

Chapter 3

Societal Factors and the Diffusion of EDI¹

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Abstract The work reported in this chapter is part of a research stream to study the interaction between a nation's societal factors and the introduction of information technology. It examines the influence of four societal factors - culture, economy, infrastructures and government policy- on the diffusion of electronic data interchange in the Netherlands. This single-case study involved conducting semi-structured interviews with participants and observers of the diffusion process in the Netherlands along with analyzing relevant policy documents. Technology stimulation programs at the national and European Union levels combined with infrastructure developments have helped to shape the introduction and use of EDI in a fashion that is consistent with economic and cultural factors in the Netherlands. The results of this study provide insight into the nature of the linkage between societal influences and information technology diffusion. Further research is needed to examine these societal factors in other countries and to identify additional societal factors which influence the development and use of information technology.

3.1. INTRODUCTION

Over the past twenty years research in information systems (IS) has broadened its scope beyond technical considerations to include the behavioral issues embedded in the context of their use. Beginning in the late

¹ In addition to the respondents, the authors would like to acknowledge the contribution of the following individuals who provided insights, information and recommendations about this research: M. Heng, Assistant Professor, and E.R.K. Spoor, Associate Professor of Information Systems, Vrije Universiteit; P. Nijkamp, Professor of Spatial Economics, Vrije Universiteit; I.A. Winter, Professor of Law, Vrije Universiteit; P. Ribbers, Professor of Information Systems, Tilberg University; R. A. Roe, Scientific Director, Work and Organization Research Centre, Tilberg University; and P. Slaa, Assistant Professor of Communications, University of Amsterdam.

1970's and throughout the 1980's the *organizational context* of IS has been a domain of IS research (see for example: Bostrom, 1977a, 1977b; Hirschheim, 1985; Hirschheim & Klein, 1989; Kling, 1980; and Manuel, 1987). Banville (1991) overviews this body of literature in discussing information systems as social systems in which organizational factors are as important to system success as technical considerations about hardware and software. He argues that research into the introduction of information systems must, therefore, include the perspectives of both the systems analyst and the organizational actors.

The movement toward a global economy during the 1990's expanded the contextual boundaries of IS research and practice to include the *societal context* as well. As the world comes closer together through transnational cooperation and political alliances, greater attention is being given to societal factors within a country which may inhibit or enhance the information systems aspects of global endeavors. Such factors include political, cultural and economic characteristics as well as a nation's infrastructures. Lally (1994), and Braa and Monteiro (1996) note the role of infrastructure in helping countries learn about and exploit information technology. Shore and Venkatachalam (1995) have examined the role of culture in system development. Cash et al. (1992), Deans (1991, 1996), Ives and Jarvenpaa (1991), Keen (1992), Steinbart and Nath (1992) and Palvia have all reported on information technology (IT) management issues in a transnational context and have found that aspects of the societal environment are important factors to be taken into account. Finally, Kamel (1995), and Mahmood Gemoets and Goslar (1995) have examined the interplay between national characteristics and IT diffusion.

These research findings support the argument that just as individual differences are incorporated into consideration of the organizational context of information systems and technology, differences among nations represented by factors in the societal context must be accounted for as well. Porter (1990) expressed this as understanding the role that national circumstances play in the development of a nation's competitive strategy. Understanding the influence of national circumstances provides several benefits. It enables IS managers at multinational firms to operate more appropriately in countries other than their own. The study of societal context also enables researchers, practitioners and policy analysts to better understand the factors at work in the successful introduction of new information technologies and practices in their own countries.

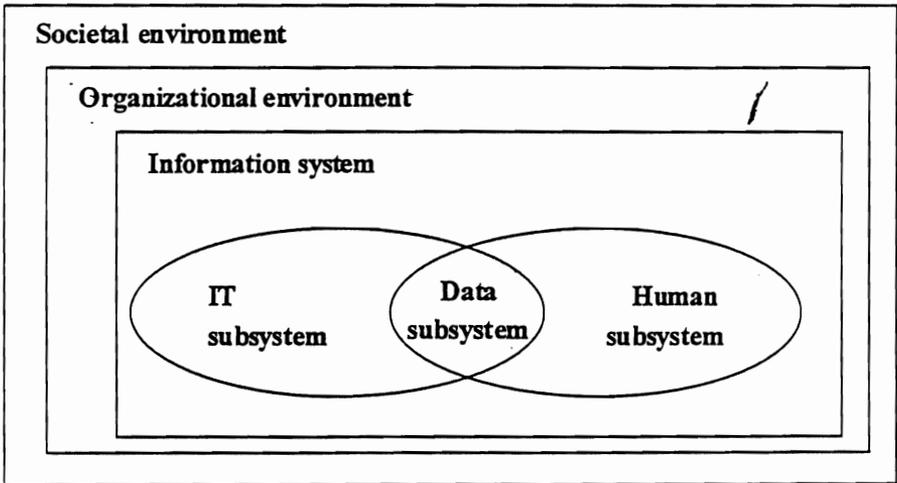
The relationship between the information system and the various contexts of use is depicted in Figure 3.1.² The information system's

