Methodologies for Evaluating Investment in Electronic Data Interchange

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ABSTRACT

Reluctance of organizations to invest in electronic data interchange (EDI, Internet-based EDI, and XML/EDI) is largely due to their inability to assess the return on these investments. We identify prescriptive and evaluative methodologies for analyzing investment in EDI: non-financial methods, purely financial methods, and financial and strategic consideration methods. We also show how computer simulation can be used as a tool for assessing EDI. Evaluating the benefits resulting from EDI implementation was illustrated through the well-known Beer Game. Our analysis and review also identifies difficulties involved in assessing the benefits of EDI in supply chains.

Keywords: Beer Game; electronic data interchange; investment assessment; simulation

INTRODUCTION

Electronic Data Interchange (EDI) is a form of electronic communication that allows firms to exchange transaction data and documents in structured formats that can be processed by computer applications software. EDI is described (Monczka & Carter, 1998) as the direct electronic transmission, computer-to-computer, of standard business forms between organizations. The ability of companies to compete and survive in a global market will depend on their ability to be flexible and to adapt to changing market needs. EDI is a tool that can help companies meet this challenge (Lankford & Johnson, 2000). It has been widely demonstrated that EDI enables organizations to redesign their processes significantly because of its three main capabilities: high speed, reliability, and ease of data capture (Hoogeweeegan et al., 1998). However, the traditional conduct of EDI using value-added networks (VANs) has set up enormous barriers to its widespread usage and acceptance (Angeles, 2000). High costs and technical limitations of EDI make it appropriate only for large firms. These barriers can be overcome by using Internet-based EDI or EDI/XML, which can reduce costs, reduce delay in transmission, and improve global accessibility (Angeles, 2000; Lu et al., 2001).

Despite these arguments, organizations are still reluctant to implement EDI, unless they are forced to do so (Webster, 1995). One main reason is that companies do not know whether and to what extent they should invest in EDI. They are also unable to assess the return on these investments (Hoogeweeegan et al., 1998). Thus, assessing EDI properly is a critical element that affects the organization’s decision in investing in EDI. As long as adequate assess-
ment of the costs and benefits of EDI is not done, decision makers tend to give priority to other investments rather than EDI despite its benefits.

This paper aims to categorize the benefits and barriers of EDI and alternative forms of EDI, such as Internet-based EDI and XML/EDI, and provide the taxonomy of prescriptive and evaluative methods to assess the value of EDI. The evaluation criteria for adopting EDI are investigated, based on theoretical and empirical reviews. We also show how the benefits of EDI can be quantified using simulation. This approach is illustrated with the well-known Beer Game Simulation. A suite of methodologies identified by us, along with the Beer Game as an illustrative simulation tool, provide decision makers powerful methods to assess EDI before making a decision to invest in it.

This paper is organized as follows: in the next section, we provide an overview of EDI, Internet-based EDI, XML/EDI, and benefits and barriers to their implementation. In the section titled “Evaluation of EDI,” we classify and review various methodologies used for justifying investment in EDI. “Using Simulation to Evaluate EDI” shows how computer simulation can be used to quantify the benefits associated with using EDI. We use the well-known Beer Game as a vehicle for this purpose. Finally, we provide conclusions and future research directions.

ELECTRONIC DATA INTERCHANGE

Definition
Defining EDI is somewhat difficult. Some definitions attempt to be highly specialized, while others convey a broad concept. According to Cannon (1993), EDI is defined as the electronic transmission of standard business documents in a predefined format from one company’s business computer application to its trading partner’s business computer application. In this definition there are five keyword phrases. First, electronic transmission is central to the EDI concept. Since one of the primary purposes of EDI is to speed the communication of information, it is more efficient to do this electronically than manually (i.e., the post office or a messenger service). Second, standard business documents include invoices, purchase orders, or shipping manifests, plus other documents that are specific to an industry. Third, standard documents must be converted into a predefined format so they can be processed by each computer. In EDI, all data elements that should be contained in a standard business document are defined. Fourth, EDI should link business computer application to business computer applications. Finally, trading partner is another company or person outside a company with whom the company transacts business, including customers, suppliers, and government agencies.

Categories of EDI

VAN-Based EDI
Traditional EDI typically allows trading partners to connect to a Value Added Network (VAN) in order to exchange EDI documents on a store and forward basis. VANs provide mailbox service that sorts EDI documents from a sender’s to the receiver’s mailbox, thus allowing the receiver to pick an EDI document when convenient. In addition, VANs also provide other services such as translating flat files from the subscriber’s application into EDI-formatted documents, interfacing with other VANs and supporting various telecommunication modes and data transfer protocols (Kalakota & Whinston, 1996; Ratnasingham, 1998b).

VAN-based EDI has some advantages. First, IT reduces need for manual processing, reduces administrative costs, and improves the timeliness and accuracy of data (Cannon, 1993; Laage-Hellman & Gadde, 1996; Ratnasingham, 1998a). Second, advanced EDI significantly reduces the probability of rework and delay, thus lowering the supplier’s and the customer’s order-processing costs. The simplification of the process by reducing the complexity of orders or increasing the fraction of standard items sold also improves business performance (Mukhopadhyay & Kekre, 2002). Finally, stra-
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