B2B E-COMMERCE DIFFUSION: THE EFFICACY OF INSTITUTIONAL DISCOURSE

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ABSTRACT

During the mid to late 1990s, shaping diffusion of B2B e-commerce was a key priority for governments and business associations. Viewing e-commerce as the key to continuous economic growth and a vehicle for transformation to the digital economy, national action plans were formulated to accelerate the standard development and adoption of e-commerce. This chapter argues that the Danish EDI Action Plan from 1996 cemented structural problems for the ongoing adoption and diffusion of newer B2B technologies due to a discrepancy between goals and actions, imbalanced partner allocation in standard development and an overwhelming focus on the public sector despite ambitions to fuel the overall business adoption of B2B e-commerce.

INTRODUCTION

During the last decades, governments and business associations throughout the world have recognized the significance of information communication technologies (ICT) for businesses and the public administration. The result has been institutional initiatives that have aimed to support the diffusion of ICT among businesses and public agencies (e.g. Teo et al., 1997; Klein, 1995; Damsgaard and Lyytinen, 2001). The Singapore NII initiatives (Neo et al., 1995; Wong, 1996), the Malaysian Information Rich Society plan (Raman and Yap, 1996), the Japanese Super Information Highway, the Al Gore Information Highway and the European Information Society policy documents (Commission, 2001; Brousseau, 2002) are some of the major recent highlights of governmental interest in ICT. E-commerce has been an important part of these policy plans and especially B2B e-commerce has had a high degree of policy saliency with various institutional initiatives to fuel development and uptake.

The objective of this chapter is to focus on the outcome of such institutional initiatives. A particular action plan that focused on diffusion of EDI in the Danish business community and the public sector (Ministry of Research and Information Technology, 1996) is assessed by comparing actual uptake of EDI to the underlying discourse, which originally drove the action plan.

It is our claim that an analysis of the content of the EDI agenda and its underlying discourse will be of value to governments, especially due to the continuous use of action plans as a means of regulating diffusion of a given technology. In the particular

Danish context, there are three reasons for paying particular interest to the analysis of the discourse embedded in the EDI agenda.

First, the Danish context is significant because the relations between market and government are unique compared to other nations where market forces play a much more critical role. The Danish tale on ICT adoption and exploitation is dominated by early coordination and commitment from both government and business associations to help fuel adoption and exploitation of ICT as a competitive instrument (Andersen et al., 2003) in line with the Porter terminology (Porter, 2001). The case presented in this chapter also reveals the reverse side of the close interplay between government and industry. Following this approach, we are not only facing the challenge of getting the important domestic players on board. The global industry players and their (proprietory) standardization work are equally challenging.

Second, the Danish case is captivating since the role of ICT in governmental units' own operations has been just as important as using ICT to gain competitive advantage. The urgency of government to ensure accessibility, transparency, efficiency, and accountability in its operations has pushed the use of ICT. Although we find similar motives in other countries, the Danish governmental sector is unique due to its employment of one third of the labor force and the reallocation of 70% of GDP. To reduce the burden on the administrative costs, the push to use ICT in its communication with the private sector has been immense.

Third, an early acknowledgement of digital divide issues (Dybkjær and Christensen, 1994; Bjørn-Andersen et al., 1982) and policy commitments to address the issues, also in the business community, form the third interesting aspect of the Danish approach to regulation of B2B e-commerce. It has been a deliberate policy choice to target micro and small businesses based on an economic growth model where demand pressure tends to come from the SMEs rather than the MNCs (Andersen et al., 2003).

Below, we encapsulate the major ICT-research perspectives and the significance of institutional regulation of diffusion of ICT. Next, we describe our framework for the analysis of the Danish action plan and define the central elements presented in the chapter. After describing the seven key elements in the Danish action plan, we evaluate the outcome of the plan in the respective business sectors. The chapter concludes by discussing the implications of the substantive findings from the institutional regulation attempts on EDI.

OUR FRAMEWORK AND DEFINITIONS

ICT research within the e-commerce paradigm has to a large extent focused on the technological benefits and the drivers and barriers related to adoption and diffusion of technology in organizations and the public sector. The benefits include in general operational or strategic benefits that can be achieved from the adoption and implementation of technology in business operations (e.g. Krcmar et al., 1995). The drivers and barriers related to adoption and diffusion of IT in organizations primarily involve political and power issues (Markus, 1983; Hart & Saunders 1997; Iacovou et al., 1995) or standardization issues (Damsgaard and Truex, 2000). Another research stream has focused on implementation issues (Chan and Swatman, 2002; Chan and Swatman, 1998) and the metrics related to assessing possible benefits of IT implementation (Massetti and Zmud, 1996; Cooper and Zmud, 1990; Lee, 1998).

The literature on institutional regulation related to ICT diffusion reveals a discrepancy in relation to the effects of coordinated efforts made by industry and trade associations or governmental units. Such a discrepancy is reflected in the body of literature focusing on institutional (especially governmental units) interventions (Lai and Guynes, 1997) and changes in the remote environment (e.g. regulation) and industry structures (Gregor and Johnston, 2001) as the most powerful causes for ICT adoption. (King et al., 1994). Findings from this line of research indicated that deliberate institutional interventions or decisions to refrain from interventions played a vital role in technology diffusion. This position has been challenged by (Johnston and Gregor, 2000) who argue that "... deliberative coordinated action by an industry as a whole, or units purporting to represent such a group position, may be severely limited in effectiveness".

