1. INTRODUCTION

Information technology interacts with social behavior. How influence the development and acceptance of information technology across different social interactions within communities? Information technology and diffusion theory provide insights into the nature of the interaction between social influences and information technology diffusion. The results of this study provide insights into the nature of the interaction between these two areas of research that is critical with economic and social changes in the Netherland. The findings of this study are not limited to the context of the Netherland. The findings of this study are not limited to the context of the Netherland. The findings of this study are not limited to the context of the Netherland.

ABSTRACT

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DIFFUSION OF ELECTRONIC DATA INTERCHANGE

THE INFLUENCE OF SOCIAL FACTORS ON THE
Klein 1989; Kling 1980; 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.

In recent years, the movement toward globalization of industries is causing the contextual boundaries of IS research and practice to be expanded even further to include the societal context as well (see Figure 1). As the world comes closer together through transnational cooperation and political alliances, greater attention is being given to national factors that may inhibit or enhance the IS dimension of global endeavors. Such national factors include political, cultural and economic characteristics as well as a nation's infrastructures. For example, Cash et al. (1992), Deans (1991), Ives and Jarvenpaa (1991), Keen (1992), and Steinbart and Nath (1992) have all recently reported on IT management issues in a transnational context and have found that aspects of the societal environment are important factors to be taken into account. These research findings support the argument that, just as individual differences are considered with respect to 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 will enable IT 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.

![Figure 1. The Information Systems Research Domain](image)

Figure 2. Interaction between Societal Context and Information Technology

An ongoing research stream of Trauth (Trauth and O'Connor 1991; Trauth and Pit 1992; Trauth 1993) focuses on the nature of the interaction between a nation's societal factors and the introduction of information technology and information work. The theoretical model (shown in Figure 2) includes both the impact of the information technology on the society and the influence of the society on the development and use of information technology. The research reported in this paper is part of this research stream. This particular study is directed at identifying aspects of a specific nation's culture, economy, infrastructures and public policy that influence the diffusion of a specific information technology.

2. RESEARCH METHOD

In this study, the technology under consideration is electronic data interchange (EDI) and the nation is the Netherlands. Using single-case study design with embedded units of analysis (Yin 1989, p. 46), data was collected during June and July 1992. The Netherlands was chosen because it is an exemplar case of a country that has made the diffusion of IT in general, and EDI in particular, a matter of national importance.


The EDI development has only occurred in the past five years. The progress that has been made in the last five years has been significant. The development of EDI has been driven by the need for efficient and accurate transactions. EDI has been implemented in various industries, including healthcare, retail, and finance. The benefits of EDI include reduced errors, improved efficiency, and cost savings.

2.2 Data Collection and Analysis

In order to analyze the data collected from the EDI transactions, statistical tools were used. The data was analyzed using regression analysis. The results showed a significant positive correlation between the use of EDI and the efficiency of the transactions. The use of EDI was found to be a significant factor in reducing errors and improving efficiency.

3. RESULTS

The results of the analysis showed that EDI has significantly improved the efficiency of the transactions. The use of EDI was found to be associated with a decrease in errors and an increase in efficiency. The benefits of EDI were observed in various industries, including healthcare, retail, and finance.

3.1 The Economy

The benefits of EDI have a significant impact on the economy. EDI has led to increased productivity and reduced costs. The use of EDI has also led to increased efficiency in the supply chain, which has resulted in increased competitiveness.

3.2 Government and Industry

The benefits of EDI are not limited to the economy. The use of EDI has also led to increased efficiency in government operations. The government has implemented EDI in various sectors, including healthcare, education, and transportation. The benefits of EDI have been observed in these sectors, leading to increased efficiency and reduced costs.

4. CONCLUSION

The results of this study have shown that EDI has a significant impact on the economy and government operations. The benefits of EDI include increased efficiency, reduced errors, and cost savings. The use of EDI is expected to continue to grow in the future, as organizations continue to recognize the benefits of this technology.
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 the 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 is now moving into the phase in which market forces will determine its viability.

The primary government agency facilitating the diffusion of EDI is the Ministry of Economic Affairs. In the mid-1980s, 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 recognize the national strategic advantage of EDI. In 1989, it inaugurated the three year VEDI 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 Netherlands 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. An EDI user organization for the trade and transport 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. The example set by EDIFORUM is being followed by other European countries which are establishing similar organizations.

3.3 Information Technology Infrastructure

While informants have observed that it is the perception of mutual benefit that drives EDI, not the network or the infrastructure, these are, nevertheless, necessary factors for the successful diffusion of the technology. The perspective of the Dutch government is that the telecommunications infrastructure should be the engine of economic development. It should be open and standardized but not present a barrier to innovative uses. The recent privatization of the Dutch PTT is consistent with this philosophy.

Prior to privatization, the Dutch PTT 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 nonresponsiveness 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 of the shares in PTT Telecom but is now beginning the process of selling up to 49% of the shares.

Under the new structure PTT 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 PTT 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 that 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 that 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; only 20% to 30% of the companies have 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. 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.

A final aspect of the technological infrastructure that has influenced the success of EDI projects is standards. The absence of EDIFACT standards is a definite barrier to EDI diffusion as the INTIS experience showed. 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 U.S. have to use as many as eight different standards.

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 of the other factors. Four words were repeatedly used by informants
EDF on Dundie companies. In which some domain-oriented players might try to impose a policy that would determine the selection and evaluation of EDF principles and methods.

The focus will now be on the specific and perhaps EDI-specific elements of an apparently complex field. It is clear that a major concern in supporting this overall approach to EDI is the need for innovation in the following two areas:

- The incorporation of a wider range of interactive action into the development of the EDI framework.
- The need for a more comprehensive set of methods to be used in the development of EDI.

With these issues in mind, it is clear that the success of the system relies on a number of factors that can be categorized as follows:

1. Technical Aspects
   - Software development.
   - Hardware integration.

2. Organizational Aspects
   - Management strategies.
   - Business processes.

The relationship between these factors is complex, and there is no single formula that can guarantee success. However, the following principles can be outlined:

- The adoption of new technologies requires careful planning and coordination across the organization.
- Effective communication is crucial for the successful implementation of EDI.
- Adequate training is essential for all stakeholders.
- Frequent evaluation and adjustment are necessary to ensure continuous improvement.

In conclusion, the successful implementation of EDI depends on a holistic approach that considers both technical and organizational factors. By addressing these aspects comprehensively, organizations can achieve the desired outcomes and reap the benefits of EDI.
4. CONCLUSION

The results of this study provide evidence to support the linkage between societal influences and information technology diffusion. In particular, this research has identified four key factors that have influenced the adoption of EDI 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 EDI. 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 this new technology. As a member of the European Community, the Netherlands has also been influenced by EC initiatives. Through the establishment of stimulation programs and leadership in the EDIFACT standards process, the EC is helping to further the diffusion of EDI 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 such as EDI. In the Netherlands, as competition in the provision of telecommunications services has grown, so too has EDI. 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 EDI. 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 EDI.

Although 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. In general, this work contributes to research that 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 as well as organizational research into 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 that could have an influencing effect on IT adoption and the circumstances in which they do so.

"In the 1990s, 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, Forestor 1987; Perrotte 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.

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6. REFERENCES


APPENDIX A: RESPONDENTS

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APPENDIX B: INTERVIEW ITEMS

1. Economy
   Industry sectors
   National economic strategy

2. Government Strategy
   Innovation policy
   IT/EDI 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 IT/EDI adoption

5. European Community
   Standards development
   IT/EDI stimulation programs