drive prices downwards. What is even more important for late adopters, they will enjoy noticeably higher e-invoice penetration and, thus, realize more savings in invoice processing right from the launch, as opposed to the case companies who acquired the technology 6-8 years ago when there were only a handful of their partners and suppliers able to issue and receive e-invoices.

Before making an investment, the interviewees from the case companies recommend the firms, who are now considering the transfer to e-invoicing, to set goals for acquired system, envision in detail its capabilities required today and in the future, forecast the changes in company's business in general and, thus, allow for possibilities to develop the system in accordance with company's future needs. The software should also be an essential part of overall IT strategy and be integratable with other corporate systems.

According to the case companies' experiences, choosing flexible and easy to work with provider of e-invoicing technology is also critical to overcome initial challenges in technical implementation and transition on the whole. Tailoring of the system to company's needs and customization of user interface, e.g. to make it look similar to earlier or currently used other applications in the company, will demand extra costs, but will eventually be worth doing as the users would adopt the new system faster with less re-training needed.

Nonetheless, regular trainings of main technology users both in invoice handling department and in business units cannot be stressed too much. As in case of introduction of any technology causing organizational change, success of implementation of e-invoicing within a company is subject at first place to user acceptance of the technology. Main users of the electronic invoice handling system, i.e. company's invoicing department and business units, are a focal target

group to start education on e-invoicing with. Having internal users committed is critical not only for cooperative attitude towards the changes and, thus, faster transition, but also for external promotion to suppliers and partners as well. For example, Lindström's sales and customer service representatives actively participate in e-invoicing promotion by raising awareness, explaining and reminding of Lindström's new invoicing model when having sales appointments and other contacts with the clients and vendor companies.

Other possible ways to increase the penetration of e-invoices in supplier transactions, besides close affiliation and personal persuasion, were discussed during the case interviews as well. Currently, when processing incoming invoices of company business units, invoice handling departments in the case companies use different pricing for handling paper and true electronic invoices. While seeming a good incentive to supply more e-invoices due to higher charges for processing paper ones, individual people in business units are not enough engaged in practice, because the volume of incoming true e-invoices has no impact on their job or salaries. Ideally, keeping business units more accountable for promotion of e-invoicing among their own vendors and, thus, for penetration of e-invoices would be one of solutions.

Larger vendors who are wealthy enough to acquire own electronic invoice processing systems may be motivated to do so by means of charging extra fees for processing their paper invoices. While this arrangement may be feasible in Finland, internationally, however, price discrimination may not work due to immature computerization of business processes in many countries as well as to different culture of business relationships. In this case, providing them with a license to use e-invoicing provider's web-based service for issuing true e-invoice may be a solution to consider. User accounts for same web-based e-invoicing service can also be given to smaller and occasional domestic suppliers. However,

by acquiring license to such services for its suppliers, a company would incur additional costs. Thus, an analysis whether an investment pays off would be essential to do beforehand.

Major players in the market may also try to use their bargaining power to convince the partners and vendors to sooner switch to e-invoicing, as exemplified in the case of the City of Tampere. This method of e-invoicing promotion is however subject to business ethics, vendors' technological maturity and financial capacity to make IT investments. Aggregately the named above ways of promotion is mostly likely to boost the penetration growth, but in reality an individual company may be able to only pick up the ones that suit its situation best.

Internal promotion may also face certain difficulties. Introduction of any computerized technology is likely to require additional skills from the employees. Back office departments in Finland are usually staffed with senior generation workers, many of whom are naturally slow to change the paradigm of how their work should be done. Automation of work processes as well as requirements for additional computer skills are likely to be taken as a threat to their workplaces, which may cause some rigidity to use new system, negligence to learn new routines, and other signs of conflict of interests. This means the companies should undertake extra efforts to influence the mentality of senior employees in order to reduce hindrances in adoption of e-invoicing technology. Trainings and other incentives are important to impel greater employee adherence to on-going reorganization.

