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Introduction

The use of electronic data interchange (EDI) is widespread and well documented (e.g., Turbide, 1994). Companies claim a variety of benefits from its use including reduced cost and time of transmitting paper documents and improved communication with customers and suppliers (Jelassi and Fignon, 1994; Scala and McGrath, 1993). These benefits are passed on to customers in the form of reduced purchase price and improved product/service quality (Mukhopadhyay, Kekre, and Kalathur, 1995). Other benefits of EDI include improved product/service quality, improved cash flow, reduced inventory, improved operational efficiency, and increased competitive advantage (e.g., Iacovou, Benbasat, and Dexter, 1995).

"Unfortunately, the reality of developing and maintaining electronic linkages between companies is not as easy or as profitable as the optimistic preaching of (interorganizational systems) advocates would lead us to believe," (Benjamin, deLong, and Scott Morton, 1990, p. 29). Many firms, especially smaller ones, are either coerced or given strong incentives/subsidies by customers to adopt EDI (Kale, 1989; Helper, 1991; Morrell, Neal, and Fries, 1995). Even firms such as J.C. Penny, which does 88% of its transactions through EDI, has at least 2400 vendors with which it does transactions manually (McCusker, 1993). Given the lack of complete EDI integration in firms who do EDI, and the number of firms who do no EDI, there is a need to examine the use of EDI and the antecedents of its success in order to provide a framework within which more firms can realize its benefits.

Much of the research that has been done about EDI has been case research about specific companies (e.g., Jelassi and Fignon, 1994), and has focused on the success of EDI from the macro, or organization level, perspective. There is a lack of evidence about the success of EDI systems from the user's perspective. User satisfaction with information systems is a widely used, corroborated surrogate for systems success (e.g., Delone and McLean, 1992). There is evidence that the potential for EDI is not being realized because of the lack of proper use in practice. For example, in private discussions with firms about their suppliers' use of EDI, it was revealed that at least some suppliers manually key in data for purchase orders and invoices, although they submit them to the firms electronically through EDI VANs. The purpose of this paper is to assess the extent of user satisfaction with EDI systems, and to identify possible antecedents to this satisfaction. Finally, we examine whether satisfaction with the system is related to the extent to which EDI is used with manual intervention.

Antecedents of User Satisfaction

User satisfaction is effected by a variety of factors, including organizational, system, and application variables. We choose to examine several that have been shown to effect user satisfaction and that seem to most directly apply to EDI usage. These are perceived benefits (Iacovou, et.al., 1995; Banerjee, et.al., 1990); organizational readiness to adopt/use EDI (Cragg and King, 1993; Iacovou, et.al., 1995; O'Cullaghan, et.al., 1992); extent of EDI integration in the firm (Iacovou, et.al, 1995; Morrell, et.al., 1995); whether EDI is externally/internally driven (Benjamin, et.al., 1990; Kale, 1989; McCusker, 1993; Saunders and Clark, 1992); how long EDI has been used (Franz and Robey, 1986; Cragg and King, 1993); perceived criticality of the application (Benjamin, et.al., 1990; Morell, Neal, and Fries, 1995); and influence of EDI on user's job (Banerjee, et.al., 1990).

Measures for these variables will be base on scales developed by the researchers cited above and on our own interpretation of the constructs. User satisfaction will be measured by adopting the 12-item scale proposed by Torkzadeh and Doll (1991). This was chosen because of it's conciseness and because it has been demonstrated to have acceptable validity and reliability.

Perceived benefits of EDI can be categorized as direct (e.g., reduced paperwork) and indirect (e.g., increased operational efficiency). Iacovou, et.al. (1995) indicate that there is only a moderate link between this and EDI adoption and integration. In fact, some have found perceived benefits have no effect on adoption, particularly in small firms, because cost is the overriding force (Saunders and Clark, 1992). However, perceived benefits are a necessary, but not sufficient, condition for high degrees of integration (Iacovou, et.al., 1995). Integration suggests that the system is used, else the changes necessary to integrate would be difficult if not impossible. Thus, we believe that the greater the perceived benefits, the more satisfied the users.

Organizational readiness, defined as the "availability of the needed organizational resources for (sic. EDI) adoption" (Iacovou, 1995, p. 467), is another necessary but not sufficient condition for integration. If a firm has the resources and knowledge necessary to integrate EDI into the firm, this suggests a level of computer sophistication. Perhaps employees are more familiar with high tech applications, thus are more comfortable using a new one. Thus we propose the greater the degree of organizational readiness, the more satisfied the user.

Degree of integration is measured as the number of transaction sets, number of trading partners, and number of applications used for EDI. This captures both internal and external aspects of integration (Iacovou, 1995). Integration is the fourth stage of Nolan's six stage model (Nolan, 1979), and also suggests a level of computer maturity. We believe the more integrated, the better the firm is at using EDI, else it would not have committed to such a large extent. Therefore, the greater the extent of integration, the more satisfied the users.

Similarly, the longer the firm has used EDI, the more satisfied we expect users to be. Although there is some evidence that years of use is negatively correlated with MIS success (e.g., Cragg and King, 1993), we believe the opposite is true of EDI. In other studies, years alone may only be part of the poor MIS success. Large scale, legacy systems that have been around for a long time may not be successful because they are outdated, awkward to use, or inefficient. Years is only incidental. With EDI, most firms have had the system in place less than 10 years, and because of the focus on success of the system, we believe that the longer it's been in place, the more opportunity the firm has had to make it effective, thereby increasing user satisfaction. Again, years alone, are not sufficient to explain satisfaction, thus the effect will be examined in light of other variables.

We also expect user satisfaction to be higher when the application is more critical to the firm. The establishment of a sophisticated computer link between firms, such as EDI, implies a long term commitment to the relationship (O'Cullaghan, et.al., 1992). Thus, for critical applications, we expect firms to do whatever is necessary to make the system a success. Applications may be more usable and effective, thereby increasing user satisfaction.

There has been much written on external forces driving initial EDI adoption (e.g., Kale, 1989; Helper,1991). Iacovou found this to be the strongest influence in the decision to adopt, regardless of whether the firm was organizationally ready to do so. Although it has little effect on later integration, we believe that in firms where EDI was adopted because of external pressure, user satisfaction will be lower, particularly at first. We will examine the impact of this variable alone, and the effect of its interaction with length of time EDI has been used.

Finally, we will examine the effect of EDI related changes in user jobs on satisfaction. EDI affects the way jobs are performed (e.g.,Banerjee and Golhar, 1994). We believe the extent to which jobs are changed can influence user satisfaction. We expect the more positive the influence on the job, the more satisfied the users.

Methodology

To minimize bias and to ensure that the questions given to the people who can supply the best answers, two separate questionnaires are used. We will mail both to the EDI manager or representative listed in the X-12 directory of EDI users. He/she will be asked to complete one questionnaire that asks about type and scope of system; length of time since implementation began; and whether it is externally/internally driven. That person will be asked to deliver a copy of the second questionnaire to the key user or contact person in Sales, Purchasing, and Transportation/ Distribution. These areas were chosen because they are the most common areas for EDI implementation. Surveys will be coded so that we can match respondents from the same company. The questionnaire for the user(s) asks questions about their perception of how critical the application is to the firm and overall satisfaction with the EDI system. It also asks about the degree of manual intervention used.

Factor analysis will be used to assess the dimensionality of constructs, where multiple items are used to measure a construct. Cronbach's alpha will be used to assess the internal consistency of each construct. MANOVA and multiple regression will be used to test the hypotheses.

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