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THE ADOPTION OF ELECTRONIC INVOICING IN FINNISH PRIVATE AND PUBLIC ORGANIZATIONS

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Abstract

This paper examines the adoption of electronic invoicing in Finnish organizations. Drawing on qualitative interview data from four companies and two public organizations, our objective is to find factors affecting the rate of adoption of electronic invoicing. We begin with Rogers (1995) model and examine and illustrate the factors of relative advantage, compatibility, complexity, trialability, and observability. We then derive a more general set of factors affecting the rate of adoption of electronic invoicing in Finland. These factors include communication, technological readiness, and management support.

Keywords: Electronic invoicing, diffusion, information systems, success factors.

1 INTRODUCTION

Electronic invoicing has been recognised as one of the most important sources of profitability increases in Europe (EuropeanCommission, 2007; Finland'sEUPresidency, 2006). Some European countries have been more active than others in enforcing the transition to electronic invoicing. As an example, since 2005, Denmark's public authorities primarily receive invoices in electronic format and this has been stipulated by law (Brun, 2007). Similarly, the Italian government has introduced a proposal in the state budget law to make electronic invoicing mandatory for all companies dealing with the central government beginning in the summer 2008.

The benefits of moving from paper bills to electronic invoicing are clear. There are considerable financial savings in the transition from paper invoices to electronic invoices. The Finnish State Treasury and some Finnish companies have estimated that an incoming paper invoice incurs costs amounting to 30-50 Euros to the receiver company. By moving to electronic invoicing, these costs can be cut by up to 80%. According to the European Associations of Corporate Treasurers (EACT), the resulting cost reductions in the supply chain expenditures total 243 billion Euros across Europe (EuropeanCommission, 2007). In Finland, the Confederation of Finnish Industries has estimated the savings from the digitalization of B2B invoices alone to 2.7 billion Euros (CFI, 2005). Besides the financial gains, the adoption of electronic invoicing has considerable environmental effects as well. It has been estimated that Europe's annual volume of bills amounts to over 29 billion (Billentis, 2007). By getting rid of paper bills would mean stopping over 20 billion letters circulating in Europe. This would save 400,000 tons of paper, more than 12 million trees, 2,700 tonnes of ink, 165 million litres of diesel and 1,350 GWh energy, every year. Even if we use source criticism and tone down these estimates, we can safely say that changing the paper invoices to electronic invoices has important micro level and macro level financial and environmental effects.

Electronic invoicing is not something totally new. Invoices have been transmitted in electronic format for decades. Already in the 1970s, EDIFACT was used by large companies as a means to exchange invoice data. However, these systems were point-to-point systems, and required somewhat heavy investments in establishing the connection between the two companies or organizations. In this study, we leave these legacy systems out of our scope and define electronic invoices as invoices transmitted through open standards, e.g., Finvoice or TEAPSSXML standards in the Finnish context. Invoices that are transmitted as attachments in e-mails are not considered as electronic invoices in this study. Electronic invoices that are transmitted over these open standards present a new interesting topic of research and there is very little academic research done on this topic.

In this paper, we examine the adoption process of electronic invoicing in Finnish companies and investigate the success factors in the transition to electronic invoices. Currently, in Finland, many companies are in the process of adopting electronic invoices. There are more and more companies that require their suppliers to deliver their invoices in electronic format. In this current study, we report the findings from four case companies (Lindström, Novart, TietoEnator, and Kuusakoski) and two public organizations (cities of Helsinki and Tampere).

2 THEORETICAL BACKGROUND AND CONCEPTUAL FRAMEWORK

The diffusion of innovations studies how, why, and at what rate new ideas and technology spread through organizations. Individuals are seen as possessing different degrees of willingness to adopt innovations; the theory distinguishes innovators, early adopters, early majority, late majority, and laggards (Rogers, 1995). The theory also identifies five factors impacting the adoption rate of innovations. These factors are relative advantage, compatibility, trialability, observability, and complexity (Rogers, 1995).

Since the early applications of the diffusion of innovations, the theory has been applied and adapted in numerous ways. In the information systems context, for example, the original five factors have been expanded to eight factors: voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability, visibility, and trialability (Moore and Benbasat, 1991).