In our analysis of the significance of action plans with respect to EDI diffusion, we apply a two-by-two matrix representing institutional involvement (low-high) and degree of EDI diffusion (low-high) in an effort to organize data on diffusion from different business sectors and public sector agencies. The measures represent qualitative measures rather than quantitative measures. The intention is not to provide data on businesses or public sector agencies that have adopted EDI or to assess companies' use of EDI, but rather to illustrate the relative priorities with respect to EDI adoption in different business sectors and public sector agencies.

The measures indicate how a group of potential adopters engaged in institutional efforts initiated by the partners involved in the national action plan for EDI. Institutional involvement is here defined as the decisions and non-decisions (Bachrach and Baratz, 1963) taken by governmental units, ministries, and business and trade associations to influence the content of the EDI action plan agenda (Laswell, 1936). In our view, the EDI action plan is primarily a pedagogical intervention rather than an economic incentive or normative action (Eckhoff, 1983). We also regard the EDI action plan as a discursive forum and leveler rather than as actions per se (Habermas, 1986).

The ICT-application represented in this chapter is EDI. We look at EDI as a technology construct rather than a business imperative (Markus and Robey, 1988; Sampler, 1996). In our analysis, we assume implicitly that a high degree of EDI diffusion is a positive sign. However, this view has been challenged from an exploitation perspective (Massetti and Zmud, 1996) owing to findings of negative impacts on network externalities (Riggins et al., 1994; Wang and Seidmann, 1995) and limited operational benefits achieved from EDI adoption (Krcmar et al., 1995). In summary, this chapter focuses on the process leading to adoption rather than on a study of adoption per se.

THE DANISH NATIONAL ACTION PLAN FOR B2B E-COMMERCE

At the European Community scene, IT became a major part of the 5th IST Framework with an outset in the Bangeman report (1996) and the Key Action II program line on e-commerce within the Information Society Technology program. A very visible sign of the European Commitment to fuel e-commerce diffusion was the creation of a new Directorate Generale (DG), namely the DG Information Society (DGXIII). A key priority for the EU EDI-policies in the mid to late 1990s was to push the

UN/EDIFACT standard. Other key priorities were diffusion to mainly SMEs by forming networks of excellences and take-up measures. In particular, the 5th Framework for R&D activities in the EU had the rapid take up of EDI among SMEs as a cornerstone. During the late 1990s, the challenge for the EU e-commerce policies was to instigate the Information Society policies to push the e-commerce take up. Yet, facing global competition (primarily from the US) with the prospect of undercutting European competition and loosing jobs diminished the eagerness to use information technology to open global market competition within Europe. Thus, the strong emphasis on European technologies and projects that had an internal EU focus appears to present a policy flavor rather than programs to increase international presence within Europe. EDI and in particular EDIFACT seemed in line with these motives.

At the Danish scene, owing to a change of government in 1992 from a right to a centre-left wing government, the small Social Liberal Party (Radikale Venstre) came into power as parliamentary support to the Social Democratic Party. The Social Liberal Party played a major role in promoting research and IT policy. The former MP, Mrs. Lone Dybkjær og Søren Christensen authored various blue prints ("From Vision to Action – Info-Society 2000" and "The Info-Society for All - the Danish Model") about the transition to the information society. We have included these blueprints below to illustrate the discourse that led to a formulation and implementation of a national e-commerce agenda – the national EDI action plan.

Building consistent agendas was difficult throughout the 1990s in part because IT issues were relatively new on the Danish political scene and none of the ministers for IT and research held their office for more than two years.

It is especially interesting to our analysis that the EDI Action Plan was launched at a time when there were strong environmental demand drivers for standards, etc. (Andersen et al., 2003). Apparently, it played a crucial role that the newly appointed Minister of Research and IT, Mr. Frank Jensen from the Social Democratic Party, had an urgent need to position his ministry. Mr. Frank Jensen was regarded as the crown prince within the Social Democratic Party. It was important to him to demonstrate results that would merit a move to more prestigious policy fields and enable a rapid political career. The other ministers during the mid - late 1990s already had an active political career or were not viewed as key persons in the Social Democratic Party with a view to holding government power. Mr. Frank Jensen launched a strong push towards deregulation of the telecommunication sector. He also tried to ensure that all business sectors and micro companies would be provided with opportunities to enter the information society. Other central policies advanced by the Ministry of Research and IT in the mid 1990s included standardization and dissemination of e-commerce to SMEs.

In November 1996, the government and the major business associations prepared an agenda for application of e-commerce in business development, future research, and policy requirements. The Agenda had three major objectives:

- End-to-end integration of data from business-to-business, thus eliminating costly reformatting of data and speeding up business cycle times.

- Long-term focus on the use of standards such as EDIFACT within organizations to provide them with security in operations within an increasingly inter-organizational business environment.

