Government as a Launching Customer for eInvoicing

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Abstract. The invoice is an important business document. Despite a large number of convincing arguments, overall adoption rates of electronic invoicing disappoint. Several European countries try to accelerate diffusion speed, some by law, others by stimulating market drivers. This paper focuses on the question whether the government can make a difference as a launching customer of eInvoicing. Results from a large scale survey show that both organisational and situational factors explain the adoption of eInvoicing. Companies that conduct business with governmental organisations are more prone to start implementing eInvoicing. Consequently, this group of suppliers is the obvious target group to launch this innovation. By doing so, government could accelerate the diffusion of eInvoicing.

Keywords: Electronic Invoicing, eGovernment, Adoption of Innovations.

1 Introduction

The invoice is an important business document. It represents billing and payment information related to commercial transactions. Besides its role between trading partners, the invoice is essential to tax administration. VAT-related inspection and collection processes rely upon the integrity and authenticity of the invoice. Electronic invoicing is the electronic transfer of this billing and payment information via the Internet or other electronic means between trading partners. Unlike paper-based invoices, e-invoices provide all data in digital format. Such eInvoicing offers substantial benefits over paper invoicing. It allows for shorter payment delays, fewer errors, reduced printing and postage costs and, most importantly, fully integrated processing [1]. In Europe it is estimated that there were 15 billion business-to-business invoices in 2007 [2]. Removing VAT barriers to electronic invoicing for example is expected to lower the administrative burden on enterprises in Europe by up to a maximum of EUR 18 billion in the medium term [3]. The European Commission estimates that replacing regular paper invoices by e-invoices across the EU could result in approximately EUR 240 billion in savings over a six-year period [2], [4].

Despite these compelling arguments, overall adoption rates of eInvoicing disappoint. Average market penetration of eInvoicing in 2009 in Europe was estimated at around 5% of all invoices annually exchanged in business-to-business

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relations [1], [5]. Thus, hampering businesses individually and society in general to reap the benefits of this e-business innovation. Likewise, individual governmental organisations, being large *buyers*, can also save on paper handling and billing process costs. These potential governmental cost savings were the main driver for the Danish and Finnish government to mandate the private sector to send all invoices to the public sector via electronic means [6].

Next to internal cost savings, "stimulating an environment that creates maximum reach between trading partners exchanging invoices" [7] is another driver behind governmental interventions within the e-business market place. The European Commission underlines the importance of governments promoting ICT adoption to the further development of e-business [8]. Next to the general awareness arising the Commission points to *the role model* of the public sector, e.g. by using public e-procurement. The Italian government for example has proposed to make the adoption of eInvoicing mandatory for central government administrations by mid 2008. Amongst others their explicit goal was to support the adoption of eInvoicing by Italian companies.

In this paper we elaborate on this second 'market stimulation driver' and focus on the specific role of *eGovernment as a launching customer*. In that case government deliberately chooses to be one of the innovators or early adopters of an electronic means of invoicing [1], [9]. Thus hoping and aiming to eliminate market failures by: enhancing network externalities, creating critical mass, setting a de facto standard and/or lowering price per unit. The question answered in this paper is: *can eGovernment make a difference as a launching customer of electronic invoicing?* We answer the question by analyzing and comparing the *adoption intention* of two groups of businesses in the Netherlands, one group solely conduction commercial business-to-business (B-to-B) transactions and another group also conducting commercial transactions with governmental customers (B-to-BG).

This paper proceeds with a brief theoretical analysis of strategies for accelerating the diffusion of eInvoicing. After that we will present an overview of adoption factors by making use of a situational approach towards the diffusion of innovations. The next paragraph then describes our research method. Results and statistical analysis are presented in the following paragraph. The paper finalizes with conclusions and a discussion of our findings.

2 Theoretical Background

The introduction of eInvoicing is an innovation to most companies, especially to small and medium scale enterprises (SME's) [10], resulting in "new ways of doing business" [1]. In this study, the specific eGovernment context adds extra dimensions to this adoption issue [11]; thus influencing governmental adoption strategies and adoption factors.