Alternative diffusion theories have discussed, e.g., the inter firm and intra firm diffusion – the latter referring to the rate at which a particular firm, once it has begun to use a new technology, proceeds to substitute it for older methods (Mansfield, 1963). The intra firm process of technology transfer is a long one, with the new and old technologies co-existing for a long time (Battisti and Stoneman, 2005). Technological diffusion has also been explained through rank (such as firm size), stock (marginal adopter), order (high order vs. low order adopters) and epidemic effects (Karshenas and Stoneman, 1993).

In our study, we use the framework by Rogers (1995) and examine how relative advantage, compatibility, complexity, trialability, and observability determine an innovation's rate of adoption. The following figure (Figure 1) depicts our conceptual research framework.

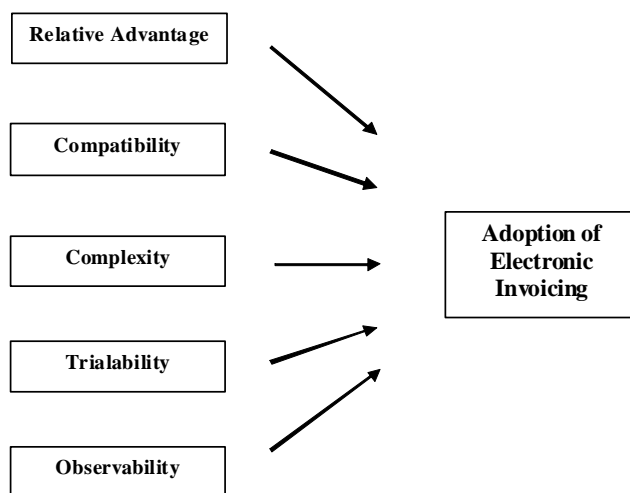


Figure 1. The conceptual framework for the study

Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes (Rogers, 1995). When measuring the relative advantage of an innovation, it is not necessary to evaluate whether it has objective advantage over the precedent idea. It matters whether an individual perceives the innovation as advantageous. The theory suggests that the greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be.

Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 1995). Technical compatibility refers to the level of compatibility between the task being conducted and the technology being used (Cooper and Zmud, 1990; Tornatzky and Klein, 1982). In the case of electronic invoicing, this implies that electronic invoicing implementation success will be more likely to occur when invoicing characteristics are compatible with the technology characteristics (electronic invoicing solutions).

Complexity is the degree to which an innovation is perceived as difficult to understand and use (Rogers, 1995). Technical complexity refers to the level of task complexity related to the innovation. Prior research has shown that there is a negative relationship between the complexity of a technology and its successful implementation (Cooper and Zmud, 1990). In the case of electronic invoicing, a

higher level of task complexity in electronic invoicing application suggests inhibited success of the implementation process.

Trialability is the degree to which an innovation may be experimented with on a limited basis (Rogers, 1995). The theory suggests that innovations that can be experimented will, in general, be adopted more quickly than innovations that are not trialable. This is due to the decreased uncertainty gained by experimenting.

Observability is the degree to which the results of an innovation are visible to others (Rogers, 1995). This observability stimulates discussion surrounding the innovation as the peer group requests evaluation information about the innovation. The theory suggests that the easier it is for individuals to see the results of an innovation, the more likely they are to adopt it.

In our study, we use these classes of antecedents to find success factors that lead to a more rapid implementation of electronic invoicing practices. Critical success factors are the focus areas that most contribute to the success of the company and to its competitive position (Daniel, 1961). Therefore, it is crucial for companies to pay attention to these factors and manage them well (Rockart, 1979). The use of the factors yields a top-down analysis that focuses on a core set of essential issues (Boynton and Zmud, 1984). CSFs have been criticized for being too difficult to use, the validity of the concept has been questioned, and the complexity of the concept may finally lead to a too simplified business environment (Boynton and Zmud, 1984). However, despite its shortcomings, CSFs can be seen as a common concept in IS research. Many of the success studies focus on particular IT systems implementations (Cavaye and Cragg, 1995; Larsen and Myers, 1999).

Torkzadeh and Dhillon (2002) study the measures of Internet commerce success following an earlier proposition (Keeney, 1999). They use a value-based approach in which 199 Internet commerce customers are individually asked questions concerning values. A further study (Chang, Torkzadeh and Dhillon, 2004) examines the developed measurement models (Torkzadeh and Dhillon, 2002) using a sample of 331 respondents. As a result, they confirm the validity of the original measurement models and improve the instrument by reducing the number of factors. Information systems success has been examined to introduce a comprehensive taxonomy (DeLone and McLean, 1992), which consists of six interdependent constructs: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. Later, they update the model to include the success metrics related to electronic commerce. Also, they divide quality-related issues into information quality, system quality, and service quality (DeLone and McLean, 2003).

