

INHIBITORS TO EDI ADOPTION IN SMALL BUSINESSES: AN EMPIRICAL INVESTIGATION

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ABSTRACT

While electronic data interchange (EDI) has been discussed in the literature as a technology that can provide several advantages, both strategic and operational, to its adopters, the adoption rate, especially that of small businesses, has not been as high as predicted. The question is why? Based on data collected from more than four hundred and sixty non-EDI adopters, our results suggest that the three most significant “inhibitors” to EDI adoption in small businesses are all related to the degree of “organizational readiness”, rather than to those factors related to the costs and benefits of adopting the technology or the influence exerted by external parties such as the government, industrial partners or EDI vendors. The small businesses that decide not to adopt EDI believe that (1) they do not possess sufficient knowledge and skills about the technology, (2) they do not have internal IT support at the level to support the use, and (3) adopting EDI is not as good for their companies as the technology advocates claim, i.e., they possess a non-positive attitude towards adopting the technology. In the eyes of small businesses, the “ability to adopt” is more important than the “benefits of the adoption” when considering adopting EDI.

1. Introduction

Despite increasing focus on electronic commerce of many business and IT conferences and despite the prevalence of electronic data interchange (EDI) as one of the key applications in the electronic commerce arena, the growth of EDI adoption in small businesses has still been much slower than anticipated. Advocates of EDI have been arguing that when adequately integrated, the technology can help a company to increase market share, gain strategic advantage and promote customer and interorganizational relationships. While many success stories of EDI adoption in large organizations, such as General Motors in the automotive industry, IBM in the IT industry, and American Hospital Supply in the hospital industry, have been reported in the literature, such well-publicized benefits seem to be far from being realized by small businesses. Therefore, a logical question that we should ask is: *why are small businesses reluctant to adopt EDI?*

In this article, we seek to provide a substantive answer to this question based on empirical evidence collected from 462 small businesses that have not adopted EDI even though an EDI product had been specifically developed for them and launched about a year at the time of the study. In particular, we examine factors that have been empirically tested in prior IT/EDI adoption studies to be influential in determining the adoption decision of EDI. The purpose of this study is to find out, among these factors, what the “inhibitors” of EDI adoption are in the eyes of small businesses.

Potential “Inhibitors” to EDI Adoption in Small Businesses

In understanding the EDI adoption behavior of small businesses, a key question to ask is what motivates or inhibits the adoption. Previous studies on IT/EDI adoption have identified at least a dozen factors that may influence the adoption practices. Grouped into three main contexts: perceived benefits and costs, organizational readiness, and external environment, these factors could all be “potential inhibitors” to the EDI adoption if not managed properly. In the following section, we discuss each of these three contexts and their related factors and consider how these factors could become inhibitors to the adoption of EDI.

Perceived benefits and costs

In this context, the main focus is on what benefits can be obtained and what costs can be incurred along with the adoption of the technology. Ample empirical evidence has shown the importance of assessing the potential benefits and costs from the eyes of the potential adopter during the adoption decision [Moore & Benbasat 1991]. Whether an organization is eager or reluctant to adopt a new IT

depends on the quantification and comparison of these benefits and costs related to the technology adoption.

In the context of EDI, the potential benefits can be of two types: operational and strategic. Vendors and/or advocates of EDI always emphasize that using EDI can help a business reduce transaction errors, improve data accuracy, reduce transaction costs, improve information quality, and speed up application processes. These are “operational” benefits that EDI can bring to an organization as they focus on operational savings and are related to the internal efficiency of the organization.

EDI can also bring strategic benefits to an organization. These benefits improve tactical and competitive advantages and are related to the impact of EDI on business processes and relationships. Examples include improving competitive advantage, customer services, and relationships with business partners.

EDI initiators and advocates emphasize in their promotion activities what kind of operational and strategic benefits that EDI bring to an organization. A negative perception of the above two types of benefits by small businesses cause them to be not eager, or reluctant, to adopt the technology.

As for potential costs, they may come from three sources: financial investment, administrative changes and the time it takes to put the system in place. Financial investment deals with the set-up costs, operating costs, and training costs related to the adoption. A small firm might find it difficult to adopt the technology if the financial investment is perceived to be too high.