2.1 eGovernment: Seduce or Enforce?

Large buyers in many cases posses the power to enforce suppliers to send invoices according to their specific (electronic) standards [12]. Thus resulting in, often

EDI-based, domain specific hub-and-spoke architectures [13], [14]. Governments can apply an additional enforcement instrument to exercise external pressure: legislation. Countries like Denmark, Sweden, Spain, Italy, Finland and Brazil have chosen (or announced) to legally oblige eInvoicing to governmental organisations [6]. Agostini and Naggi [15] question the effectiveness and legitimacy of this forced adoption of procedures and standards, "which have not achieved an established consensus under 'normal' circumstances". The risk is to improve internal efficiency for public bodies, while negatively affecting enterprises, which are in fact obliged to duplicate their invoicing and invoicing-connected procedures [15].

Arendsen et al. [11] have examined factors influencing the adoption of governmental high impact applications by small and medium scale businesses. They suggest that (especially smaller) businesses follow another adoption approach towards governments than towards fellow businesses. Expected benefits and external competitive pressure are important adoptions factors in the business-to-business context, stimulating businesses to follow an *offensive strategy*. Within the business-to-government context companies on the contrary seem to tend to a more *defensive strategy*. A lack of organisational readiness (and willingness) makes them reluctant to invest in a long term e-relationship with governmental organisations. Malone [16] shows that the provider of this kind of a relation is more than others capable of realising significant benefits. From that perspective, many electronic data exchange relations between businesses and governmental organisations can be characterized as an electronic hierarchy. A case study of the mandatory tax filing by Dutch businesses [17] showed this was one of the dominant arguments for businesses to outsource these governmental e-services to intermediary parties.

The 'government as a launching customer'-strategy's primary objective has to be the homogeneous gain of efficiency throughout the whole economic system, with consequent positive repercussions on enterprises themselves, by winning the SMEs' typical "excess in inertia" [15]. Countries like the Netherland in that respect have chosen for a less coercive, but more 'public policy encouragement' [1] strategy focussing on enterprises institutional dynamics, needs and beliefs [15]. The next paragraph presents an overview of factors influencing the adoption of eInvoicing.

2.2 eInvoicing Adoption Factors

e-Invoices can be generated and transferred automatically and directly from the issuer's or service provider's financial supply chain systems to those of the recipient. Most of the economic benefits therefore do not arise from savings in printing and postage costs but rather from the full process automation and integration from order to payment between trading parties [2]. Consequently, much of the eInvoicing literature has centred the analysis about eInvoicing mainly with a focus on the supply-chain management and inter-organisational systems (IOS) theories. The adoption of IOS innovations in general has been broadly studied [18], assessing adoption drivers like efficiency, effectiveness and competitive position [15]. Azadegan and Teich [19] present an overview of adoption models and factors and assess the applicability to the eInvoicing domain. The adoption of business-to-government systems however has hardly been studied yet [11].

eInvoicing adoption factors can be defined from different perspectives. Rogers [9] defines adoption as: a decision to make full use of an innovation at the best course of action available. He suggests that technology adoption is the result of the effect of five groups of variables: the perceived attributes of the innovation, the type of decision making, communications channels used, change agent's efforts and the nature of the social system. Especially the five perceived attributes of innovations, *relative advantage, complexity, trialability, observability* and *compatibility* have been used in many studies concerning the adoption of (inter-)organisational information systems, like for instance financial systems [20] and EDI systems [21]. Several researchers however question the applicability of the theory for studying organisational adoption of the adoption of complex inter-organisational systems based on electronic data exchange relations [19], [22].

Tornatzky and Fleischer [23] have developed an alternative model to study the adoption of technological innovations by organisations. Their TOE-model contains three variables influencing the adoption decision making process: the technological, organisational and the environmental context. Kuan and Chau [24] used the model as a basis for their study of the adoption of the business-to-government system for the filing of import and export declarations in Hong Kong. Zhu et al. [25] used it as foundation for their Electronic Business Adoption Model. They conclude that *firm size* is a significant adoption factor. They also show *competitive pressure* has a significant positive relation with the decision to adopt. Hong and Zhu [26] use the TOE model to explain how the integration of inter-organisational systems affects e-commerce adoption in US and Canadian businesses.

