Chapter 1 Introduction

Electronic commerce (EC) in its various forms is perceived by many organizations and "experts" as the way that business will be done in the future both near term and long term. The potential of electronic commerce has driven market values of firms like Amazon.com up to billions of dollars even though they may be losing money and are not sure if or when they will turn a profit. Much of the current wave of interest in EC is driven by new readily available technologies like the Internet and the World Wide Web (WWW). The excitement regarding Web Commerce (WC) has lead many to believe that EC is relatively new. In reality, EC in the form of Electronic Data Interchange (EDI) has existed for 30 years and accounts for far more business than WC. It is the preferred and often required way of doing business with many large organizations such as the U.S. Federal Government, Ford, General Motors, and Wal-Mart.

EDI is the business-to-business transfer of documents in an electronic format (Horluck 1994 and Emmelhainz 1990). It was believed that the use of EDI would lower transaction and inventory costs for firms which would enable some firms to be more competitive in their marketplace (Premkumar, Ramamurthy, and Nilikanta 1994). EDI is primarily utilized by large organizations and their suppliers in what is called a hub-and-spoke system with the initiating organization as the hub and their suppliers as the spokes (Horluck 1994). Initially EDI was accomplished by transferring computer tapes that held transactions in an electronic format. Now, typically, Value Added Network (VANs) providers now provide telecommunication links between trading partners. In the last several years, some firms have started to use the Internet as a telecommunication link for EDI transactions.

There are two basic ways that EDI can be implemented. It can either be integrated into a firms computer based information system or it can non-integrated in which case it is a stand alone computer application. Typically, large buyer firms initiate EDI with their suppliers (Horluck 1994). The integrated approach offers more benefits as all transactions are handled through computer application programs with a minimum of human involvement. However, it is expensive and complicated to implement an integrated EDI solution. Non-integrated EDI is much less expensive but it does not reduce the labor that is required to handle transactions. In addition, it does not reduce keying errors like the integrated approach. It appears that the firm that initiates EDI in their supply chain typically integrates EDI while suppliers tend to use the non-integrated approach.

While EDI has existed for 30 years, it has not experienced the rapid adoption rate that WC has in the last few years. Currently, less than 10% of U.S. businesses and less than 5% of world business utilize EDI (Sokki 1998, Kalakota and Whinston 1996 and Lehmann 1996). These values contrast with the much higher adoption rates that had been expected (Emmelhainz 1994). The adoption rates for other recent information technologies such as the WWW and e-mail have been much higher in a much smaller time frame which leads to the question of why has diffusion of EDI occurred so slowly compared to other recent information technologies. According to Kalakota and Whinston (1996), it is not due to technology problems with EDI but instead with benefits. This is in conflict with Emmelhainz (1990) and Sokol (1995) who point out the tremendous benefits to firms that adopt EDI. The inconsistency of benefits of EDI has also been reported by Crum, Premkumar, and Ramamurthy (1996) who report
that firms are not reporting financial benefits from EDI. In a similar vein, Pfeiffer (1992) reports that 60% of the firms that implement EDI do not realize changes in inventory levels.

**Purpose of Research**

This dissertation addresses three major questions related to EDI.

1. What is the current status of EDI?
2. Is there an economic model that can explain the low diffusion rate of EDI?
3. Is there an alternative structure for EDI that could lead to increased adoption rates?

**Plan of Presentation**

In order to address the first research question, Chapter 2 will examine existing research on EDI. Based on the results of the research we will then synthesize a view of the current status of EDI. We then review theories that are relevant to the diffusion of EDI and information technologies in general. Together the existing research and theories will help us to determine the reasons for the low adoption rate of EDI compared to other information technologies. Based on this discussion, we propose reasons for the low adoption rates and areas for future research.

We will use the research conducted for the first major question to answer the second question in Chapter 3. Based on inventory theory, an economic model is developed which computes the cost savings which arise from an EDI system for a given set of parameter values for a buyer. Sensitivity analysis of the model is performed over a range of values from the literature. In addition, we show how a buyer firm can determine the number of suppliers it needs to join its EDI system before EDI becomes cost-effective for the buyer. This leads us to recommend changes in EDI systems which will lower the cost of implementation.

In Chapter 4 we develop and test a new system for EDI which uses the Internet and new information technologies. The new system results from the findings of Chapters 2 and 3 and transaction cost economics. We then show that our new system offers substantial benefits to a firm using the results of the economic model from Chapter 3 compared to a traditional EDI system.

**Limitations**

Due to the many combinations of buyer, supplier and inventory management systems, our economic model examines EDI from only the buyer's perspective in a buyer-initiated system. The economics of supplier-initiated EDI remain the subject of future research.