- The use of VANS initially to achieve a more "open" data exchange, format and transport media allowing greater flexibility of choice, costs and value-addition for large and small organizations.

FROM VISION TO ACTION – INFO-SOCIETY 2000

The forerunners of the national e-commerce agenda from 1996 were two policy statements published by the government and prepared for the Danish Parliament. The first statement "From Vision to Action – Info-Society 2000" (Ministry of Research and Information Technology, 1995) was used as a lever to create awareness of the information revolution's significance. It was stated that the movement towards the Info-Society was a public movement affecting everybody. Similar to initiatives in Italy (Kumar et al. 1998) and Hong Kong (Damsgaard and Lyytinen, 1998), the strategy should therefore be based on a Danish model ensuring that market forces would not be the only forces to determine the development. Although the statement primarily focused on building a strong infrastructure, it also stressed the public sector's obligations to engage in the movement. However, the role of Danish companies was by no means underestimated. It was acknowledged that the opportunities created by the information society would be a great challenge to Danish companies. The policy statement pointed out that:

> "Danish companies must not only effectively introduce new technology for rationalization purposes, it certainly also means that they must be able to transform new technology into new products to respond to special customer requirements."

It was suggested that if companies adopted EDI, it "would result in considerable rationalization gains and a closer interplay between organizations." However, there were no specific directives on how to achieve the rationalization gains and a closer interplay between organizations. It was announced that the Ministry of Research and IT, the Ministry of Business and Industry, the Danish EDI Council and the relevant industry and trade associations were about to launch a campaign to further the use of EDI and e-mail in businesses and the public administration. However, it was decided to publish another political IT statement before launching the national agenda for e-commerce. The next statement was published in 1996.

THE INFO-SOCIETY FOR ALL – THE DANISH MODEL

The next political IT statement was named "The Info-Society for All - the Danish Model" (Ministry of Information Technology and Research, 1996b). The statement announced that:

> "…, this new technology presents a number of opportunities and problems, which demand political consideration and action. A

cohesive, aggressive strategy for how we wish to form developments
in Denmark is necessary."

Included in the "aggressive strategy" was the 1996-action plan for electronic commerce. It stated, "the importance of a fast, effective and consistent implementation of e.g. EDI could hardly be overestimated." First and foremost, it argued that technological landmarks such as EDI would give Denmark an international lead improving efficiency of working procedures and the development of new products and production processes.

The action plan aimed to provide the necessary conditions for companies and the public sector to reap the gains enabled by EDI. The 1996-action plan acknowledged that the growing globalization of commerce made it essential for Denmark to follow the trend of doing business electronically across borders. The parties involved in the action plan agreed that EDI as such was not a novelty. However, the diffusion of IT in the Danish society and the decrease in software and hardware prices were likely to create a fertile environment for diffusion of EDI. It was recognized that most Danish companies had a sufficient level of experience and IT know-how to implement EDI. When the action plan was launched in 1996, fifty percent of the Danish companies in the industry segment exchanged data via telephone technologies or network technologies. Especially exchange of electronic messages to financial institutions had a high diffusion rate among Danish companies (Horlück, 1996). The relatively new World Wide Web had already been adopted by one out of five companies, and it was reported that thirty percent of all businesses planned to adopt www in the near future (Ministry of Information Technology and Research, 1996a).

Thus, the time appeared to be ripe for a coordinated effort to spread electronic communications from a few sectors to all sectors in industry and trade in Denmark., Based on this broad agenda, the action plan was launched to the business community and the public sector. In the foreword to the action plan it was stated:

> "The plan is to provide dynamism and accelerate growth. This will be
> achieved through the public sector joining forces with a large number
> of commercial organizations to create joint solutions. By this approach,
> we will avoid a state in which everyone waits for everyone else, or in
> which the approaches chosen are not coherent."

To create the necessary dynamics and consistency, seven initiatives were formulated. The initiatives aimed primarily at supporting the diffusion of EDIFACT based EDI-communication and thus electronic data transactions between private companies and the public sector. There were high expectations to the public sector's capacity in relation to development and implementation. It was clear that the public sector had to take the lead and provide an example. At the time that the agenda was formulated, EDIFACT was considered the dominant standard framework for safe interchange of data between computers in different companies. Although some of the international companies used ANSI X.12 as well, the battle on standardization was more concerned with proprietary standards versus UN EDIFACT than with discussing EDIFACT versus other standards. The policy consensus was that a development of EDIFACT standards would facilitate B2B e-commerce.

There was a general process of negotiation between the parties with the objective to strengthen the application of e-commerce in a business-to-business relationship. The target was to establish technical, organizational and educational facilities for EDIFACT-based communication in all business sectors, including the financial sector and the public sector's exchange of data with private companies before the end of 1998. By creating these facilities, the aim was to propagate the application of EDIFACT-based communication within all relevant areas by the year 2000 (Ministry of Research and Information Technology, 1996).