² For further discussion of information systems and their environments see Trauth et al. (1991), pp. 22-36.

comprised of two subsystems: the technology subsystem (hardware and software) and the human subsystem (people and organizational procedures). These two subsystems intersect at and share the data subsystem. The information system exists within a hierarchy of environments. The environment (or context) is that which is outside the system boundaries but which exerts an influence on the system. The organizational environment is the company, office, etc. within which the IS functions. Factors in this environment will have an influence on the way the IS is designed and operates. This organizational environment, in turn, functions within a societal context such as a nation or a regime (e.g., the European Union). It too will have an influence on the way in which the IS functions.

Figure 3.1.

The Information Systems Research Domain

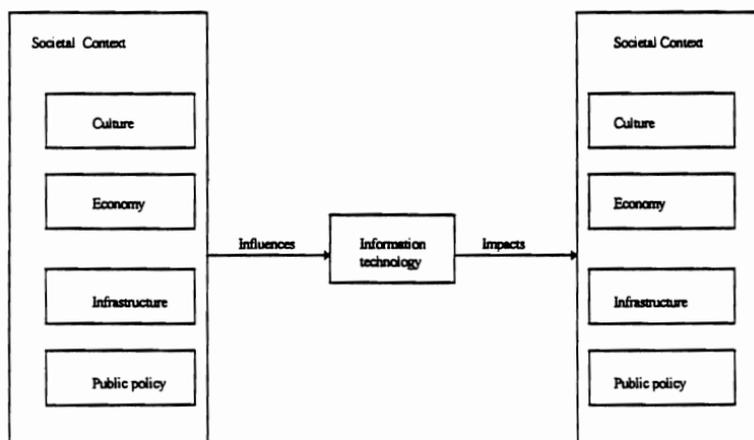


A research stream of Trauth (1993, 1995, 1996) employs this model of societal environment to focus on ways in which a nation's cultural and societal factors help to shape the introduction of information technology and the performance of IT work, and the reciprocal effects of such IT and information work on the society. The model, shown in Figure 3.2, illustrates

the interaction between IT and societal context: societal factors have an *influence* on the development and use of information technology; and the information technology has an *impact* on the society. The research reported in this chapter is part of this research stream. It focuses on aspects of a particular nation's culture, economy, infrastructures and public policy which have an *influence* on the diffusion of a particular information technology.

Figure 3.2.

Interaction between Societal Context and Information Technology



3.2. THE RESEARCH PROJECT

The objective of this research project was to consider the influencing role of societal factors in the diffusion of a particular information technology —EDI— in a particular country: the Netherlands. The Netherlands was chosen because it is an exemplar case of a country which has made the diffusion of IT in general, and EDI in particular, a matter of national importance. This research was conducted as a case study with embedded units of analysis (Yin, 1989, p. 46). Data included interviews and documentary analysis and were collected at two points in time: 1992 and

1997. Following the 1992 observations, data were analyzed and initial results were reported.' This chapter builds upon and updates these initial research results.

3.2.1 Respondents

In the first phase of the research, data was collected primarily by means of semi-structured interviews with selected individuals who have been involved in the diffusion of EDI in the Netherlands.' These interviews were one and one-half to two hours in duration. Two criteria were used in selecting respondents. First, as a group, they needed to represent a variety of perspectives on EDI diffusion. To achieve this, four different viewpoints were identified: provider, policy maker, user and observer. These categories had been used in previous research into the nature of technology-society interaction (Trauth, 1984). The definition of each category of respondents is the following:

Providers	Those involved with providing technological capability for EDI
Policy Makers	Representatives from government agencies involved in standards organizations and EDI stimulation efforts
Users	Firms currently using EDI or industry organizations established to promote the use of EDI
Observers	EDI researchers, professors and consultants who have followed the diffusion of EDI in Netherlands

The second criterion for inclusion in the study was that the respondent needed to be in a position to provide informed comments about the societal factors as they relate to EDI. Further information on the respondents and their qualifications is given in Appendix 3.A.