Iacovou et al. [27] have developed a model focussing on the adoption of inter-organisational systems and more specifically electronic data interchange systems by small and medium scale businesses. The model consists of three factors expected to positively influence the organisations adoption decision: p*erceived benefits*, *organisational readiness* and *external pressure*. Chwelos et al. [28] refined and extended this EDI adoption model. Their empirical study showed that especially *perceived benefits, financial resources and IT sophistication* had a positive relation with *the intention to adopt*. Grandon and Pearson [29] expanded the model towards application and adoption of e-commerce by SME's. In general it seems that the foremost indicator of adoption is the business's readiness to adopt, i.e. the internal capability in implementing a new technology. Azadegan and Teich [19] add network factors like network size and interconnectedness to their theoretical framework for e-procurement technologies.

3 Research Method

Similarly to Chwelos et al. [28] our research focuses on *the intention to adopt*. Figure 1 presents the research model that was used in this research. As can be derived from figure 1, we deliberately left out the 'classic' TAM/UTAUT variables of 'Perceived usefulness' and 'Perceived ease of use'. As [34] points out, these concepts are largely tautological when it comes to explaining intention to adopt. Instead, our model uses two types of determinants: organisational factors and network (situational) factors. The intention to adopt was measured through a single choice question in which the

answering categories characterised different phases of the adoption process. Respondents were asked to state which phase characterised their position best. The *organisational factors* were measured as follows:

- *Organisational size* was measured in terms of the number of employees on a seven point scale, varying between 'Single person company' and '250 or more employees'. In addition we measured invoicing volume by looking at the number of suppliers, customers, invoices received and invoices sent. The volume was measured on a four point scale (0-10; 10-50; 50-100; 100+).
- *IT-readiness*, *Innovativeness and Attitude* were measured through seven-point Likert scale items. The translated and shortened version of these items can be found in table 2.
- *Knowledge* was measured through a set of ten true or false questions about eInvoicing. The number of correct and incorrect answers were counted. In addition the number of times a respondents answered 'Don't know' was counted a measure of absence of knowledge.

Based on the theoretical framework in section 2, the situational variables that were taken into account were:

- *Adoption by others*: the number of network parties that have adopted eInvoicing.
- *Social influence*: the degree to which the direct environment of respondents is positive (or negative) about eInvoicing.
- *Cost of investment*: the perceived technical and organisational costs that need to be made to implement eInvoicing within the organisation.

Besides a general intend to adopt, the intention to adopt *given specific practical circumstances (situational factors)* has been investigated. In order to measure this, we took a vignette approach [30]. In this approach respondents are presented with hypothetical situations. A specific case is a unique combination of values and variables. The vignette approach deals with network complexities by combining the strengths of survey and experimental research. One of the vignettes used in the study, illustrates the practical use of the approach:

> Suppose that you have been made responsible for the strategic choice whether to adopt eInvoicing in your company. From the research you have performed, you gather that eInvoicing is hardly being used in your sector. You estimate the technical and organisational costs for implementing eInvoicing within the organisation are reasonable. You have seen some examples of companies using eInvoicing successfully. Moreover, your industry organisation is positive about eInvoicing.

After this vignette, respondents were asked how likely it is that their company switches to eInvoicing within 12 months, given the described situation. For this we used a seven-point Likert scale. By systematically varying the vignettes, the effect of differences between situations could be investigated. In addition, respondents were presented with two cases. In order to prevent order effects the cases were rotated differently for different respondents. Analysis of the data shows that there were no significant differences between the two rounds.