Table 1. The 1996-action plan

Initiative	Policy consensus
1. Establishment of EDI standards in all sectors	No later than 1998, the EDIFACT standard must be established in all industries and sectors, for all commercial documents of significance, such as orders, invoices, payment messages, transport notes and registration of real property. The goal is to ensure the availability of a vital prerequisite for companies' options to participate in the electronic marketplace within trade, manufacturing, transport, finance, etc.
2. EDI for public procurement contracts	Through forthcoming EU framework agreements, the public sector will include its suppliers' ability to participate in fully electronically-based document interchange as an integral part of its tendering conditions, no later than 1998.
3. Handling EDI in public-sector financial systems	By the end of 1998, public-sector financial systems will be able to handle all relevant commercial documents in EDIFACT format.
4. EDIFACT-based interchange of administrative information with the public sector	In order to ease the administrative burden on companies, the opportunity must be created before the end of 1998 for companies operating in areas in which serviceable standards exist to undertake EDIFACT-based electronic reporting to the public sector. And initiatives will be aimed at areas in which there is a need for new standards.
5. Development of EDI software	A number of initiatives are being aimed at software developers. These initiatives are intended to promote the development of a range of EDI software products destined for the market. The price and functionality of these products must satisfy the needs of all types of companies, regardless of an individual company's level of ambition concerning the use of EDI.
6. Legislation on digital signatures and electronic documents	New legislation on digital signatures will prepare the way for ensuring that the use of electronic communications is just as secure and clear-cut as the use of conventional communication on paper.
7. Danish EDI Council as initiator and coordinator	The Danish EDI Council will assume a central initiating and cross-sectorial role in the implementation of the action plan.

Source: Adapted from The Danish national EDI action plan, (Ministry of Research and Information Technology, 1996).

In the introduction to the 1996-action plan, it was acknowledged that the project was ambitious and would require involvement from several business sectors and institutions. The timeframe for the adoption and implementation of EDI was short. It was expected that the use of EDIFACT-based communication could be tested and diffused among all relevant sectors by the year 2000. As initiatives 1 to 4 in Table 1 show, it was expected that EDI could be implemented by 1998. The means to meet this end included awareness campaigns arranged by the Danish EDI Council. Another approach dealt with making the necessary arrangements to execute public procurement via EDI. However, it was the adopters that carried the main responsibility for acting according to the recommendations in the action plan. This strategy was in accordance with the IT policy statement from 1996 "The Info Society for All – The Danish Model", which pointed out that:

> "One decisive feature of "the Danish model" is that without grandiose plans, but precisely through dialogue and effective action, we are in a position to implement the necessary infrastructure quickly and to remove the barriers to it."

This attitude can be explained by the long and successful Danish tradition of establishing co-operative dairies and abattoirs in the 19th century.ii It clearly reflected the expectations to the industry and trade associations and individual organizations. Although the individual initiatives should be carried out by the industry and trade associations in concert with individual organizations' action plans, the Danish EDI Council was appointed as a coordinating unit. In addition, the ministries involved provided limited financial resources.iii

But although the Danish EDI Council was appointed to monitor implementation of the action plan, it had no fiscal authority in relation to the private or public sector. The active role played by the Danish EDI Council resulted mainly in support of several projects and provision of information and publications on EDI to the business community.iv In their efforts to propagate information about EDI in the Danish business community, the EDI Council presented a definition of EDI to support a shared understanding of the term. The EDI Council used the following definition of EDI:

> The term EDI is defined as the exchange of structured, electronic messages. This exchange is conducted with a minimum of human interaction. A requirement for defining an electronic exchange as EDI is that messages are exchanged in a standard agreed upon in advance. The format may be an individual proprietary standard or an international standard e.g. EDIFACT.

The definition includes the elements outlined in the contemporary definitions used in academia by Hansen and Hill (1989) and Pfeiffer (1992). In this context, it is very interesting that the Danish business and administration environment was exposed to the definition. In relation to the action plan, the EDI Council has broadened the definition by including proprietary standards. The action plan, on the other hand, favors the EDIFACT standard and encourages organizations to adopt this standard.

Especially, the two IT policy statements focused on building a telecommunication infrastructure to support the Internet and gain the benefits and opportunities embedded in this means of transportation of information. The EDI Council's definition of EDI only outlines the electronic exchange of messages connected to EDI whereas the means of transportation was considered less relevant. In a similar manner, the degree of organizational integration is subject to individual interpretation, mentioning a minimum of human interaction as the ultimate goal.

In 1998, the EDI Council evaluated the outcome of the 1996-action plan[v]. It was acknowledged that although a number of initiatives had been implemented within different sectors, including development of low-cost EDI software, the diffusion of EDI had failed to progress at the pace suggested in the 1996-action plan. The first initiative, establishing EDI-standards, was based on information obtained by the business associations. The initiative was close to be implemented in the sectors related to mortgage, shipping, and insurance. However, sectors such as industry and trade progressed at a slower pace. But the Council expected that the objective of standardization would be fulfilled by 1999. It realized that especially SMEs had not implemented EDI as much as expected. In relation to the standardization issue, the EDI Council realized that the XML-standard (eXtended Markup Language) presented a promising alternative to EDIFACT. It was also suggested that the Internet might be an attractive means of transportation of EDI messages in terms of cost and simplicity. According to an assessment by the EDI Council, the fifth initiative in the 1996-action plan, development of EDI-software, had had a slow start. One problem was a lack of differentiation in the beginning. The development of EDI-software had failed to consider price and functionality in relation to individual organizations' needs and level of ambition for EDI-usage. However, remedial action had been taken by the initiation of pilot projects, e.g. the TradeDocument Project.