For companies with permanent contract arrangements it is also sensible to plan in advance how they are going to handle redundant work force after the introduction of automation invoice processing. Should there be no employees naturally retiring soon and regular lay-offs be for some reason inappropriate, the question of staff relocation becomes very tangible. In the case organizations

there were only few examples of suitable positions for relocated employees, such as similar duties in accounting department and secretarial tasks. Proponent literature suggests positions, for example, in customer service, call center, sales, etc. (Penttinen 2008, Dolman 2005). Companies, however, should realistically assess the need of extra resources in those or other areas, as well as competence of released workers and costs of additional training.

Due to a small number of relocations, the case studies of this thesis also shed little light on what criteria may be used when deciding who of invoice processing personnel should be relocated after the decrease of labour requirements in invoice handling department. All relocations in case organizations happened on voluntary basis where employees might apply for announced vacant positions in other departments. Alternatively, companies may take a more proactive, but comparatively expensive approach by carrying out aptitude tests to find most suitable skills for internal vacancies.

In general, relocation challenges appear relevant only under conditions where a company has mostly permanent job contracts and experiences a considerable decrease of labour requirements in invoicing department, while labour deficiency in other business functions is noticeable. As of now, however, the latter two are not pertinent. It is still a long way for e-invoice penetration to approach its limits as well as recent economic crisis does not allow speaking about severe labour market shortages. Contract system in many private organizations is also shifting towards fixed term agreements, which makes an employer more flexible in situations where a fraction of labour becomes obsolete.

There is anyway a high probability that companies will face a challenge related to labour resource shortage in some foreseeable future. Since retirement rates are forecasted to considerably grow in 5-10 years, attraction of younger professionals to certain positions may become troublesome. As discussed in the case interviews, positions in invoicing department, as well as positions in back office in

general, may not attract enough of young applicants due to the fact that this kind of job is still very monotonous and has a limited path for further career building. Retaining young recruits may be a problem unless a job picture can be made more attractive and demanding. According to several of the interviewees, job rotation and enrichment of daily routines with other duties may be some of possible solutions to reorganize a workplace in the back office into a more engaging one.

Finally, a question of whether the introduction of e-invoicing can be made an earnings contributor can be raised again. As argued in subchapter 6.2, e-invoice technology primarily aids company income through contraction of the bottom lines, i.e. it favours savings in costs of sales. Nonetheless as testified by the case companies, thanks to enhanced control of invoice due dates, companies may not only avoid interest on overdue payments, but can also better exploit settlement discounts where available. Early settlement discounts are less popular in Finland nowadays, but they are still widely used in Western Europe where a company may normally enjoy 2-5% discount on services or goods acquired if paying an invoice until a certain date. Charging higher fees for processing paper invoices can still be an additional source of income, at least domestically in Finland. There is already an existing practice of charging extra for providing information in paper, e.g. copies of certificates, bank statements, invoices, other documents, etc. The same practice can be reversed to be used for deducting fees for processing incoming invoices delivered in paper, which could be made possible through more complete contracts with suppliers to avoid likely misunderstandings. This trivial source of cash inflows may work well until e-invoice penetration is close to its realistic limits. Such arrangement in internal invoicing, i.e. among business units of one company and the invoice handling department, is not expected to be effective in terms of earnings as the money would in practice be travelling within the company without adding to revenues.

Discussion of practicalities can be concluded by referring to a message received during the interviews with the management of case companies: the transition to e-invoicing has not been flawless, human labour is still important as full automation is not yet achievable, and benefits may be less sizeable than initially expected, but retaining traditionally manual routines in the office is of absolutely no option. Vice versa, all of the case companies are looking forward to further modernizing their work processes to make their businesses more agile to challenges of today's information age.

#### 6.4 CONCLUSIONS AND FURTHER RESEARCH SUGGESTIONS

Given the fact that there are few real life case studies on electronic invoicing as of yet, the significance of this thesis is in that it revealed implementation experiences and explicated benefits the companies-adopters have realized within 6-8 years since the launch of electronic invoice handling system. In particular, the studies showed that electronic invoice handling systems facilitate companies to gain better transparency and control over their invoicing, and achieve higher labour productivity in invoice handling units. However, due to yet low true e-invoice penetration and still somewhat immature technology a great deal of costs savings and productivity enhances are not so far achieved.