3 METHODOLOGY AND SELECTION OF THE CASES

In our study, we use the case study methodology to examine the success factors related to the implementation of electronic invoicing. The case study methodology has distinct advantage when a "how" or "why" question is being asked about a contemporary set of events, over which the investigator has little or no control (Yin, 1994). In our research, we investigate how companies have implemented electronic invoicing practices and what factors they perceive as important in the process.

Furthermore, the strength of the case study approach is that it enables the capture of "reality" in considerably greater detail and the analysis of a considerably greater number of variables than is possible with many other approaches (Galliers, 1991). This was especially important in our work as the objective of this research was to find the underlying factors and motives for moving to electronic invoicing, and not just the company policy statements.

To be included in this paper, we selected four companies: Lindström, Novart, TietoEnator, and Kuusakoski. In addition, we selected two public organizations: the cities of Helsinki and Tampere. This variety of private and public organizations enables us to form a more complete understanding of the diffusion and adoption of electronic invoicing in Finnish organizations.

Our case research included discussions and interviews with the key-informants of each of the researched companies. In addition, we conducted an extensive review of company documents such as annual reports and marketing brochures. More specifically, the case Lindström is based on discussions with the CEO, the CFO, and the business controller. One 1.5 hour interview including all the three informants was tape-recorded and transcribed. The case TietoEnator is based on discussions with the vice-president of the executive advisors unit, and with the process owner of inbound invoicing. One 2 hour interview with TietoEnator was tape-recorded and transcribed.

The case Kuusakoski is based on discussions with the financial manager. The case Novart is based on discussion with the accountant. The case city of Helsinki is based on discussions with the financial director. The case city of Tampere is based on discussions with the director of the financial service centre. All interviews at Kuusakoski, Novart, Helsinki, and Tampere were tape-recorded and transcribed.

All the interviews focused on invoicing issues. We started by letting the informants describe the incoming and outgoing invoices; volumes, types of senders and receivers etc. We then proceeded to asking more specific questions regarding the implementation of electronic invoicing: the motives, the challenges, and the impacts of the transition to, e.g., buyer-seller relationships.

The empirical data from each of the interviews yielded about 10-15 pages of text, totalling about 60 pages. The text was then analyzed to make a distinction between success factors, objectives and realized benefits. Then, we searched for citations that relate to the diffusion of innovations framework. A set of these citations are illustrated in Table 1.

4 CASES

The cases discussed here are Lindström, Novart, TietoEnator, Kuusakoski, City of Helsinki, and City of Tampere.

4.1 Case Lindström

Lindström is a Finnish textile service company founded in 1848. In Finland, Lindström is the market leader in the field of textile services, and the company is one of Europe's leading textile service companies as well. Lindström has operations in 18 countries with more than 2,300 employees and the turnover of the company amounted to 227.5 million Euros in 2007. Lindström's range of services consists of workwear, mat, protective equipment, hygiene, restaurant textile, hotel textile and shop towel services.

Lindström has been some kind of a pioneer in electronic invoicing issues in Finland. Since 2002, Lindström does not handle invoices in paper format. It sends out 50,000 invoices per month (outgoing) of which 33% go through in electronic format, the remaining bills (67%) are printed on paper by a service provider and these are consequently sent to the client in paper format by the postal service. Lindström receives 2,400 invoices per month (incoming), of which 25% arrive in electronic format, and 75% are scanned by a service provider. These scanned bills are then transmitted to Lindström's electronic systems. All archiving of invoices is done in electronic format. The company has estimated that paper invoices incur, roughly speaking, 10-times the cost of electronic invoices.

4.2 Case Novart

Novart is the largest kitchen and bathroom fixture manufacturer in Finland with 500 employees and a turnover of 90 million Euros. The company is part of the Nobia group which is the leading kitchen and fixture company in Europe. Novart has 60 years of expertise in kitchen fixture manufacturing and has four brands: Petra, A la Carte, Netto and Parmakitchen. Novart operates from two factories in Finland (Forssa and Nastola) and serves both the consumer segment and the construction companies. The

factory in Forssa focuses on serving the business clients and the Nastola factory focuses on serving the consumer segment.