In the overall evaluation document of the 1996-action plan by the EDI Council[vi], it was concluded that the action plan had been a success. One of the reasons for its success was the wide support it had elicited from the business associations. According to the managing director of the EDI Council, the criterion for success was to provide business and administration with the necessary opportunities and tools for EDI application. Thus, the objective was rather to create the opportunity to use EDI than to convince as many organizations as possible to adopt EDI.

Textbox 1. Greetings to the 1996-action plan, a review of the plan

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"Catch the Ball"

The following text is a report from a feature article in a business magazine focusing on the steel and machinery industry[vii]. Mr. Agner Mark, managing director,[viii] praises the emergence of the EDI action plan by proclaiming, "the 1996-action plan is a fantastic opportunity for the Danish business community". Mr. Agner Mark reviews the seven initiatives of the action plan and argues that the action plan is ambitious because it is the first of its kind in the world. Due to its specificity it is rather a users' manual than a declaration of intent. By adopting EDI as prescribed in the action plan, it is possible to gain efficiency, reduce cost on business routines, and create a competitive lead for a number of Danish businesses. "The consequence of the governmental initiative will be the construction of a solid infrastructure securing Danish businesses optimal conditions for improved service and collaboration with suppliers and other business partners. At the same time, such a lead in utilizing technology will reduce the administrative burdens and provide Danish businesses with a good position in the global competition." Mr. Agner Mark continues by saying " Electronic communication is not enough in itself. Data has to be transferred automatically from one IT-system to another. It is the condition for fast and

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low-cost transfer of large amounts of data where errors must be avoided. EDI (EDIFACT) is the solution - or rather it is the technological prerequisite." The final statement from Mr. Agner Mark is: " The action plan implies a number of good initiatives and it is obvious that the business community should catch the ball – it has already been thrown into the field. The businesses can't afford to miss it."

USE OF EDI IN THE DANISH BUSINESS ENVIRONMENT

The use of IT in the Danish industry and trade sectors has been steadily growing from the mid 1990s when the issue caught attention due to awareness campaigns launched by governmental units and professional business associations.

Table 2. Companies using EDI 1996-2001. Percent

Year	Companies using EDI (%)	Company size covered in the survey (number of employees)	N (%)	Reference
1996	33	5+	387 (20%)	Ministry of Information Technology and Research (1997)
1998	28%	10+	1815 (61%)	Ministry of Information Technology and Research (1999).
1999	36	10+	1.092 (29 %)	Ministry of Information Technology and Research (2000).
2000	15	5+	3.357 (67 %)	Statistics Denmark (2001).
2001	18	5+	3.327 (66 %)	Statistics Denmark (2002).

Although there has been a decrease in the number of users during the period 1995 to 2000, Andersen et al. (2000) found an ongoing growth in the number EDI messages sent via third party vendor companies. There was a substantial growth in the number of EDI messages exchanged ranging from an annual growth of 34 percent to 46 percent. The same study also revealed that the growth in bytes transmitted during the same period increased by the same rates, indicating that larger messages are exchanged. Finally, the study found an increase in assigned EAN-numbers.[ix]

Thus, the study by Andersen indicates that the EDI traffic has increased from 1995 to 2000. With the exception of the health sector (Johansen et al., 2002), the financial sector (Bjørn-Andersen and Andersen, 2003 (forthcoming)) and the logistics & freight and agricultural sectors (Andersen et al., 2003), there has not been a general spread of EDI to the larger part of the business community.

Studies of digital data exchange within the steel and machinery industry (Henriksen, 2002), the textile & clothing industry (Hjarup, 2001), the industry in general (Horlück, 1996; Petersen et al., 2002), the retail sector (Juul and Andersen, 2001, 2002) and the public sector (Andersen, 2002) support the picture that digital exchange of orders and invoices has been the exception rather than the norm during the mid 1990s and up to the present time. Yet, throughout the 90'ties, e-commerce was

labeled a business imperative (Choi et al., 1997; Kalakota and Whinston, 1996). Several efforts have been made to promote the ideas and support businesses that wanted to adopt the innovation. OECD[x] and EU[xi] have allocated resources to marketing the innovation at an international level and several national initiatives have pursued the idea of diffusion of e-commerce.

