Electronic Data Interchange: Issues in Adoption and Management

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Electronic Data Interchange (EDI) has come to revolutionize in recent years the way in which businesses conduct their trading activities. Based on the establishment of trading partner relationships, EDI systems have come to signify a speedy, efficient, and accurate means of electronically exchanging business transactions. Even as there is growing popularity and potential underlying EDI, there appears to be insufficient insight into the adoption and management of EDI systems. Specifically, there is a need to know more about why EDI is (or is not) adopted, how EDI has worked for past adopters, what aspects may need further development in order to enhance its value to users, and the nature of organizational experiences with EDI in general. With these factors in mind, this study reports on the results of an empirical study of EDI users. Findings indicated that organizations experience several benefits from EDI. These benefits tended to vary based on factors such as length of EDI use, proportion of customers using EDI, total EDI-related investment, and number of employees. Findings also indicated that the overall fulfillment of EDI expectations was influenced by incorporation of management reporting and the integration of EDI technology into the information systems function of the organization. The presence of formalized cost-benefit assessment procedures and planned expansion were also associated with greater fulfillment of EDI expectations. These findings are discussed in terms of their implications for the management of this valuable, strategic IT resource: EDI.

Corporate America spends billions of dollars each year on computing and business communications, with a goal of integrating hardware, software, and people into information collection, processing, and delivery structures (Scala & McGrath, 1993). Many organizations now include as part of this process the proactive use of information technology in their arsenal of strategic weapons (Van Over & Kavan, 1993). Among these “weapons” are cooperative systems for exchanging information electronically across organizational boundaries. These interorganizational systems have both processing capabilities and communications links. They enable organizations to coordinate and share information when pursuing a common objective, representing a cooperative information system that can enhance competitive advantage (Swatman & Swatman, 1992). Electronic data interchange (EDI) is a prime example of this type of system.

EDI has come to revolutionize in recent years the way in which businesses conduct their trading activities. Based on the establishment of trading partner relationships, EDI systems provide for a speedy, efficient, and accurate means of electronically exchanging business transactions. Ranging from the manner in which purchases are made to how payments are remitted, they can contribute to reducing paperwork, decreasing human error, increasing accuracy, and improving productivity. In addition, EDI systems, if adequately integrated into organizational use of information technology, can be of significant strategic value to the organization (Swatman & Swatman, 1992). To the extent that they are effectively integrated with existing information systems and resource management, EDI systems can also facilitate the reengineering of some critical business processes (Borthwick & Roth, 1992; Hammer & Champy, 1993). Thus, EDI systems...
represent a resource management philosophy rather than just a technical systems issue.

Though the technology for EDI has been available for some time, its full effects are still being learned (Clinkunbroomer, 1991). Even as there is growing popularity and potential underlying EDI, there appears to be insufficient insight into the adoption and management of EDI systems. Specifically, there is a need to know more about why EDI is (or is not) adopted, how EDI has worked for past adopters, what aspects may need further development in order to enhance its value to users, and the nature of organizational experiences with EDI in general. Further study of these aspects of EDI is needed. With these factors in mind, this study reports on the results of a descriptive survey of EDI users. It adopts an empirical hypothesis testing approach to shed light on these issues.

**Background and Hypotheses**

**The EDI Process**

EDI is the electronic, computer-to-computer exchange of business information in a structured format between business trading partners or between various units within an organization (Ferguson, Hill, & Hansen, 1990). Accordingly, EDI is a high-speed method of electronic communication that facilitates the exchange and processing of high volumes of business data from one computer to another. EDI is being used by many companies to order and pay for goods from suppliers, to arrange transportation with carriers, to receive orders from customers, to invoice customers, and to collect payments from customers. The application of EDI involves the conversion of written documents into structured, machine-readable formats so that a computer in one company or functional unit within a company can receive and process data from another company’s or unit’s computer. These documents relate to business events such as purchasing, sales, inventory management, accounts receivable, and accounts payable.

Senn (1992) notes that the following activities are key to effective EDI usage: (1) the establishment of a standard method for identifying and marking products, (2) a standard format for exchange of data, (3) EDI software, and (4) a common data dictionary. In order to run EDI, typically five basic components are needed (Colberg, 1990): (1) a body of EDI standards such as those developed by the American National Standards Institute (ANSI), (2) EDI software to generate, receive, and interpret transactions with trading partners, (3) a capability to send and receive EDI transactions, a function often provided by value-added networks (VAN), or by third-party networks or point-to-point configurations, (4) enhancements to applications software required to accept or originate EDI transactions, and changes to traditional business procedures for strategic advantage, and (5) hardware, including appropriate peripherals such as a printer, modem, and storage devices.

As illustrated in Figure 1 (Ferguson, Hill, & Hansen, 1990), the differences between traditional, paper-based systems (Panel A) and EDI systems (Panel B) can be significant. The time delays (denoted by bent lines in Panel A) associated with each stage of a business transaction in paper-based systems do not present the same concerns in EDI systems (denoted by straight lines in Panel B). For example, the time delays between order inquiry and inquiry response, placing a purchase order and receiving it, sending an invoice and receiving it, mailing a payment and receiving it, and updating accounts is reduced, if not eliminated, by means of electronic exchanges of underlying information in an EDI system.

Transmitting messages in EDI systems involves several stages. To illustrate a specific EDI communication, consider a purchasing/selling transaction between a buyer and seller. First, a buyer initiates the EDI transaction. The buyer’s computer system translates, for example, a purchase order into the required EDI format (transaction set). During this phase, the buyer must also provide the system with information on the seller’s name and identification number. Next, the buyer’s system inserts identification information in front of the transaction set and control totals after the transaction set. Then, the buyer transmits the EDI envelope to the seller.

Once the seller receives this information, he/she verifies the format of, and control totals in, the transaction set, ensuring that all information contained in the envelope was received clear, ungarbled, and intact. The seller then sends a functional acknowledgment to the buyer. The functional acknowledgment does not confirm that the seller intends to supply goods to the buyer, but that the information was received. At this time, the seller translates the transaction set into his/her own internal processing format and processes the transaction. When the buyer receives the goods, he/she sends a receiving advice to the seller. The seller responds by sending a remittance advice to the buyer who pays the supplier with an electronic fund transfer. At each stage of the process, when information is transferred, the receiver responds with a functional acknowledgment.

**Potential Merits of EDI**

EDI can present an adopting organization with many advantages as well disadvantages (Scala & McGrath, 1993). First, the time needed to exchange information is greatly reduced (Muller, 1994). Paper-based systems are often inordinately slow. However, the time for mailing and processing (e.g., keying and rekeying order information) inherent in paper systems is eliminated with EDI. EDI messages can replace any paper document exchanged between two parties when completing a transaction. Moreover, the computer exchange of information is instantaneous. This can streamline interactions and improve the quality of customer service.

Secondly, EDI systems can contribute to reduced clerical error (Smith, Strawser, & Wiggins, 1991). With EDI
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