3.2.2 Data Collection and Analysis

The items that were discussed in the interviews were drawn from three sources. One was results of previous studies which considered aspects of the societal environment important to information managers operating in a global context (Cash et al., 1992; Deans, 1991; Ives & Jarvenpaa, 1991; Trauth, 1992; and Trauth & Pitt, 1992). Another source of interview items was the interview protocol developed and used in related research by Trauth

See Trauth, Deckszen & Mevissen. (1993).

At the time that the interviews were conducted the American author, Dr. Trauth, was a visiting professor at the Vrije Universiteit.

(see Trauth & O'Connor, 1991). The final source of interview items was the results of related research into electronic communications in the Netherlands by Vervest (1986) and Wierda (1991). The interviews focused on the following embedded units of analysis: economy, government strategy, technological infrastructure, culture, and the European Union. The interview protocol is shown in Appendix 3B. The data obtained from each interview was content analyzed by two members of the research team using the categories in the interview protocol.

3.3. THE DIFFUSION OF EDI IN THE NETHERLANDS

The use of electronic data interchange in the Netherlands, in its earliest form began in the late 1960's when companies such as Philips began exchanging electronic data using proprietary standards. By the early 1980's large firms in the Netherlands were becoming involved in EDI activities. But the majority of the EDI developments began to occur in the latter part of the 1980's. In 1994 there were 15,000 Dutch companies employing EDI; by 1997 there were 25,000 companies out of a potential of 400,000 doing so (Hoogewegen, forthcoming).

When this research began the working definition of EDI being used by informants closely mirrored standard definitions found in the literature: *interorganizational, computer-to-computer exchange of business documents in a standard, machine-readable format* (see, for example, Emmelhainz, 1993). The focus was generally limited to the technology; the up- and down-stream implications for business processes were not typically considered to be a part of the EDI discussion.⁵ With the rapid diffusion of the commercial Internet and other advances in telecommunications in the mid 1990's the concept of electronic commerce has joined the EDI arena. Organizations and initiatives that were once focused on the narrower concept of EDI at the time of our initial research have broadened in scope to incorporate electronic commerce in 1997. They have built upon the structures put in place for stimulating the use of EDI in the early 1990's for the stimulation of electronic commerce in the latter part of the 1990's. The progress of the Netherlands in the introduction of EDI and, more broadly, electronic commerce is the joint result of efforts by economic sectors which recognized the benefits, the activities of industry and national user organizations, government stimulation programs, and pressures from international trading partners.

5 To illustrate this point we note that some respondents upon hearing about our research project expressed mild surprise that business professors would be exploring what to them was simply another form of technology.

3.3.1 The Economy

The Dutch economy is well positioned to be receptive to ED!. It is an open economy in which trade is dominant. Thus, the progression from manual and face-to-face trading to *electronic trading* is a natural one. Because of its international orientation, key sectors such as trade, transport, distribution and agriculture were sensitive to increased international competition due, in part, to increased use of information technology. Since these sectors are all information intensive, they have been open to improvements in information processing and transmission.

An example exists in the flower sector. The Netherlands dominates world trade in both the production and distribution of flowers, and the flower industry is the leading contributor to the Dutch Gross National Product. Not only is it the largest producer of flowers but it also distributes flowers grown elsewhere. For example, flowers grown in South America and destined for markets in North America are often sold through auctions in the Netherlands. Time and speed are crucial in an industry in which the freshness of the product is paramount. At present, the entire value chain of the flower industry is highly automated; from production through auctioning to transportation. Before any government stimulation programs existed to promote EDI, members of the flower industry, themselves, recognized the need to explore its advantages. In 1988 members of the industry established a flower industry bureau and sought funding from a government program established to support innovative technology projects. From this and subsequent funding an organization called EDIFLOWER was created. A primary focus of EDIFLOWER has been active participation in the development of EDI standards: the creation of EDIFACT messages," EDIFLOWER presents itself today as an organization that stimulates the use of electronic commerce and ED! in the flower and plant business. In doing so it has become engaged in infrastructure provision through Florinet,'

3.3.2 Government Stimulation Activities:-

The government approach to IT diffusion has been and continues to be one of targeting those technologies that are perceived to have significant potential to enhance the Dutch economy. Recognizing the potential value of EDI, the Dutch government provided indirect stimulation of ED! diffusion through industry sectors. The government strategy was to create the

⁶ "Messages" or "transaction sets" define the content and structure of each EDI document.