Table 3. Research on Danish EDI and B2B e-commerce initiatives by industry sector 1995-2002

Industry sector / segment studies		EDI examples & initiatives	Sources
Governmental sector	Health sector	MedCom (Letter of discharge, Prescriptions, Laboratory request and results) E-procurement	Johansen et al., 2002
	Municipalities National government		Andersen and Juul, 2002
The financial sector		Home- and officebanking Interbank clearing	Bjørn-Andersen and Andersen (forthcoming)
Industry	Danish Association of Industries of Consumer Products (DLF)	EDITEX	Horlück, 1996 Petersen et al., 2002 Andersen et al., 1999
	Steel and machinery industry Textile & Clothing Industry	TradeDocument Project	Henriksen, 2002 Hjarup, 2001
Whole sales	Steel and machinery	TradeDocument Project	Henriksen, 2002
Retail	Grocery sector		Damsgaard and Lyytinen, 2001
		Le@n	Andersen et al., 1999
	Suppliers to the retail sector		Juul and Andersen, 2001; Juul and Andersen, 2002
Transportation & logistics			Falch, 1994

ANALYSIS AND DISCUSSION

Large companies had already adopted EDI (Andersen et al., 2000; Horlück, 1996), but SMEs hesitated as they lacked sufficient knowledge of the innovation. It is a fact that the EDI-traffic increased (measured in number of messages and number of bytes exchanged) from 1996 and in the years ahead (Andersen et al., 2000), but it did not create a large EDI-landslide. However, due to their involvement in formulating the EDI Action Plan, industry and trade associations initiated several EDI projects. The mid-way evaluation in 1998 of the 1996-action plan prepared by the Danish EDI Council documented that several efforts had been made to meet the demands, but the goals had by far been reached.

In connection with the Danish EDI Action Plan, there were no economic or normative interventions. Contrary to the TradeNet in Hong Kong, the adoption of EDI was not enforced. As a natural consequence of the Danish EDI Action Plan, private businesses might have been enforced to report their figures to e.g. the Inland Revenue service via EDI-messages. This would have been relevant since the Action Plan aimed at making the public sector a locomotive for EDI adoption. Since all Danish businesses communicate with the Inland Revenue service, it would have provided a broader scope of EDI-communication. The Inland Revenue service was among the (few) public sector agencies that actually utilized the opportunities created by EDI usage (cf. Table 3). However, no enforcement was used to involve private businesses in the exchange of EDI-messages. Another approach to create a large-scale diffusion of EDI might have been a strong encouragement of the public sector to perform its procurement electronically. Part of the reason why mandatory e-procurement was not implemented was a lack of technological readiness at both demand and supply side. The municipalities, for example, (cf. Table 3) had a low degree of adoption and diffusion of EDI in general. But perhaps the strongest explanation is the fact that the public sector was not managed on a top-down style. About one third of the employees in the Danish governmental sector is employed in central government and two-thirds at the local level in the 275 municipalities and 14 counties. Local government has a large degree of autonomy and various management reforms in the public sector have decentralized budgets and procurement to each government institution. Any ideas of making e-procurement mandatory in the public sector were in total conflict with the overall management agenda for the public sector. It was a paradox that the management reforms introduced in the 1990s had the overall aim to increase efficiency and effectiveness. However, the means to achieve this objective (decentralization and autonomy at institutional level) prevented a central, top-down led strategy for e-procurement. Formulated more aggressively, the overall management discourse prevented an effective introduction of an e-commerce agenda in the public sector.

Although financial resources were used as direct subsidies to support the diffusion of EDI in the Danish business community, the resources were limited and they were not allocated to individual business. The financial support was given to projects such as the TradeDocument Project (Henriksen, 2000; Henriksen and Andersen, 1999) initiated by the two major Danish trade and industry associations.

Thus, we may argue that the economic incentives for adoption were absent in the 1996-action plan in relation to individual businesses. The initiators of the action plan relied more on a pedagogical approach (Eckhoff, 1983). Through information campaigns by the Danish EDI Council and the associations supporting the 1996-

action plan, the advantages of EDI were communicated to the potential adopters. Thus, the communication process became a central issue in the adoption and diffusion of EDI in the Danish business environment.

One issue is how the message about the innovation is communicated. Another issue is how the innovation is presented. The message can be communicated via mass-communication networks or through interpersonal relations (Rogers, 1995). In the 1996-action plan, both types of communication channels were used. The EDI Council and the professional business associations communicated in parallel with the ongoing governmental information campaigns the advantages of the innovation to their members via publications, newsletters and social arrangements. The second issue – how the innovation is presented – is perhaps more relevant in this context. Two different types of information are involved in the communication process: signaling and know-how (Attewell, 1992). According to Attewell, signaling refers to communication about the existence and potential gains of a new innovation, whereas know-how refers to knowledge transfer in relation to the innovation. "The technical know-how is relatively immobile, and often has to be recreated by user organizations." (Attewell, 1992, p. 7). This places a heavy burden on potential adopters since they have to re-learn about the innovation before adoption can take place. The first policy statement on technology from 1995 suggested that EDI adoption could lead to "considerable rationalization gains and a closer interplay between organizations". In the 1996-action plan, EDI was described as a tool that could give Denmark an "international lead and improve the efficiency of working procedures and development of new products and production processes". Efficiency was an attribute connected to the innovation, whereas the traditional innovation attributes[xii] played a secondary role. However, the statements formulated by the business community might be even more significant. The feature article in Textbox 1 gave a quick two-page representation of the initiatives in the 1996-action plan and the advantages of EDI. Mr. Agner Mark argued in favor of efficiency, cost reduction, and competitiveness due to EDI adoption. The article left the impression that the investment would pay off, which suggests that the information communicated on EDI belonged in the category of signaling rather than know-how.