The other source of costs relates to the potential administrative and implementation costs incurred in the adoption process. EDI, categorized as a Type III innovation in Swanson’s [Swanson 1994] typology of information systems innovations, impacts not only the technical core of the organization, but also the administrative core of the host business. The potentially high cost, in terms of putting the EDI system in place and making it function, may reduce the incentive to adopt. In a study on adoption of EDI by small businesses, over 43 percent of the respondents indicated that additional work procedures were needed in order to make their EDI systems fit their normal day-to-day operations [MacGregor et al. 1998].

The third source of costs relates to the actual time required to put the system in place. This includes the lead-time needed to complete the registration process, the time required for installation of the system, and the time needed for basic training. Small businesses simply may not have vast amounts of time it may take to implement a new IT system.

To summarize, there are five cost/benefit-related factors that could possibly become inhibitors to EDI adoption in small businesses. They include two factors related to potential benefits to be obtained and three related to potential costs to be incurred.

Organizational readiness

Having potential benefits outweigh potential costs may not be enough for an organization to decide to adopt an IT such as EDI. An organization may be reluctant to adopt an IT when it does not feel “ready” to adopt. This degree of “lack of readiness” may come from the lack of certain organizational resources to match with the adoption or from a negative (or at least non-positive) attitude towards adopting the technology.

In the context of EDI adoption by small businesses, relevant organization resources may include (1) knowledge and skills about EDI, (2) internal IT/EDI support, and (3) support from external parties such as EDI vendors.

As emphasized in quite a few research studies on small businesses [Rayment 1985, Thong et al 1996], a small business is not simply a scaled-down model of a large business. Unlike their large counterparts, small businesses are always characterized by lack of IT expertise and experience. Therefore, one important factor that inhibits a small firm in adopting a certain IT is the lack of technical competency of the IT to be adopted. Therefore, a sufficient level of EDI knowledge and skills are therefore required in order that the small business may feel ready to adopt the technology.

Another characteristic of a small business is that it often lacks good internal IT support. Most small businesses do not have any formal, or even informal, IT department or unit and routine IT support and/or maintenance is performed by its accounting and/or administrative units. Owing to scarce financial resources and limited career advancement prospects, small businesses generally face difficulties in recruiting and retaining internal IS personnel. Because of this constraint, a small business may be reluctant to adopt new technologies such as EDI because it does not feel secure or satisfied with its existing internal IT support.

Instead of relying on internal IT support, small businesses may count on external assistance. For instance, prior studies on IT adoption in small businesses have found that the influence of both internal support and internal training on IT adoption is not significant [Igbaria 1997] while effective external IS expertise is found to be important in the small business context [Thong et al 1996]. Therefore, if small businesses do not believe they can get sufficient external IT support, from the EDI vendor, for example, they may be hesitant to adopt the technology.

In addition to having sufficient organizational resources to support the adoption, the management and/or end-users' attitude towards EDI can also be another significant factor in the decision. Various IT adoption models, such as the Technology Acceptance Model by Davis [Davis 1989], have emphasized the importance of forming a positive attitude towards using the technology in the eventual adoption and use of the technology. In other words, if either the top management (who approves the adoption) or the end-users (who use the technology) do not have favorable attitudes towards the technology that is going to be adopted, the negative attitude itself may become an inhibitor to the adoption of the technology.

To summarize, a small business may be reluctant to adopt EDI owing to either unfavorable attitudes towards adopting the technology or the lack of organizational resources including IT experience, internal IT support, and external IT support.

External Environment

EDI is an inter-organizational system in which other stakeholders in the network also play an important role. The adoption decision therefore can also be influenced by external parties including the government, counterparts in the industry and EDI vendors. The influence can be positive (e.g., promotion and/or recommendation of the technology) or negative (e.g., competitive pressure or imposition from business partners and/or the government).

Unlike other IS innovations, EDI can be business-to-business or business-to-government. Particularly in the latter case, the government can play an important role in the promotion or enforcement of using the system. One example is the TradeNet used in Singapore. This EDI system is a government initiative and it is mandatory for traders to submit structured electronic trade permit applications to the Trade Development Board in Singapore through the system. Organizations are therefore required to adopt it due to the government influence and its regulations [Teo et al 1997]. Another example is the ValuNet used in Hong Kong for trading companies to lodge trade declarations for their imports/exports. Both the government and Tradelink, the service provider of ValuNet, have been actively promoting the system to local organizations, and to small businesses in particular.