¹ See <http://www.ediflower.nl>. EDIFLOWER has included in its website a link to Facing Facts Website which offers companies a wide range of electronic commerce services from web design and online marketing to web software and database and development tools.

necessary preconditions for the technology to flourish by directing efforts at awareness, motivation, education and research. The Dutch government motivated use of ED! by funding concrete projects which served two purposes. First, as in the case of the flower sector, they enabled firms or industries who are already motivated, to experiment with the technology. Second, these projects served as demonstrations of effective use of ED! so that others may see for themselves its benefits.'

The Dutch government has expanded upon its early ED! stimulation efforts by responding to the challenges and opportunities presented by the Internet and the advent of electronic commerce. A recent example of this government effort is 'a project associated with the "electronic.highway" or the Internet. The rapid entrance of the Internet into the global consciousness" in recent years has resulted in both government and private sector rethinking of ways in which business has heretofore been conducted. In 1994 the Dutch government developed a strategy document *Information. Superhighway: from Metaphor to Action*' which expressed its consciousness of the importance of the electronic highway for the Netherlands and the government's intention to stimulate the use of the electronic highway. Two ideas in this document that are germane to the present discussion are the recognition that infrastructure and knowledge-intensity of the society are necessary for developing a competitive climate for attracting business to the Netherlands.

There are three specific policy initiatives present in this document which resulted in response to recommendations from the Advisory Council for Science and Technology Policy. One was to strengthen the basic conditions for innovation. This is being carried out through changes in R&D tax structures, and depreciation incentives for the import of innovative technologies into the Netherlands. The second was to improve the match between the demand for knowledge and its supply through better cooperation between the industrial and university sectors. The third initiative was to stimulate better use of promising emerging technologies. This is to be accomplished by funding the development of the electronic highway in the Netherlands and electronic commerce applications on it.

The private sector also plays a key role in decisions regarding project funding. Leaders of industry have participated in setting priorities by

- 8 It was not within the scope of this study to consider whether or not governments *should* stimulate ED! growth or whether by doing so they are restricting organizational choices. Rather, our concern was with ways in which the Dutch government worked to stimulate ED! usage once the decision to do so was determined by the public and private sector stakeholders. As we learned during our interviews, consensus plays a key role in decision making in the Netherlands.
- 9 See Ministerie van Economische Zaken, Directie Voorlichting (1994) and URL <http://www.minez.nl/ecom>

targeting industries in which EDI will improve their competitive positioning. From the beginning of EDI stimulation programs, private sector participation has occurred through analysis of issues, assistance in decisions regarding project funding, and sometimes through direct encouragement of firms to get involved with EDI. An important component of the stimulation strategy is that technology push cannot continue indefinitely. At a certain point, it is believed, market pull must take over if the technology is to be successful. EDI, for example, was a high priority for three years (1989-1991). It then moved into the phase in which market forces determine its viability and the government moved on to other technology stimulation efforts.

One government activity currently involving the private sector in technology diffusion is the "action program for electronic commerce?" in which members of the private sector are being asked to submit ideas on what the Netherlands needs to do to become the business center of Europe with respect to electronic commerce. Another example is the SPOED initiative." This stimulation program for emerging electronic services is a joint endeavor of the Ministry of Economic Affairs, an employers' organization (Vereniging VNO-NCW), and an organization for small and medium sized companies (Koninklijke Vereniging MKB-Nederland).

An example of joint efforts at stimulation can be seen in the "Media Plaza" demonstration center which is set to begin operations in Utrecht in 1997.¹² The purpose of this initiative - in which private sector organizations participate financially or otherwise- is to stimulate the diffusion and adoption of the electronic highway in the Netherlands. Groups of people from all types of private and public sector organizations are invited to a futuristic building to experience the possibilities of the electronic highway by means of a movie, an interactive game and several presentations which show the possibilities for particular sectors of Dutch society. While the technological link between this effort and earlier EDI stimulation efforts is clear, what is not so obvious is the organizational link. The initiative for the Media Plaza came from an individual who was awarded a professorship by the Dutch government in 1992 as part of the EDI stimulation effort!