Currently, the company has 4,000 suppliers, and receives about 30,000 invoices per year. The penetration of electronic invoicing has increased from 21 % in 2006 to 28 % in 2007. In December 2007, already 34 % of invoices came in electronic format. Novart implemented their electronic invoicing system in 2006. They started to scan their incoming invoices (the company still scans the paper invoices by themselves) in late 2005, and in early 2006, the company tried electronic invoicing with the pilot supplier. The pilot was a success with only one minor difficulty of data conversion. Therefore, the company decided to start to receive invoices in electronic format already in very early 2006. The company has not yet started the electronic invoicing of outgoing invoices. Some of the large construction companies have asked Novart to send the invoices in electronic XML format, and the company plans to start the electronic invoicing of outgoing invoices in 2008.

4.3 Case TietoEnator

TietoEnator is one of the largest information technology (IT) service providers in Europe. TietoEnator is specialized in consulting, developing, and hosting its customers' digital businesses. The company is organized according to the different industry sectors. These sectors are telecom & media, forest & energy, banking & insurance, healthcare & welfare, processing & network, government, and manufacturing & retail. TietoEnator has operations in close to 30 countries with almost 16,000 employees and has a turnover amounting to 1.6 billion Euros (2006).

In our study, the case TietoEnator focuses on incoming invoices as our informant was responsible for the incoming invoices at the company. TietoEnator implemented electronic invoicing of incoming bills in 2005. Today, the company receives 12,000 invoices per month and 60% of them are in electronic format. There are about 100 suppliers in Finland that send their invoices to TietoEnator in electronic format.

4.4 Case Kuusakoski

Kuusakoski is an international recycling services company. In addition to being the leading recycler of metal-based products in the Northern Europe, Kuusakoski is also recognised as one of the largest suppliers and refiners of recycled metals in the world. Kuusakoski has over 100 service locations in Finland, Baltic countries, China, Great Britain, Poland, Russia, Sweden and Taiwan. In 2006, Kuusakoski's turnover amounted to 832 million Euros, the company employed 2,000 people, and its material flows totalled 2.5 million tons.

In 2005, all invoices at Kuusakoski were in paper format. In two years, Kuusakoski has adopted electronic invoicing so that all (about 30,000) outgoing sales invoices are sent electronically to the service provider. This service provider then transfers 2-3 % of the invoices in electronic format to Kuusakoski's clients, the remaining 97-98 % of invoices are printed and then sent to the client by post. The low penetration of electronic invoicing in outgoing bills is mainly due to the fact that 80 % of Kuusakoski's invoices are to international clients. Only 20 % of the outgoing invoices are destined to Finland.

Kuusakoski receives about 45,000 invoices per year, 25-26 % of these arriving in electronic format. The remaining incoming paper invoices are scanned into electronic format. In addition to these "normal" invoices, Kuusakoski pays for the "scrap" raw-material that is recycled. The amount of these invoices is 100,000 per year. All of them are sent electronically to the service provider who then transfers 2-3 % electronically and the remaining 97-98 % by post.

4.5 Case City of Helsinki

Helsinki was founded in 1550 and it is the capital of Finland situated in the south of Finland. Helsinki is the largest city in Finland with a population of 570,000. The city of Helsinki receives 560,000 invoices per year. 240,000 of these incoming invoices are in electronic format (42 % of incoming invoices). The city sends out 1.2 million invoices per year; 50,000 invoices to businesses, the rest to the inhabitants of Helsinki. 25 % of the invoices to businesses are in electronic format.

All the bills sent to the consumers (inhabitants of the municipality) have been in paper format. In September 2007, Helsinki did a pilot study of electronic invoices to the inhabitants of the municipality. The city offered the possibility to get the children's day-care bills in electronic format to the consumer's electronic banking system. During September 2007, 15,277 invoices were sent out and 446 (2.9%) inhabitants chose to receive the invoice in electronic format to their electronic banking systems. The city did not advertise this possibility and therefore, the 2.9% penetration can be seen as very promising. In technical terms, the pilot was a success and the consumers adopting this system were satisfied. Helsinki will continue the pilot with day-care invoices, and based on the results, the city will probably open the electronic format to other services as well before the end of 2007.