As opposed to the situation in large organizations, industry influence is particularly important in the small business context. Small firms tend to have fewer resources to build up their internal knowledge base on current technological trends and developments and therefore tend to rely on their counterparts to assist in their decision making. As argued by Hart and Saunders [Hart & Saunders 1997], a business partner's influence is most likely to be a significant factor in the EDI adoption decision by less powerful partners.

The adoption decision can also be influenced by the promotion efforts conducted by EDI vendors because, as argued above, small firms tend to rely on external parties for information related to the advantages and disadvantages of adopting a technology. The vendors of the technology are naturally one of such important external parties. A well-executed promotion campaign by the vendors could help push a small business to adopt the technology. A poorly-executed promotion campaign, on the contrary, could make a small business hesitant to make the adoption decision.

To summarize, there are three external factors that, if managed improperly, may become inhibitors to the adoption of EDI by small businesses. They include influence from the government, influence from the industry and promotion campaigns by the EDI vendors.

2. Research Instrument and Sample

To test the above factors, a research instrument was developed from the following procedures. First, a preliminary questionnaire was developed with items adapted and modified from prior research studies and practitioner-oriented IT magazines, where ever appropriate. The face validity of the items used in this questionnaire was assessed by five staff members of the EDI service provider that sponsored this study. They included the Chief Executive Officer, the Chief Operation Officer, the marketing communications manager and two other staff members. Subsequent meetings were conducted with the three senior management officers to ensure that all the questions and terms used in the questionnaire could be clearly understood by the respondents. Some modifications were then made to clarify the meanings of particular

questions. The final instrument consists of 39 items that measure the twelve factors discussed above. Of these items, the respondents were asked to indicate the following:

- Potential benefits: the extent to which they agreed that adopting the EDI package could help them achieve the stated benefit (1: strongly disagree; 7: strongly agree)
- Potential costs: the extent to which they agreed that the issue described was an obstacle to the adoption (1: strongly agree; 7: strongly disagree)
- Knowledge and skills about the technology: assessment of the degree of knowledge and skills of EDI possessed by the firm (1: very poor; 7: very good)
- Internal IT support: assessment of the level of performance of internal IT support: (1: very poor; 7: very good)
- Support provided by the vendor: the extent to which they perceived the level of IT support provided by the vendor (1: very poor; 7: very good)
- Attitude towards adopting the EDI package: the view of adopting the technology by the top management and the end-users (1: very poor; 7: very good)
- Influence from the government: the degree of influence by the government (1: no influence at all; 7: strong influence)
- Influences from the industry: the degree of influence by various parties in the industry (1: no influence at all; 7: strong influence)
- Promotion campaign by the vendor: assessment of the level of performance of the promotion activities by the vendor (1: very poor; 7: very good)

Given a 7-point Likert scale with “1” as the “negative” end, “7” as the “positive” end, and “4” as the “neutral” point, a factor that has a mean score less than 4.00 may be interpreted as an “inhibitor” to the adoption of the technology. For instance, a small firm might be hesitant to adopt if it strongly agreed that the potential costs described in the statements were obstacles, and its knowledge and skills about the technology, its internal IT support and the support provided by the vendor were all very poor.

An EDI service that had been launched for about one year at the time of the study and its potential users (i.e., those not yet adopting) were chosen as subjects of the study. This service, called ValuNet, is an EDI system between trading companies and the government for import and export declarations in Hong Kong. A government-franchised company called Tradelink, which sponsored our research study, provides the service. (More details about ValuNet and Tradelink can be found at their web-site (<http://www.tradelink.com.hk>)).

In Hong Kong, import and export declarations are mandatory for every consignment shipped in or out of the region. With ValuNet, companies can lodge their declarations directly with the government by computer and pay the appropriate charges electronically. According to Tradelink, there are several advantages to using the system. First of all, companies can submit their import and export declarations 16 hours a day, 7 days a week, which helps them avoid penalties for late submission. Second, companies no longer need to send messengers to lodge and pay for the declarations at the government's walk-in counters. Third, much of the data can be automatically generated from stored databases or other shipping documents, which saves companies the chore of re-keying and reducing the possibility of error. Fourth, full records are kept, and ValuNet maintains electronic archives for auditing or other purposes, which allows companies to save valuable storage space. Finally, the total cost of an electronic declaration is guaranteed to be no more than a paper declaration.