The results also indicated that successful transition to electronic handling of invoices involves not purely financial outlay, but also complimentary efforts such as, for example, promotion of new work practices internally among the personnel and externally to vendors and other business partners, development of trustworthy and flexible relationships with a e-invoicing solution provider, restructuring of work processes related to invoice handling and accounting, having an understanding how an electronic invoice system fits overall corporate IT presently and forecasting how the system can be taken further should certain turns in company's business take place.

When viewed within the theoretical framework, the thesis results support the premise that information technologies increase labour productivity, but monetary return to IT investment can be observed primarily in a form of reduced bottom line.

Altogether, the attitudes of case respondents towards electronic invoice processing allow saying that companies look forward to even more automation and efficiency in office routines and are of the same mind that “paper invoices have no future” (Harald 2009). The interviews also produced valuable points for managerial considerations, as, for example, advice to look into a possibility to create incentives for business units to promote electronic invoicing to the clients and partners they interact with.

As there were inherent drawbacks in a chosen data gathering method, unavailability of certain recorded data across the case companies, and biases to current contract system in Finland, more accurate results of the case studies could have been obtained by minimizing the effect of these constraints. For example, to better assess the impacts of electronic invoice handling in the case organizations the interviews of key informants can be coupled with a survey of other stakeholders for getting a more objective picture. If more of recorded data were possible to receive, the findings would be less subject to likely blunders due to interviewees’ perceptions, imprecise recollection and assumptions. Thus, it would be interesting to have a similar case study in a company where virtually all required information would be easily accessible so that to compare the obtained results against the findings of the present case studies.

Furthermore, a case study on aggregate benefits of incoming and outgoing electronic invoicing should also deserve an interest as it can offer a more complete picture of what value e-invoicing technology brings to an individual company.

A follow-up research may also be carried out in the same case companies in some 5-7 years to, firstly, see how well the benefits of e-invoicing are progressing, and, secondly, to check how creatively the companies are able to re-utilize released labour resources, in order to maintain productivity level, under a forecasted labour market shortage.

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## Exhibits and other appendices

Exhibit 1 Electronic data interchange / IT usage in businesses per purpose, Spring 2008<sup>1</sup>

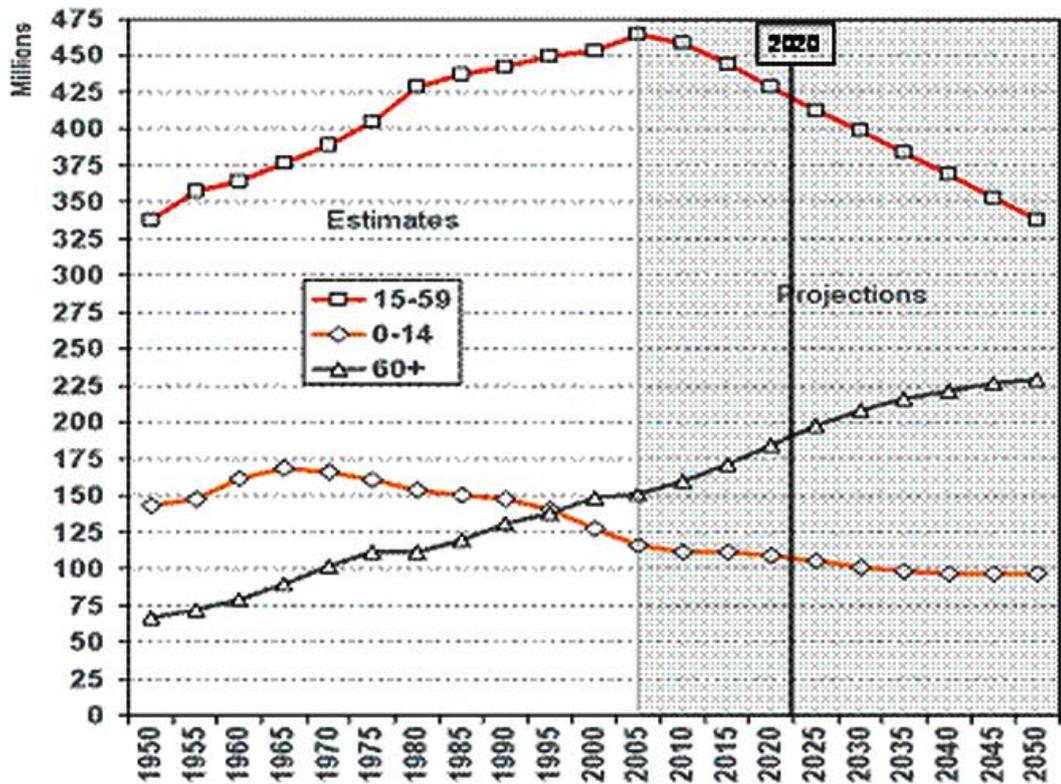
	Ordering from suppliers	Receiving e-invoices	Receiving orders from clients	Sending e-invoices	Sending or receiving product information	Sending or receiving transportation documents	Sending payment information to financial institutions	Information sending to or receiving from authorities
	%	%	%	%	%	%	%	%
Industry branch								
Manufacturing	31	34	50	41	30	31	27	65
Construction	44	37	26	23	37	11	37	67
Motor vehicle trade	85	41	27	18	64	36	38	40
Agency and wholesale trade	41	26	50	42	39	43	20	52
Retail trade	81	16	20	16	54	28	43	48
Accommodation and catering	59	39	45	18	51	14	..*)	41
Transport	33	26	49	26	28	62	..	38
Post and telecommunications	38	43	50	49	27	27	..	61
Business services	20	48	20	46	19	9	33	68
Employees								
5 – 9	45	24	30	22	39	27	28	49
10 – 19	46	34	34	29	40	22	37	55
20 – 49	37	34	36	37	30	24	31	70
50 – 99	34	41	44	49	25	25	28	69
100+	43	66	48	61	31	38	26	66
10+	42	40	38	39	33	25	32	63
All businesses	43	34	35	32	36	26	31	58