4.6 Case City of Tampere

Tampere is the third largest city in Finland and the largest inland centre in the Nordic countries. Currently, there are little over 200,000 inhabitants in Tampere, and almost 300,000 inhabitants in Tampere Sub-Region, which comprises Tampere and its neighbouring municipalities.

The city of Tampere receives 250,000 invoices per year. 34 % of the incoming invoices are in electronic format; the remaining invoices are scanned in electronic format and then inserted to the system. Tampere has made a policy statement that it does not accept incoming paper invoices. Exceptions are allowed in special circumstances (68 % of incoming invoices still being these exceptions). Tampere sends out 1.4 million invoices per year and very few (less than 1 %) of these are in electronic format. Electronic invoicing of outgoing bills to the inhabitants of the municipality and to businesses is projected to start in 2008. The city of Tampere has estimated that by moving to electronic invoicing, the city can save 88 % of its invoice handling costs. So far, Tampere is on schedule and the estimation seems a correct one.

5 ANALYSIS

When conducting the interviews, we started by letting the informant tell us information about the background of the company, about its business, and about their suppliers and clients. We then proceeded to asking general questions about invoices, e.g., the volumes of incoming and outgoing invoices, and the types of invoices. Last, we asked questions concerning the implementation process of electronic invoicing. The interviews were transcribed and we coded the data by searching for factors affecting the diffusion process of electronic invoicing in the case companies.

We made some general observations from the interviews. All the case companies and public organizations started their electronic invoicing by focusing on incoming invoices. This is quite logical as the monetary savings of electronic invoicing go mainly to the receiver organizations. All the organizations were very eager to increase the penetration of electronic invoicing because of the cost savings. All the organizations stated that an invoice in paper format incurs extra costs to them. However, they were not willing to take drastic measures (e.g. by placing a handling cost on paper bills or by denying the reception of paper bills). Two organizations, TietoEnator and the city of Tampere made an exception (and a third one, Lindström, is planning to do so in 2008). They made a policy statement not to accept any invoices in paper format.

5.1 Illustrating the diffusion factors with interview data

In the following table (Table 1), we have gathered the factors impacting the diffusion of electronic invoicing in Finnish private companies and public organizations. The factors are categorized using the Rogers (1995) framework: relative advantage, compatibility, complexity, trialability, and observability.

Factors impacting the diffusion of electronic invoicing	Citation from the interview
<u>Relative advantage</u>	“Two years ago, when contemplating the adoption of electronic invoicing, we made cold calculations about the costs and benefits of electronic invoicing, just over 30 Euros per incoming paper bill.”
	“Scanning the paper bills to electronic format incurs costs to us so we want to increase the number of electronic invoices received.”
	“By moving to electronic invoicing, we have been able to reduce the number of errors in invoices considerably.”
	“Health care bills are sometimes paid twice by the inhabitants of our municipality by mistake. When they want to get their compensation, it gets messy. Electronic invoicing can fix this problem efficiently.”
	“My work has shifted from copying and paper work to computer. I find it much more meaningful to work in this way.”
	“The circulation time of bills has decreased from one week to just two or three days in our company.”
<u>Compatibility</u>	“When compared to the international invoices, it is very important that in Finland, we have these established standards, e.g., TEAPPSXML and Finvoice.”
	”It is important that the electronic invoicing interface is easy to use and looks like a paper bill.”
	”Technology must be compatible with the work processes, otherwise there will be too much errors.”
<u>Complexity</u>	“Transitioning to electronic invoicing should be easy.”
	“We would like to have one large German company to send us invoices in electronic format, but the German bank of that company cannot provide the invoice in right kind of format.”
	“We should be able to centralize our invoicing. For now, we have multiple (7) invoicing departments.”
	“We cannot get the required XML document from our current system and that is why we have not started the electronic invoicing of outgoing bills.”
<u>Trialability</u>	“We found it important to have a good pilot company with whom we could test the electronic invoicing connection. In our case, it was a travel agency with whom we have a lot of invoicing on regular basis.”
	“When piloting the electronic invoice to the consumers (inhabitants of the community), it was clear that the electronic invoice had to contain all the information previously available on the paper bill. The continuity factor was very important here.”
<u>Observability</u>	“We want to project a positive, modern image of the public service.”
	“Active information flow internally to employees is very important.”
	“We found that one of the most important factors is being active toward the client/supplier. The availability of the electronic invoicing possibility is stipulated in the contract. Taken up in the discussions with the client/supplier.”