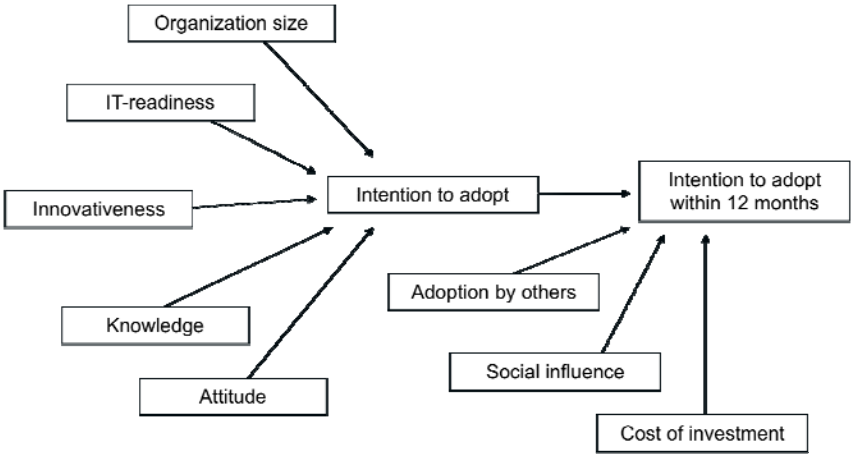

Fig. 1. Research Model

Data gathering and data analysis

In May 2010 data has been gathered via the online panel of a commercial organisation. In total 5150 people were invited to participate in the research. Of the 1221 respondents that started the online survey 512 respondents (42%) were filtered out because they did not meet the selection criteria. Another 78 respondents (6%) stopped during the survey. In the end 613 respondents filled out the questionnaire completely. This sample is representative with regard to industry sector. However, this study is biased in favour of larger size companies. A representative number of smaller sized companies would pose serious statistical challenges: it would cause a lack of statistical power to detect significant effects. Hence, proportional representation of companies by size is not a viable alternative for the present study.

Data analysis concentrated on two questions: to what extent do the two groups (B-to-B and B-to-BG) differ with regard to organisational factors? (see paragraph 4.1) and to what degree do the adoption factors influence the intention to adopt eInvoicing for both groups? (see paragraph 4.2). In order to obtain an answer to the first question we used descriptive statistics and t-tests. The second question is answered by making use of structural equation modelling with WARP PLS [31].

4 Results

4.1 Analysing Organisational Adoption Factors

*Intention to adopt eInvoicing***.** In the questionnaire we asked companies how soon they were thinking of switching to eInvoicing as a general measure of adoption intention. Figure 2 directly compares B-to-B and B-to-BG within each category of adopters. From the figure we conclude that B-to-BG are more inclined to switch to eInvoicing than B-to-B. Using independent t-test, this difference is significant ($t=-6.082$; $p<.00$).

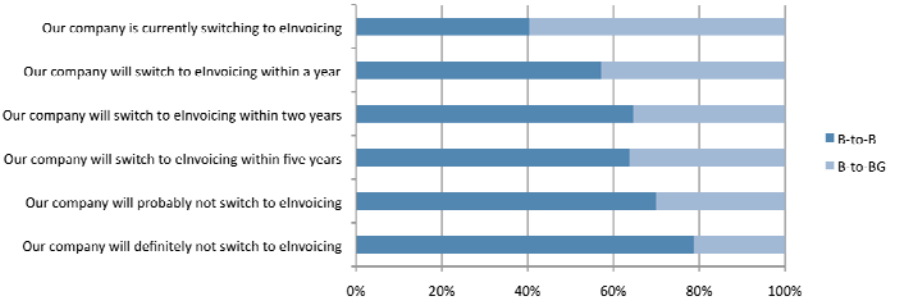

Fig. 2. Intention to Adopt: phases in the adoption process

Organisation size. The larger an organisation, the more often it not only has other businesses but also governments as their customer. This is also reflected in the number of suppliers and customers and the number of invoices sent and received. All differences are significant as can be derived from table 1.