An issue that played a minor role in the policy statements was the cost of EDI. One of the seven initiatives in the 1996-action plan explicitly mentioned development of EDI-software as an objective, but the cost of hardware, integration[xiii] of EDI-software, and implementation of EDI in organizations was not mentioned in the statements[xiv]. In a survey from 1996 on EDI adoption among members of The Confederation of Danish Industries, the arguments in favor of EDI and the barriers to implementation of EDI were described (Horlück, 1996). The two highest scoring items in terms of barriers related to EDI implementation involved the large investment in connection with EDI adoption and the uncertainty in terms of actual advantages from using EDI. The third highest scoring item in the survey was related to the lack of standardization of trade data standards.

Apart from serving as a tool for creating awareness of EDI, the 1996-action plan aimed at introducing the EDIFACT-standard in the Danish business community and the public sector.

The major incentives to adopt EDI were issues such as quicker access to data, cost reduction, facilitation in handling orders, invoicing, etc., fewer errors in data, improved relations with customers and suppliers, and requests from major trading

partners to introduce EDI. According to the respondents, efficiency and the strategic role of EDI were of major importance to the adoption of EDI. Based on the contemporary needs expressed in the Horlück-survey and the message communicated on EDI in the policy statements, there seemed to be a certain ideal agreement on which direction to take and what to achieve.

As mentioned in section 2, our aim was to map the degree of institutional involvement in the formulation of the EDI Action Plan and the degree of EDI adoption. Appendix A provides a list of institutional involvement at different governing levels. Based on insights from the research projects reported in Table 2 and the data summarized in Appendix A, Table 4 displays a qualitative mapping of the continuous variables, institutional involvement and EDI adoption in selected businesses and public sector agencies.

Table 4. Institutional involvement and adoption of EDI divided by industry segment

Involvement	Degree of EDI adoption	
	Low	High
Low	Municipalities	The financial sector
		The MedCom project
		The agricultural sector (DLF)
		Transportation and logistics
High	The industry segment Wholesalers	The national taxation bureau

The Inland Revenue service was involved in formulating the EDI Action Plan and eager to gain the benefits that might be derived from increased EDI usage (Andersen et al., 2000). Based on information from the Inland Revenue service, its EDI usage is assessed to be high in both dimensions in Table 3. On the other hand, representatives from the municipalities did not play an active role in formulation of the EDI Action Plan. Nor did they pursue EDI adoption and implementation at any significant level with respect to EDI usage in the daily transactions both in relation to public or private relations.

The professional business and trade associations played an active role in formulating and operationalizing the EDI Action Plan (Henriksen, 2002; Henriksen and Andersen, 1999). However, they did not succeed in influencing adoption and diffusion among their members. Our assessment is therefore that the trade and business associations' institutional involvement was high, but the degree of adoption among their members was low.

A number of associations did not take an active part in formulation of the EDI Action Plan. These associations are clustered in the upper right corner of the two-by-two matrix in Table 3. Nonetheless, these associations represent some of the business sectors that have been most successful in utilizing EDI in Denmark (Andersen et al., 2000).

One of the issues that fascinate us at the Danish scene is the public sector's role as a major market player in the EDI Action Plan. However, the Danish EDI Action plan is not a governmental plan although the public sector acts as a major player in

fulfillment of the plan. The important insight about the role of government might not include the traditional top-down command and the concept of "government" versus "market".

The successful EDI initiatives originate at lower levels of government and in the market where they have managed to spiral and gain success despite a lack of policy saliency. Also, we point to the consensus between the public sector and the private sector on the Action Plan.

However, the consensus among the business associations and the governmental players does not overrule the remaining tensions in fulfilling the EDI Action Plan. The outcome of the action plan raises the question whether the resources could have been prioritized differently. On the one hand, the major Danish companies such as Mærsk, Danfoss, Grundfos and FDB have not benefited from the EDI Agenda. They have all managed well without the EDI Action Plan and been able to influence their suppliers and shipping agents in the use of EDI (often in a proprietary format) regardless of the political agenda's content. On the other hand, the EDI Agenda has helped to stimulate a range of EDI projects that otherwise might not have been implemented. These projects were especially targeted at the majority of Danish businesses – SMEs, which through this exposure were provided with the necessary information to consider the relevance of EDI in their businesses.

CONCLUSION

Our analysis of the Danish EDI Action plan has revealed a close interplay between industry and government in pursuing the digitalization of business-to-business transactions. The mapping of the policy goals and activities has displayed a range of pedagogical instruments rather than normative or economic incentives. The focus on B2B e-commerce was within the context of incremental changes in the business relationship rather than as a driver for value chain reconfiguration or altering business practice.

The active use of the public sector as a dominant market demand driver in the diffusion of B2B e-commerce and the attempt to streamline the internal processes in the public sector stand out in the Danish action plan. However, the lack of active industry involvement, apart from the business associations, also stands out. Whereas the EDI Action Plan received active support from single public sector agencies and organizations, the plan only had indirect support from individual companies. Business associations alone represented the private sector.