Table 1. Factors impacting the diffusion of electronic invoicing

In the table above, we have illustrated the diffusion of innovations framework with citations from the interviews. Next, we will discuss the most cited diffusion factors emerging from the interviews in greater detail.

5.2 Most cited diffusion factors in the interview data

In addition to the citations, we collected the most cited diffusion factors from the interviews. These factors can be classified into communication factors, technological readiness, and management support.

Communication factors

The most cited factor affecting the diffusion of electronic invoicing was internal and external communication. The respondents felt that the activity towards clients and suppliers had a positive effect on the adoption of electronic invoicing. The availability of the electronic invoicing option should be made clear to clients and suppliers. This should be stipulated in the contract. Also, we learned that there were inactive links, meaning that the buyer and the seller might already be using electronic invoicing between some business units, while some other business units (in these same respective companies) had not initiated electronic invoicing. By enhancing the communication concerning electronic invoicing, these missing already established links can be activated with very little effort.

In addition to this active external communication, the interviewees pointed out that the electronic invoicing project has to be well communicated within the company. The personnel must be given the necessary training and information concerning the implementation of electronic invoicing. In the implantation phase, the employees often need assistance in processing the electronic invoices. Therefore, the need for an internal contact person specializing in electronic invoicing emerged from the interviews.

In addition to external and internal communication, the interviewees saw that the different operators should collaborate and communicate seamlessly to tackle any problems in the transmission of electronic invoices. The interviewees even suggested that the operators should set up a checking system for invoices that are lost in transmission.

Technological readiness

In all the interviews, the respondents stated that technology should be mature. In the Finnish context, the respondents appreciated the fact that there were established standards such as the Finvoice and the TEAPPSXML standards. However, the transmission from one standard to another and from one operator to another was seen as troublesome. The interviewees saw that in this respect the technology was not mature enough.

In addition to the maturity of technology, the respondents saw that centralizing the billing systems acts as an important enabler in the transition to electronic invoicing.

Management support

Management support was mentioned as an essential factor. In some cases, the management had merely given orders to the “grass-roots level” to implement electronic invoicing. They had not taken into consideration that this would be a rather challenging task due to the fact that there were, e.g., 14 separate billing systems in that specific organization. Therefore, we interpret that management really needs to take a more holistic view to electronic invoicing and support the electronic invoicing initiatives for it to succeed.

In addition to the management support, most organizations stated that one active project owner can speed up the process of implementing electronic invoicing in that specific business unit. This person can be located at any level in the organization

In addition to these factors presented in the table, the interviewees saw that there should be at least one clear project owner in the organization, who is actively in charge of the transition process.

5.3 Problem areas and factors that hinder the adoption of electronic invoicing

In addition to the factors that contribute to the diffusion of electronic invoicing, we asked the respondents to cite factors that hinder the adoption of electronic invoicing. These include, for example, conversion issues between operators. The interviewed organizations reported that some of their invoices had gone missing and that they had told that it is due to conversion failure between the different operators.

Adding attachments to the electronic invoice presents problems to the organizations interviewed. Finvoice, for example, does not allow for attachments to be included in the invoice. Some organizations have solved this problem by adding a link to a webpage containing the information or the image of the actual invoice. Some organizations have had to go back to sending or receiving paper invoices for those clients or suppliers that require attachments.

One considerable problem area that emerged from the interviews was the step towards internationalization. None of the organizations had really initiated electronic invoicing internationally. The interviewees contributed this to the fact that their international invoicing connections were mainly customized EDI solutions which do not allow for open architectures. In addition, the local legislation requirements such as electronic signatures make it difficult to extend the Finnish electronic invoicing practices to international connections.

6 CONCLUSIONS

Electronic invoicing is being adopted in Finnish companies at an increasingly fast rate. In this paper, we set out to examine the factors that affect the diffusion of electronic invoicing in organizations. We interviewed four companies and two public organizations and used the Rogers (1995) framework as an initial conceptual framework.

We illustrated the Rogers (1995) framework with citations from the interviews. Then, we discussed the most cited factors that the respondents considered as most important ones. Lastly, we reported the problem areas that the respondents mentioned as having a hindering effect on the adoption of electronic invoicing in their respective organizations.

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