The primary government agency facilitating EDI and electronic commerce is the Ministry of Economic Affairs. In the mid-1980's it established the Informatics Stimulation Program which was concerned with stimulating the development of information technology in general along with related education and research. In 1988 the focus moved to specific applications of IT. It was during this time that the government began to

10 See URL <http://www.minez.nl/ecom/dfiindex.htm>

11 "Spoedmeans "urgent" in Dutch. See URL <http://spsaed.wirehub.net>

12 See URL <http://www.mediaplaza.nl>

recognize the national strategic advantage of EDI. In 1989 it inaugurated the three year VEDp3 program to provide funding for the development of model EDI projects. Consistent with the economic strengths of the Netherlands, nearly half of the VEDI projects were in trade and transport, a third were in industry and construction, and the remainder were in service industries (*Guide to VEDI Model Projects*, p. 7).

Other agencies involved with technology stimulation efforts are the Ministry of Telecommunication, Trade and Transport which focuses on EDI in the transport sector, and the Ministry of Agriculture which is involved with EDI activities in that sector. In addition, the Dutch Office of Technology Assessment provides the necessary background research into and "evaluation of new technologies.

Facilitating the diffusion of EDI has not ended with the conclusion of the VEDI program. It continues through the activities of EDIFORUM. This organization was established in 1988 as an EDI user organization for the trade and transport sectors. It has since grown to include all sectors. Its overall mission is to promote the use of EDI in the Netherlands. It does this by coordinating the efforts of various sectors and industries, undertaking research and disseminating the results, and serving as the liaison between government efforts and private sector projects. In addition, it is the locus of standards activities in the Netherlands. It has recently expanded its role to include disseminating information about electronic commerce. The example set by EDIFORUM is being followed by other European countries which are establishing similar organizations to promote EDI and electronic commerce.

Despite its past successes, the effectiveness of stimulation programs has been questioned by both private sector organizations and the government. Some observers see the Dutch government being more reserved with stimulation of electronic commerce than it was with EDI. Although the rhetoric is there, they say, the government appears to be less forthcoming with tangible evidence of its support.

3.3.3 Information Technology Infrastructure

While the perception of mutual benefit is the sufficient condition for adoption of EDI, the network or the infrastructure is the necessary condition for successful diffusion. The perspective of the Dutch government is that the telecommunications infrastructure should be the engine of economic development. It should be open and standardized, and present no barriers to

13 Voorbeeldprojecten Electronic Data Interchange (YEDI) [Model projects on Electronic Data Interchange] is a program run by the Directorate-General for Services, Small and Medium-sized Enterprises and Planning, of the Netherlands Ministry of Economic Affairs.

innovative uses of electronic communications. The privatization of the Dutch PIT in the early 1990's is consistent with this philosophy.

Prior to privatization, the Dutch PIT was a government agency of the Ministry of Telecommunications, Trade and Transport. It retained a monopoly on all telecommunications equipment and service provision except in-house communications systems. Bureaucratic inefficiencies that resulted in non-responsiveness to customer needs along with the desire to promote technological innovation through greater competition led to its privatization in 1989. The Dutch government originally held all the shares in PTT Telecom but is now selling some of them.

Under the new structure PIT Telecom is the monopoly provider of the physical infrastructure. Data and international voice transmission is open to other providers. Value added network (VAN) services are also permitted. This last aspect of the regulatory structure is very important for the diffusion of EDI since most Dutch companies utilize VANs for such transmissions. Respondents observed that a state PIT with monopolistic control of value added services can be a barrier to EDI because the absence of competition can result in higher costs and services which are not state-of-the-art.

Another aspect of the technological infrastructure important to the diffusion of EDI is the installed base of information technology and the level of technological literacy in firms which will be using it. Experience with EDI projects to date has shown that these are indeed influencing factors. For example, while the flower sector is highly automated, it is primarily in the areas of production and distribution; in 1992 only twenty to thirty percent of the companies had automated management systems. As a result there has been some difficulty in demonstrating the cost effectiveness of EDI since the long term benefits are to be found in the use of the electronic information involved in EDI transmissions. Companies without computer based management systems, therefore, have found that they need to develop these computer applications before they can realize the true benefits of EDI or other forms of electronic commerce. Another example can be found in an early EDI project in the transport sector. INTIS was established to facilitate distribution activities at the port of Rotterdam. One of the problems with implementing INTIS was that many of the small firms had completely manual operations. Resistance resulted from a lack of IT experience which led to the perception that the cost of EDI made it too risky a proposition. The Media Plaza is an example of a response to this need. This project not only illustrates government stimulation efforts, it also exemplifies the efforts to create awareness and greater understanding within the Dutch population about the benefits of electronic communication. In fact, the Media Plaza is an extension of an earlier effort aimed at promoting the use of ISDN.