\* = very uncertain to be presented

Source: IT usage in businesses, Statistics Finland 2008

<sup>1</sup> Available online, in Finnish: [http://www.tilastokeskus.fi/til/icte/2008/01/icte\\_2008\\_01\\_2008-12-18\\_tau\\_002\\_fi.html](http://www.tilastokeskus.fi/til/icte/2008/01/icte_2008_01_2008-12-18_tau_002_fi.html).

Exhibit 2 The Ageing Population in Europe



Source: Tieto Plc 2006

Exhibit 3 The City of Tampere organization chart

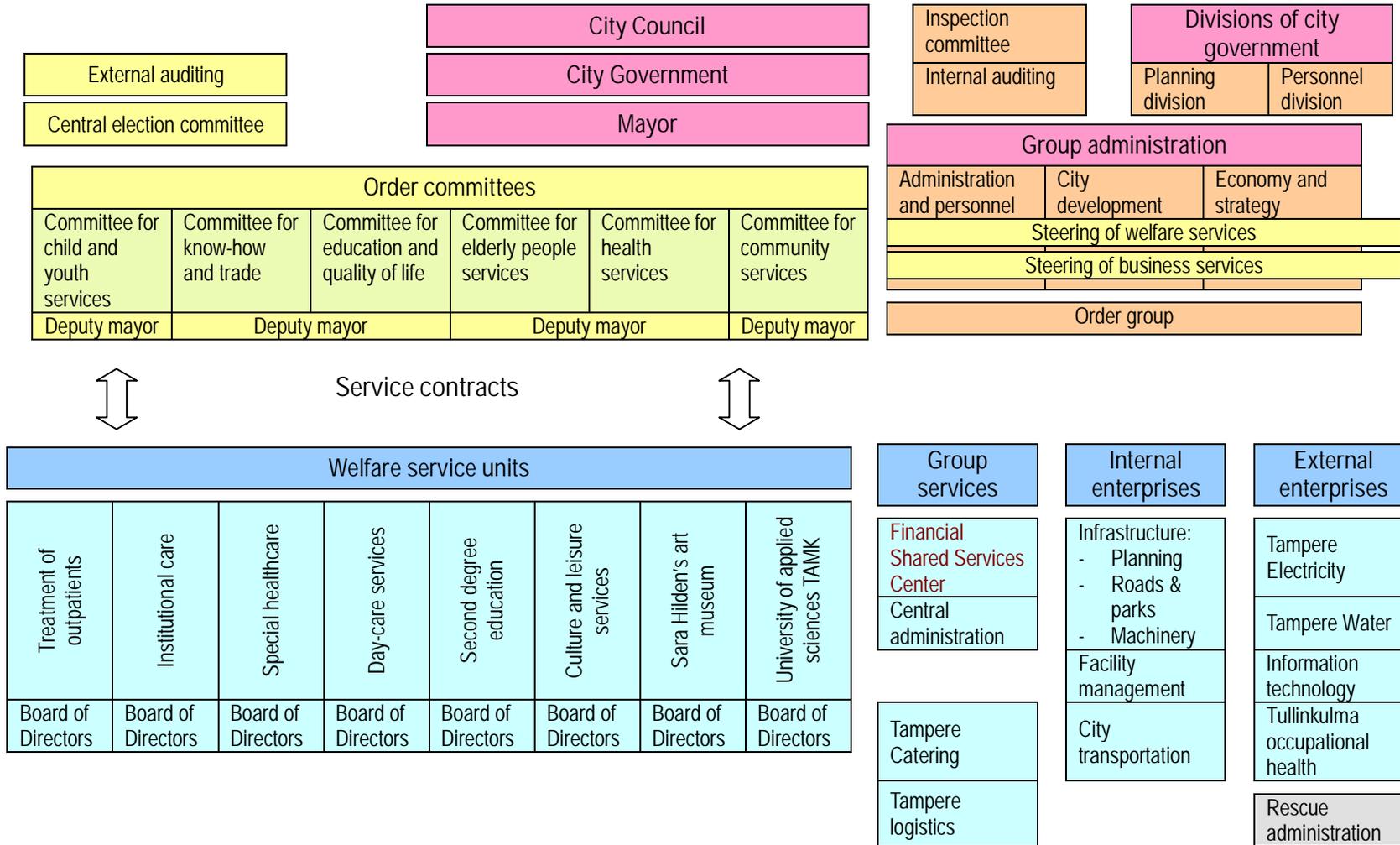


Exhibit 4 Finnair Group organization chart

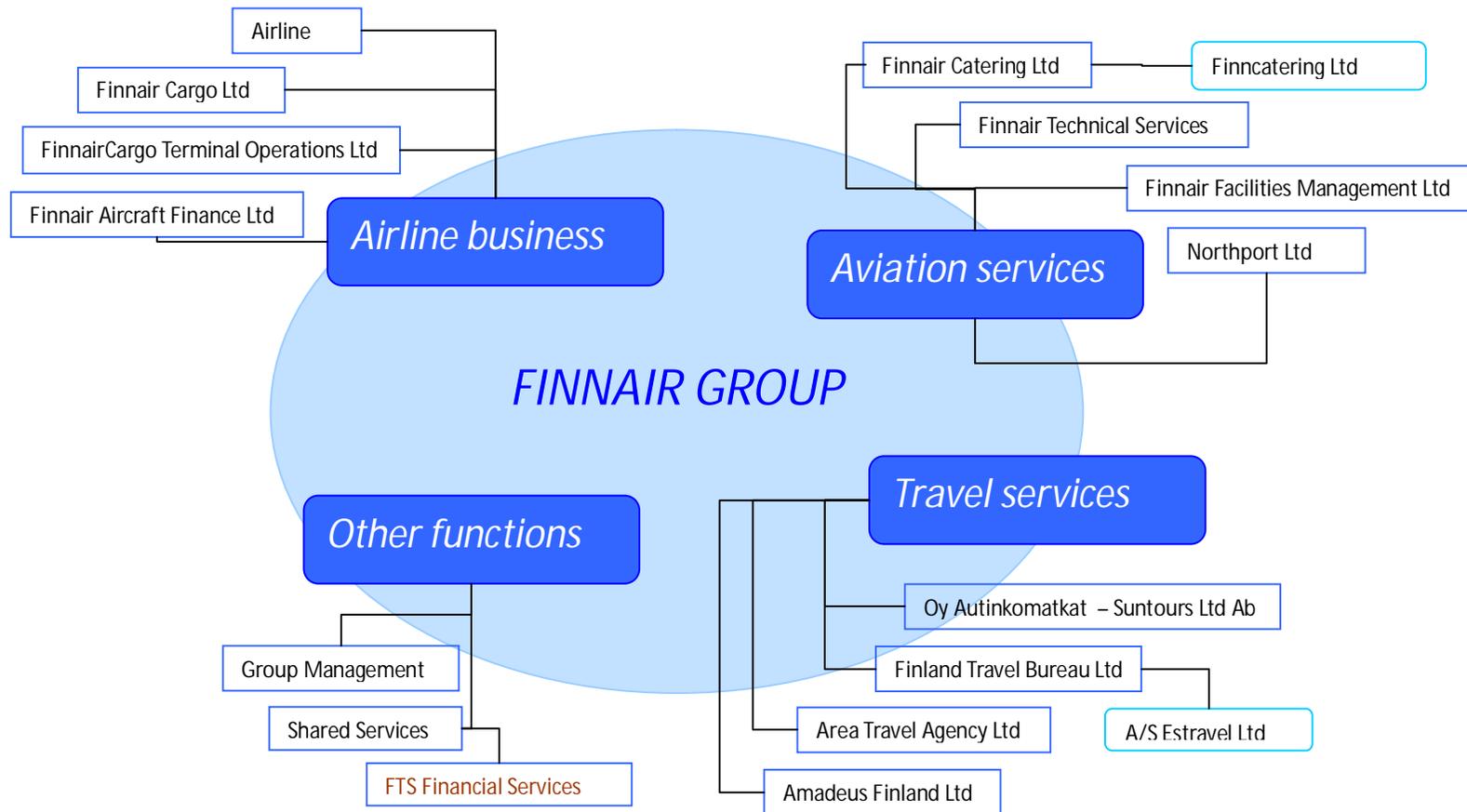


Exhibit 5 Lindström Group organization chart

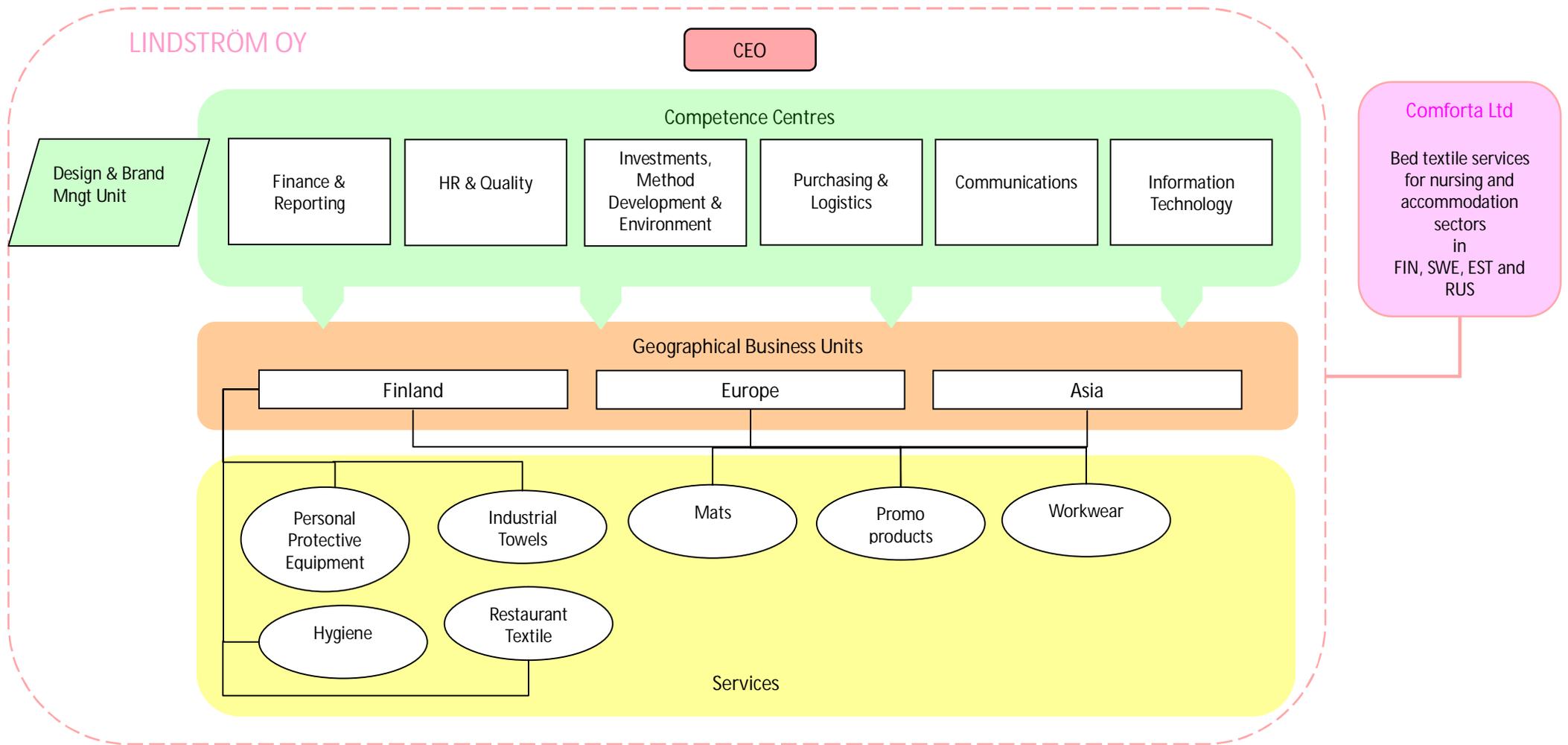


Exhibit 6 Basic data on incoming invoicing provided by the case companies