With the assistance of Tradelink, three thousand companies were randomly selected from their database for this survey study. These firms were mainly small businesses with fewer than 100 employees (the definition used by the Hong Kong Government for a small business) and were mainly in the manufacturing and trading sectors, which are the major sectors involved in import and export declarations. A letter of purpose about this study, together with a questionnaire, was sent to the senior executives of the companies. Also, a follow-up telephone call was made to each of these senior executives after two weeks.

Seven hundred and seventy-one questionnaires were received within a month after the questionnaires were sent, with a response rate of 25.7 percent. Forty-six of them, however, were not included in the final data analysis because of either incomplete responses or because the company was found to have more than 100 employees and therefore was not qualified to be called a small businesses according to the definition we employed. Among the remaining 725 respondents, 462 (65.3%) were non-adopters of ValuNet. These 462 firms were the target group for our subsequent data analysis.

3. Data Analysis

The research instrument was evaluated for reliability, convergent validity and discriminant validity. Reliability was assessed by computing Cronbach’s alpha. As shown in Table 1, except for the government influence factor, all factors have adequate alpha values (ranging from 0.740 to 0.978). The lower reliability for the government influence factor (alpha = 0.66) can be partly attributed to the small number of items in the factor. Convergent validity and discriminant validity were assessed by performing a factor analysis. A Principal Components Analysis was performed with Varimax rotation. Convergent validity is demonstrated if the items load highly (loading > 0.50) on their associated factors. Discriminant validity is achieved if each item loads higher on its associated factor than on any other factors. Results of the factor analysis show that all items have loadings greater than 0.50 on their associated factors and load higher on their associated factors and on other factors. Therefore, the conditions for convergent validity and discriminant validity are also satisfied.

Table 1: Reliability of the Factors in the Instrument

	Item Mean	Reliability
<i>Benefits and Costs Context</i>		
Potential Benefits (Operational)		
Improve data accuracy	4.525	
Improve security of data	4.407	
Improve operation efficiency	4.857	
Speed up application process	5.063	
Reduce clerical errors	4.823	
Reduce operation costs	4.413	0.921
Potential Benefits (Strategic)		
Improve organization image	4.175	
Improve competitive advantage	4.164	
Benefit other business practices	4.003	
Improve customer services	4.081	
Improve relationship with business partners	3.872	0.951
Potential Costs (Financial)		
High setup cost	4.824	
High running cost	4.426	
High training cost	4.528	0.884
Potential Costs (Administrative)		
Substantive training needed to bring current employees "up to speed"	4.449	
Existing operation processes difficult to adapt	4.059	0.740
Potential Costs (Time-related)		
Long lead time needed to complete the registration process	4.488	
Long lead time to install the EDI software package	4.493	
Long lead time to complete the training before starting to use	4.631	0.860

Organizational Context

Knowledge and skills about the Technology

Understanding of the EDI software package	2.582	
Prior experience of using the EDI software package	2.503	
Experience of using other EDI software packages	2.535	0.847

Attitude towards Adopting the EDI Package

Top management attitude towards the EDI software package	3.119	
End-users' attitude towards the EDI software package	3.423	0.847

Internal IT Support

Experience in EDI software support	3.216	
Expertise in EDI software support	3.200	0.978

Support Provided by the Vendor

Technical support	4.500	
Customer hotlines	4.735	
Training courses	4.689	0.957

External Environment Context

Influence by the Government

Progressive mandatory measures introduced by the government	4.683	
Closing of the paper-receipt counters by 31 March 2000	5.169	0.666

	Item Mean	Reliability
Influence by the Industry		
Requested by important business partners	3.709	
Requested by majority of business partners	3.771	
Recommended by important business partners	3.578	
Recommended by majority of business partners	3.605	0.966
Promotion by the Vendor		
Promotion of the EDI software package through exhibitions	3.957	
Promotion of the EDI software package through seminars	4.204	
Promotion of the EDI software package through mass media	3.848	
Promotion of the EDI software package through direct mailing or sales literature	3.598	0.868