A final aspect of the technological infrastructure that has influenced the success of EDI projects is standards. The absence of EDIFACT standards in an industry is a definite barrier to EDI diffusion as the INTIS experience showed.¹⁴ A complicating factor is the existence of multiple EDI standards throughout the world. For example, Dutch wholesalers in the flower industry who deal with the US have had to use as many as eight different standards.

3.3.4 Culture

At the heart of a nation's societal factors which can influence the diffusion of EDI is its culture. It pervades all the other factors. Four words were repeatedly used by informants when the topic of the Dutch culture arose. They are: *trade*, *pragmatic*, *trust* and *consensus*. These characteristics help to account for the relatively rapid diffusion of EDI in the Netherlands as well as the particular way in which its diffusion has occurred.

The Dutch describe themselves as a trading people. This term is used to explain a tolerance of differences and an openness to new ideas and approaches. But the pragmatic feature also demands sufficient justification. Thus, in order for EDI or any new information technology to be accepted, demonstrated benefits must be in evidence. The Netherlands has also been described as a trust culture in which commitment, discussion and consensus are key elements. These features have a distinctive influence on the implementation of EDI. In many business relationships there is a dominant partner who is in a position to impose EDI on its trading partners. In the United States, this situation has been described as the weaker partners receiving "drop dead" letters informing them that they must use EDI if they want to continue doing business. In the Netherlands, however, the EDI negotiations are conducted using the framework not of power but of consensus. There was consistent agreement across all respondents about the following critical success factors for EDI in the Netherlands: trust, win-win, and the management-labor relationship.

Trust is essential. With it a variety of problems can be overcome. Without it, EDI will fail. For example, there are certain legal issues associated with EDI such as the absence of a signature or the possibility of privacy invasion when the systems contain confidential personal information. When these issues were raised in interviews the response was that there has to be a trust relationship to begin with. And if there is, then a "gentlemen's agreement" is sufficient and the absence of a signature or the possibility of privacy invasion is not a concern. This is not to say that

¹⁴ EDIFACT currently has 200 messages covering business and administrative sectors (see URL <http://www2.cordis.lulespritJsrc/invencom.htm#dgxxiii>).

everyone automatically trusts each other. In fact, one informant stated that the Dutch start with distrust. Part of the problem with the INTIS project was that not all of the players trusted each other. A concrete implication of this finding is that more effort may need to be exerted in establishing an EDI relationship in the Netherlands but once it is accomplished, subsequent difficulties may be easier to overcome here than in other countries.

What accompanies trust is the perception of mutual benefit. These two factors reinforce one another. Trust is necessary but is not sufficient for a successful trading partner relationship. Both partners must also see the advantages in clear, measurable terms. There must be consensus. The perception of a win-win situation, in turn, provides motivation to trust each other. It was observed that EDI will only be successful when all parties involved are motivated to engage in it. This cultural trait is clearly taken into account in the approach adopted by the government in its stimulation strategy. It takes a proactive role in supporting projects which will demonstrate the benefits and encourage EDI use rather than allowing a laissez faire situation in which some dominant international players might attempt to impose EDI on Dutch companies.

The perception of mutual benefit must exist in the relationship between management and labor as well. Both sides must see the benefit of EDI in order for the technology to be successfully introduced. In fact, Dutch law requires the involvement of work councils when jobs are significantly affected by the introduction of technology. Consensus plays an important role here, as well. Just as both trading partners must see the benefits, so too must labor and management see the benefits to the firm, the country and the economy. Since there is more harmony between labor and management in the Netherlands than in some other countries, this is a reasonable and achievable goal.

3.3.5 The European Union

The final societal factor that was examined for its influence on the diffusion of EDI in the Netherlands is the country's participation in the European Union. Respondents commented that as the Single European Market increases competition, information technology in general and forms of electronic communication such as EDI in particular are becoming more important factors in competitive advantage. In addition; the opening of national borders means that the burden of data gathering is shifting from the government to the firm. For example, with open borders customs data are no longer collected. Therefore firms in ED countries need to collect and maintain their own statistics on transport.