Our hypothesis based on our study indicates that the lack of direct representation will structure the future orientation and decision-making in terms of current and future policy programs on diffusion of ICT: The lack of industry involvement has not made the outcome of the EDI action plan useless. Yet, it has led to a very limited adoption and diffusion of B2B e-commerce in Denmark. The statistics indicate 1) that it is the same industries that exchange more and more messages and types of messages (Andersen et al., 2000) 2) that large companies, which often are old and well-established (Petersen et al., 2002), adopt ICT regardless of campaigns initiated by institutions as long as there is a profitable potential in e-commerce. Given these ex-

post observations, the EDI action plan with its focus on development of global standards by SMEs contradicts the extensive use of proprietary standards.

This observation points to an ongoing dilemma for institutional involvement in general in diffusion of e-commerce. The global market forces and the larger national single industry players did not push EDIFACT when the EDI Action Plan was launched. It was rather the proprietary standards and the competition with the American ANSI X.12 standards that prevailed in the mid 1990s. During implementation of the action plan, industry mergers and the global pressure to adopt the Internet and proprietary standards had an impact on the adoption of EDI, but these factors also challenged the borders and instruments of national institutional playing fields.

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APPENDIX A.

Government and business association players involved in the formulation of the Danish EDI Action Plan from 1996

Industry sector	Government Department	Government council/ association	Government agency	Business association
Governmental sector	Danish Ministry of Education And Research *Ministry of Finance, Agency for Financial Management and Administrative Affairs*	*Association of National Procurement Officers* *National Association of Local Authorities* Local Government Computing Data Association (KMD)	*Central Customs and Tax Administration* *Danish Armed Forces* *Statistics Denmark* *National Procurement Ltd.* *City of Copenhagen*	
The financial sector				Danish Bankers' Association Danish Insurance Association Association of Danish Mortgage Banks
Industry	Danish Ministry of Business and			Confederation of Danish Industries

	Industry			Danish Federation of Crafts and Small Industries *IT Business Association*
Whole sales				Danish Chamber of Commerce
Health care		*Association of County Councils in Denmark* *Copenhagen Hospital Cooperation*		*Danish Pharmaceutical Association*
Retail				Danish Commerce and Service Association
Agriculture				Agricultural Council of Denmark
Transportation & logistics			*DSB*	Danish Ship Owners' Association *EDI Transport Denmark* *EAN-Denmark*
Construction & housing			*Danish Royal Palaces and Properties Agencies*	Danish Contractors' Association *EDI-Byg (construction)*
Others	Danish EDI Council *Danish Data Association*			

Source: (Ministry of Research and Information Technology, 1996)

Legend:

Players highlighted with *italics* are associations, which indicated that they supported the EDI Action Plan. The other players were directly involved in formulating the EDI Action Plan.

ENDNOTES

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ii The co-operative movement led to a social and economic lift for a large number of small and often impoverished farmers. The establishment of co-operative dairies and abattoirs improved the quality and quantity of the production benefiting the Danish export of agricultural products to e.g. Great Britain, which at that time was engaged in industrialization. From a political point of view, the co-operative movement is seen as an important factor in the development of the Danish parliamentary democracy.

iii The two ministries involved granted DKK 24.6 millions (about 3.5 million US$). DKK 18 million (about 2.7 million US$) were earmarked for the Danish EDI Council's information initiatives and DKK 6.6 million (about 0.8 million US$) were made available to projects working with standardization issues. The Danish EDI Council would administer the funds.

iv A complete list of activities and projects supported by the Council can be found at www.edi.dk/

v The information is based on an internal working paper "Midtvejs-status for Den Nationale EDI-Handlingsplan" ("Mid-term evaluation of the national EDI action plan") provided by The EDI Council.

vi The information is based on an internal working paper "Slutrapport for Den Nationale EDI-Handlingsplan" ("The final evaluation of the national EDI action plan") provided by The EDI Council.

vii The article is from the magazine "Jern og Maskinindustrien" (the steel and machinery industry), vol. 26 (1996), issue 22, pp. 26-27. The magazine is the leading channel for information on the steel and machinery industry. An independent private publishing house publishes the magazine.

viii Managing director of Dan Net Ltd., Agner N. Mark writes the feature article. Dan Net Ltd. was, and still is, one of the largest VANs providers in Denmark.

ix The number of assigned EAN location numbers reflects the number of companies that are able to send and receive EDI messages.

x http://www.oecd.org/dsti/sti/it/ec/

xi IST, Key Action II, 5th Framework. http://www.cordis.lu/ist/ka2/welcome.html

xii Rogers (1995) argues that the following five innovation attributes are of major importance to adoption of an innovation: Relative advantage, compatibility, complexity, trialability, and observability.

xiii It is generally acknowledged that to gain full advantage of EDI, organizations should integrate their internal systems with the external IOS, see e.g. (Riggins and Mukhopadhyay, 1999).

xiv A later publication from The Danish EDI Council from 1999 "Elektronisk handel og samarbejde – det betaler sig at bruge EDI" ("Electronic commerce and cooperation – it pays to use EDI") elaborates on the expenses connected to EDI investments in an abstract way. The publication outlines the items that should be included in a cost-benefit analysis related to purchase of EDI. So, even though research had shown that a cost-benefit analysis had a limited value in relation to EDI (Bjorn-Andersen and Krcmar, 1995) the article argued that cost was an influential factor for EDI adoption.