Table 1. Differences between B-to-B and B-to-BG for organisation size

	Mean B-to-B	B-to-BG	t	p
Organisation size[1]	2.57	3.83	-9.54	0.00
Number of suppliers[2]	1.96	2.54	-9.33	0.00
Number of customers[2]	2.55	2.97	-6.29	0.00
Number of invoices received[2]	1.74	2.25	-7.89	0.00
Number of invoices sent[2]	1.92	2.37	-6.32	0.00

[1] Measured on a seven point scale
[2] Measured on a four point scale (1 = 0-10; 2 = 10-50; 3 = 50-100; 4 = 100+)

Other organisational factors. Table 2 shows the scores for B-to-BG and B-to-B for the organizational factors Innovativeness, IT-readiness, Attitude and knowledge. First thing that stands out is that all items score higher than 4 on a five point scale. This result might indicate that all items load on one grand underlying construct. In order to check this we ran a factor analysis on the scale items. Results shows that, as was intended, the items represent the three different underlying constructs.

A second thing that can be deducted from table 2 is that organisations that conduct business with governmental organisations (B-to-BG) systematically score higher on *Innovativeness* and *IT-readiness* than businesses from the B-to-B group. Results in Table 2 show that almost all differences between the two groups are significant. Regarding the factor *Attitude* the differences are smaller but still the scores for B-to-BG are systematically higher than for B-to-B. The factors *Knowledge* shows a slightly different picture. Organisations that do business with the government answer more questions correctly but more incorrectly as well. Businesses solely conducting business with fellow businesses more often “do not know” the answer.

Table 2. Differences between B-to-B (n=373) and B-to-BG (n=196) for Innovativeness, IT-readiness, Attitude and Knowledge (all items have been recoded so that higher scores represent a positive direction)

	B-to-B	B-to-BG	t	df	Sign.
Innovativeness					
The management actively seeks new ideas	4.33	4.64	-2.45	567	0.01
Innovations are easily incorporated in projects	4.32	4.61	-2.50	567	0.01
Innovations in processes are encouraged	4.52	4.89	-3.25	439	0.00
Innovation is part of our culture	4.25	4.58	-2.58	567	0.01
IT-Readiness					
IT provides more control in daily business	4.73	5.06	-2.71	427	0.01
IT improves the way our company operates	4.88	5.28	-3.33	567	0.00
Thanks to IT we are in business 24-hours a day	4.85	5.25	-2.91	567	0.00
We use the latest IT applications	4.17	4.30	-1.07	567	0.29
We use IT to meet our companies goals	4.64	4.98	-2.71	567	0.01
We work more efficient with IT	4.90	5.26	-3.06	457	0.00
IT opens new opportunities	4.26	4.65	-2.97	567	0.00
IT gives us more freedom	4.59	5.01	-3.53	448	0.00
Our company relies on IT	4.72	5.06	-2.62	567	0.01
Attitude					
It is harder to get paid with eInvoicing	4.82	4.90	-0.72	567	0.47
eInvoicing helps to work more efficient	4.26	4.61	-3.37	567	0.00
The tax office will not accept eInvoicing	4.86	4.90	-0.40	567	0.69
eInvoicing is too expensive for our company	3.90	4.27	-3.05	372	0.00
It more work to send an e-Invoice	4.78	4.89	-1.00	567	0.32
It is easy to deceive people with eInvoicing	4.59	4.83	-2.19	567	0.03
Knowledge					
Number of questions correct	4.28	4.51	-1.09	443	0.28
Number of questions incorrect	2.15	2.36	-1.44	567	0.15
Number of questions 'Don't know'	3.54	3.11	1.54	567	0.12
Intention to adopt (general)	2.78	3.31	-4.12	358	0.00
Intention to adopt (within 12 months based on scenario)	3.06	3.29	-1.84	567	0.07

4.2 Explaining Adoption Intention

The results from the previous section show that B-to-B and B-to-BG differ when it comes to size, innovativeness, IT readiness, attitude and knowledge. The question that can now be asked is, do these factors *predict* adoption and do they predict adoption *differently* for B-to-B and B-to-BG. In order to answer that question we use the structured equation modelling (using WARP PLS) to predict adoption for both groups separately. The result of this analysis is presented in table 3.

Results show that for both groups of business the resulting research model has a good fit and explains over 30% of the variance. All relationships are significant in both models and the differences between the two groups are small. (The average inflation factor is low for both models. Moreover, the individual items load as intended on the latent variables.)