This heightened need for information processing on the part of firms in member countries is accompanied by a strong telematics thrust within the EU. The 1987 European Community Green Paper (*Towards-a Dynamic European Economy*) expressed a policy shift towards liberalization of telecommunications markets (Commission of the European Community, 1987). The intent of increasing the level of competition is to improve telecommunications infrastructures and motivate providers to offer value added services.

At the same time that ED policy is encouraging diversity through competition, it is also emphasizing harmonization through standards. In the case of EDI this means that the European Union is a leading player in the development of EDIFACT - the international EDI standard approved by the International Standards Organization (ISO) in 1987. Just as the absence of standards represents a barrier to the diffusion of EDI, the EU efforts to further the development of EDI messages can be seen as stimulating EDI development (Trauth & Thomas, 1993).

EDI stimulation is occurring in other ways through a number of programs directed at technology development in general and EDI development in particular. The TEDIS program is directed at EDI stimulation through promoting projects, creating awareness and developing standards. The EDIFACT Secretariat for Western Europe is within TEDIS. TEDIS was developed by European Commission Directorate-General for Telecommunications (DG XIII). The first phase of TEDIS which ended in 1991 was similar to the Dutch VEDI program: stimulation through the funding of model EDI projects. The intent was to heighten awareness and motivation by highlighting successful EDI implementations. The second phase, begun in 1992, was directed at stimulating EDI platforms on a European scale and harmonizing legal rules.

Electronic commerce is being stimulated by the European Union through several initiatives. The European Forum for Electronic Commerce and Trade (EFFECT) was launched in 1996 with the objective of establishing a forum for awareness, dissemination and adoption of electronic commerce in the European context. The lead countries are France, UK, Belgium, Greece, Sweden, Italy and the Netherlands. EDIFORUM is the Dutch representative in EFFECT. Commerce 2000 is an initiative to create networks of cooperation between trading partners representing both large firms and small and medium enterprises (SME's). Both EFFECT and Commerce 2000 are programs of ESPRIT, the information technologies program of the European Commission Directorate-General for Industry (DG III). Among the research areas covered by this Directorate is 'technologies for business processes' which includes electronic commerce.

3.4. CONCLUSION

The results of this study support the linkage between societal influences and information technology diffusion. In particular, this research has identified four key factors which influence adoption of EDI and electronic commerce in the Netherlands: the economy, government policy, technological infrastructures, and culture. The dominant economic activity in the Netherlands - trade - has been shown to be a key motivator for engaging in ED!. The role that a government can play has been illustrated by the active though indirect role of Dutch governmental agencies in encouraging firms to implement new forms of electronic communication to support trade. As a member of the European Union, the Netherlands has also been influenced by ED initiatives. Through the establishment of stimulation programs and leadership in the EDIFACT standards process, the EU is helping to further the diffusion of EDI and electronic commerce in member countries. The importance of a nation's technological infrastructure has been demonstrated by the role that telecommunications regulations can play in either enhancing or hindering network applications like ED!. As competition in the provision of telecommunications services has grown in the Netherlands, so too have EDI and electronic commerce. The importance of the technological infrastructure within firms and within industries has also been observed. Firms with little knowledge about or exposure to information technology have been hesitant to move toward ED!. The influence of cultural traits on the diffusion of IT is subtle yet pervasive. In the Dutch case, pragmatism, trust and consensus emerged as key cultural factors in the successful adoption of ED!.

Two overall observations can be made about the Dutch experience with the diffusion of ED!. One is that while there has been significant adoption of ED! in the Netherlands, the level of participation has still fallen short of expectations (Hoogewegen, forthcoming). However, this fact should be viewed in perspective: in the US only 100,000 out of a potential 1.9 million companies are currently participating in EDI (Oakie, 1997).

The second observation is about the relationship between electronic data interchange and electronic commerce. At present, Dutch organizations are in a state of flux with respect to the two. A number of larger organizations are broadening their ED! expertise centers into electronic commerce expertise centers. Some hold the view that the emergence of electronic commerce makes ED! obsolete". Others argue that the two are different and provide complementary benefits to a firm. Whereas EDI is a business-to-business exchanges, electronic commerce is about business-to-consumer exchanges. In addition, through its standard "messages" EDI affords the consistently

efficient transfer of business documents, something electronic commerce does not.