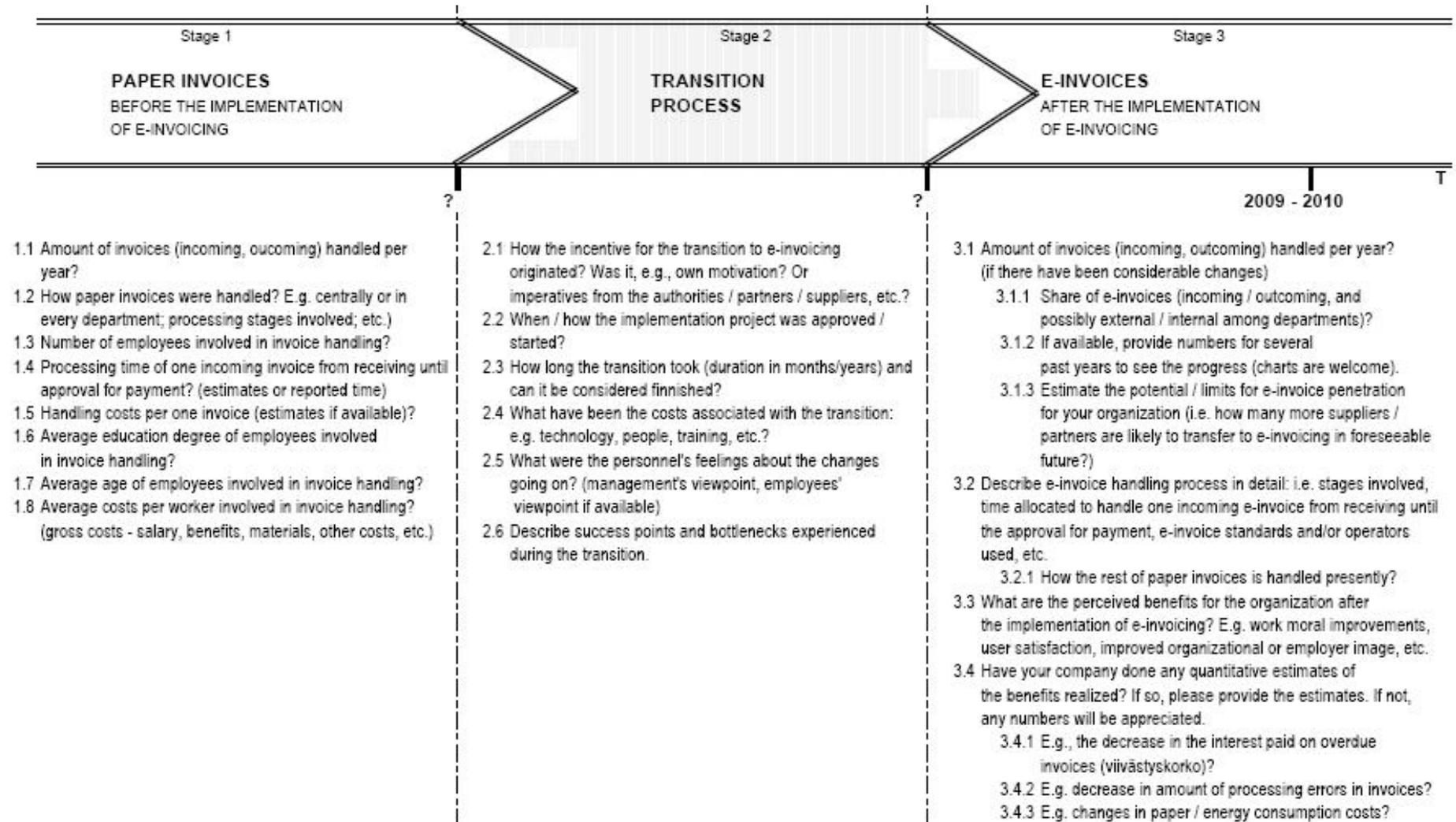
	City of Tampere		Finnair Plc		Lindström Ltd		
	2002	2009	2003	2009	2003	2009	
total incoming invoices per year:	211 160	334 000	165 000	162 931	20 000	20 000	
paper invoices	211 160	170 777	165 000	143 418	20 000	10 000	
% paper invoices	100,0 %	51,1 %		88,0 %		50 %	
true e-invoices		163 223		19 513		10 000	
% true e-invoice		48,9 %		12,0 %		50 %	
employees involved	40	22	26	21	1	0,7	(FTE)
weekly work time	36,25	36,25	37,5	37,5	37,5	37,5	(h)
average yearly throughput of incoming invoices per FTE	5 279,0	15 181,8	6 346,2	7 758,6	20 000,0	28 571,4	
fully loaded invoice handling employee costs per year	35 000,0	40 000,0	40 800,0	43 200,0	38 000,0	40 000,0	(€)