Table 3. SEM analysis for B-to-B (n=373) and B-to-BG (n=196)

	B-to-B		B-to-BG	
Average Path Coefficient	0.22	**	0.22	**
Average R Squared	0.31	**	0.33	**
Average Inflation Factor	1.19	good if <5	1.18	good if <5
Adoption intention	Intention to adop	Intention in 12 months	Intention to adop	Intention in 12 months
R squared	0.30	0.33	0.27	0.40
Organisation size	0.19	**	0.23	**
Innovativeness	0.16	**	0.19	**
IT-Readiness	0.22	**	0.09	*
Knowledge (# correct answers)	0.20	**	0.13	**
Attitude	0.19	**	0.22	**
Adoption intention (in general)		0.45 **		0.48 **
Critical mass		0.15 **		0.13 **
Costs for implementation		0.12 **		0.16 **
Social influence		0.32 **		0.37 **

* p<0.05; ** p<0.001

Results presented in table 3 show that the general adoption intention and the intention to adopt within 12 months are, quite logically, strongly connected to each other. It is more interesting to see that the predictive power of the general (organizational and individual) factors explain equally well as the situational factors that explain the intention to adopt within twelve months. This means that situational factors form a strong component in eventual adoption. In addition we would like to stress that social influence is the most important predictor of the situational factors.

5 Conclusions

The question answered in this paper is: *can eGovernment make a difference as a launching customer of electronic invoicing?* As opposed to the mandatory strategies of some European governments, this study focussed on the voluntarily adoption behaviour of businesses and on factors influencing their intention to adopt eInvoicing.

Results show that companies that conduct business with the government are more inclined to switch to eInvoicing than companies that only do business with other companies. In addition we observe that these companies that carry out business with the government are in general larger, more innovative, more IT-ready and have a more positive attitude towards eInvoicing.

Further analysis shows that these are all relevant and explaining factors for the adoption of eInvoicing. Both organisational and situational factors contribute to the adoption of eInvoicing. Both groups of factors explain approximately one third of the total variance. A general intention to adopt is explained well by organisational factors whereas a more specific likeliness of adopting can very well be related to situational factors. We conclude that situational factors should be taken into account when predicting the diffusion of eInvoicing and new technologies in general.

Together these results provide a positive answer to the question whether or not eGovernment can make a difference as a launching customer of electronic invoicing. Companies conducting business with governmental organisations are *more willing and able* to start implementing eInvoicing. To governmental organisations, this group of suppliers is the obvious target group to launch this innovation. Stimulated by their (governmental) customers this group of businesses is more than others in the position to become the early adopters, to increase network externalities and to start the snowball rolling. By focussing on this group of businesses first, government can make a difference.

6 Discussion

Results show that companies that conduct business with the government are larger than companies that only do business with other companies. This indicates that governmental procurement strategies in general have a bias towards larger suppliers. This may be explained by the fact that governmental organisations have a tendency to reduce risks and prefer relationships with stable, proven and mature organisations. This however hampers competition and decreases small companies' possibilities to conclude long term contracts with larger customers.

In the case of eInvoicing this might put a brake on the rate of diffusion. As a launching customer government primarily reaches businesses having a larger than the average company size. This asks for additional policy measures to stimulate adoption amongst (very) small companies. Governmental organisations could for example stimulate their suppliers, as part of the overall launching customer strategy, to motivate their (smaller) suppliers to start eInvoicing with them. Results of this study show that situational factors like *Social influence* and *Adoption by others* are powerful adoption factors.

This research does not only yield practical implications. From a scientific point of view, this research has a contribution as well. The combined approach of organisational and situational (network) factors proved to be fruitful. Using this approach we were able to omit the variables central to adoption models such as TAM [32] and UTAUT [33] (i.e. perceived usefulness and perceived ease of use). By doing this we have build a model that may not yield the high levels of explained variance custom in TAM-like research. However, we did create a model that explains the diffusion of an innovation from the *situation* rather than a model that explains technology use from its own usefulness. Having said that, we do acknowledge that we have to improve the models by gaining more in depth insight into network factors. Future research will be aimed at this.

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