Though this case study is specific to a certain country and technology, the findings contribute to the theoretical model underlying this research area. The results also provide greater detail about the aspects of the four societal factors in the model. In doing so, they add to the growing body of knowledge about the way in which features of the societal environment help to shape the diffusion of any new information, technology. This work contributes to research which identifies and explores societal factors that should be taken into account when planning the introduction of information technology.

There are three audiences for research into societal context as it relates to information systems and technology: researchers, practitioners and government policy analysts. For researchers this represents a new and relatively unexplored area of research. It involves incorporating work from sociology and anthropology just as organizational context research incorporates the disciplines of psychology and organizational behavior. These research results can be used to educate practitioners in multinational firms about critical success factors for information technology implementation in countries other than their own. For practitioners operating in their own countries, these results can help to shed light on previously unexplored factors that may have bearing on system success and failure. Finally, government policy analysts can learn about key societal variables that should be taken into account in developing policies regarding information technology innovation and stimulation.

The research to date by these authors and others is at the exploratory stage. Further research is needed to apply the factors identified in this study to other countries and other technologies. Further research is also needed to identify additional societal factors which could have an influencing effect on IT adoption and the circumstances in which they do so.

"In the 1990's social and cultural factors regarding technology will play a much more important role than in the past," replied Professor Zegveld of the Netherlands Office of Technology Assessment when asked about the relative importance of societal factors in information technology diffusion. The results of this study are consistent with this perspective. While examination of the interaction between societal factors and technology has been ongoing in the sociological literature (for example, Forester, 1987 and Perrolle, 1987), these authors **argue** that greater attention to this topic needs to be paid by the information systems community. Just as organizational factors will influence the design and ultimate acceptance of information technology within a single firm, so too will political, cultural and economic factors help to shape the rate and path of IT diffusion in a nation.

Appendix 3A. Interview respondents

Providers

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F. Bonsel, Ir., Business Development Project Manager, Telematics Systems and Services, PIT Telecom

T. Hagen, EDI Marketing Services, IBM U.K.

W.J. Nieuwenhuizen, Ir., Director of Innovation and Business Development, Telematics and Systems Services, PIT Telecom.

R.C. van Olmen, Drs. MBT, Marketing Development, Office for Network Systems and Services, IBM Nederland N.V.

Policy Makers

W.J. de Jong, Senior Advisor, EDIFORUM (Dutch umbrella *i* organization to promote EDI use and standards and the representative of Dutch interests in international EDI forums).

A.E.C. de Meulder, Drs., Policy Analyst, Directorate General for Services, Small and Medium Enterprises, Ministry of Economic Affairs.

J.J. van Scheijen, Drs., Director of Services, Directorate General for Services, Small and Medium Enterprises, Ministry of Economic Affairs (Dutch agency responsible for developing EDI initiatives).

W. Zegveld, Prof. Ing., Steering Group Chairman, Netherlands Office of Technology Assessment

Users

A.I.L. Alkemade, Senior Advisor, Agritech Advies B.V. and

Project Leader, EDIFLOWER (flower industry organization promoting EDI standards and use).

G. Goodwin, Information Manager, Wavin Building Products, Ltd.
(Representing EDI usage in the construction industry.)

R. Haanstra, Central Information Office, ANWB Koninklijke Nederlandse Toeristenbond (Royal Dutch Tourist Board).
(Representing EDI use in the transportation and tourist industries.)

Observers

P. Vervest, Prof. Dr., Managing Director INTERCAI Telematics Consultants. (One of the first scholars to study EDI in the Netherlands, has worked with EDI in industry and currently consults internationally on EDI and electronic communication issues.)

P. van der Vlist, Prof. Ir. Partner, Bakkenist Management Consultants and Project Manager, VEDI Project. (Responsible for first government-sponsored EDI stimulation project).

Appendix 3B. Interview items

1. Economy
 - Industry sectors
 - National economic strategy
2. Government Strategy
 - Innovation policy
 - ITIEDI stimulation programs
 - Telecommunications and information policies
3. Technological Infrastructure
 - In country as a whole
 - Within firms
 - Status of PTT
 - Regulation of value added network providers
4. Culture
 - Aspects that encourage/inhibit ITIEDI adoption
5. European Union
 - Standards development
 - ITIEDI stimulation programs

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