Numbers in shaded areas are estimates/assumptions given by the case company's interviewees; no recorded data were provided.

Exhibit 7 Sample questions for exploratory case studies on transition to e-invoicing and post-implementation benefits

Case companies: The City of Tampere, Lindström Ltd, Finnair Plc

Respondents: management responsible for invoicing, selected employees from invoice handling department



- 3.4.4 Other benefits and savings, changes in the process productivity per man-year(tuottavuus per henkilötyövuosi)?
  - 3.5 Have the expectations for the benefits been met?
    - 3.5.1 What could've been done differently / more efficiently?
    - 3.5.2 Do you expect that there will be more benefits realized in course of time?
  - 3.6 Number of employees involved in invoice handling now?
    - 3.6.1 How their work is organized? E.g. they work in central unit for invoice handling or in different departments?
    - 3.6.2 Their working hours per week?
    - 3.6.3 Costs per employee (if changed after the transition to e-invoicing)?
  - 3.7 After the transition idle labour is likely to be released. What has happened to these employees:
    - 3.7.1 If redeployed: How many? What departments/functions? Training required?
      - 3.7.1.1 Have you perceived/noticed any impacts in those departments /units /functions where the workers were redeployed to? E.g. higher labour productivity, better job motivation, etc.
    - 3.7.2 If laid off: how many?
    - 3.7.3 If naturally retired: how many?
    - 3.7.4 If voluntarily changed the job/company: how many?
      - 3.7.4.1 Why they changed the job (if known)?
  - 3.8 What were the criteria used for deciding upon who of the personnel stays in invoice handling and who is redeployed? (or laid-off?)
  - 3.9 What is current employee satisfaction with the technology, their duties, etc. (invoice handling employees)
    - 3.9.1 The redeployed personnel's satisfaction if available?
  - 3.10 Could you give any advice or recommendations on e-invoicing adoption for other companies / organizations?
- EXTRA QUESTION(S):
- 3.11 Does your organization in general have any standardized methods for assessing the return on IT investments / IT value?
    - 3.11.1 If so, how it works in practice? (e.g. what metrics used, frequency of assessment, who's responsible, etc.)