4. Why are small businesses reluctant to adopt EDI?

To identify factors that are significant in the adoption decision, the mean score of each factor is computed and shown in Table 2. As explained in the previous section, a factor may be interpreted as an inhibitor to the adoption of the technology if it has a mean score of less than 4.00. As shown, five inhibitors are identified. They include (1) lack of knowledge and skills about EDI, (2) unsatisfactory internal IT support, (3) non-positive attitude towards adopting EDI, (4) insignificant influence by the industry, and (5) poor promotion campaign by the EDI vendor.

Table 2: Mean Scores of Factors

Factor	Context	Mean Score
Knowledge and skills about the Technology	Organizational	2.540**
Internal IT Support	Organizational	3.208
Attitude towards Adopting the EDI Package	Organizational	3.271*
Influence by the Industry	External Environment	3.666*
Influence by the Vendor	External Environment	3.902
Potential Benefits (Strategic)	Benefits and Costs	4.059
Potential Costs (Implementation-related)	Benefits and Costs	4.254*
Potential Costs (Time-related)	Benefits and Costs	4.537
Potential Costs (Financial)	Benefits and Costs	4.593
Support Provided by the Vendor	Organizational	4.641
Potential Benefits (Operational)	Benefits and Costs	4.681*
Influence by the Government	External Environment	4.926

* The difference between this mean score and the one below is statistically significant at the 1% level.

** The difference between this mean score and the one below is statistically significant at the 0.1% level.

Reason No.1: Non-adopters viewed themselves as having significantly insufficient knowledge and skills of EDI.

An overarching reason why the small businesses in the sample decided not to adopt EDI was the lack of knowledge and skills of EDI. The mean score of the factor is significantly lower than all other factors (p-value < 0.001). The non-adopters assessed themselves as having not only very little understanding of EDI but also very little experience in using the technology. This suggests that the “knowledge barrier” is the number one inhibitor to the adoption of EDI in the context of small businesses [Attewell 1989]. Many small firms just view that they do not have sufficient knowledge and skills on the use of EDI.

Reason No.2: Non-adopters did not feel that their internal IT personnel were good enough to support the use of EDI.

The second most important reason relates to another organizational resource. As “expected” in the small business context, the non-adopters viewed themselves as not having sufficient internal IT expertise to support their use of EDI. Given that EDI is a new IT to them and that they have very little knowledge and skills about the technology (Reason No.1 as discussed above), those small businesses have to defer their adoption decision.

Reason No.3: Non-adopters did not feel positive towards the adoption of EDI.

Another equally significant inhibitor is the non-positive attitude towards adopting EDI by both the top management and the end-users of the non-adopting small businesses. As evidenced by many prior studies on IT adoption [e.g., Moore & Benbasat 1991, Taylor & Todd 1995], there is a strong relationship between the attitude towards the use of an IT and the intention to use and/or the actual use of the technology eventually. The small businesses that decide not to adopt EDI simply do not have a positive attitude towards the technology.

Reason No.4: Non-adopters did not feel any strong influence and/or pressure coming from their industry

EDI is a kind of IT that requires a high penetration level for its success. Like many other inter-organizational systems, competitive pressure exercised by more powerful partners or competitors is one of the most critical factors for EDI adoption by small firms. The non-adopters in the sample, however, did not feel any significant influence or pressure exerted by their counterparts in the industry. One can also say that the influence or pressure had not yet reached to a level so that they felt it necessary to follow what their counterparts had done. This may be partly due to the fact that most small businesses do not have a "well-connected" information network. They simply do not have much information about what their counterparts are doing.

Reason No.5: Non-adopters were not satisfied with the promotion campaign by the EDI vendor

Even though Tradelink, the service provider of ValuNet, has been doing a lot of promotion through various channels such as exhibitions, seminars, mass media and direct mailing, their performance, as evaluated by the non-adopters, was not satisfactory. As the vendor is, at least theoretically, a very important resource from which small businesses can learn about the technology, this unsatisfactory performance has made the small firms reluctant to adopt the EDI system.

5. What Can We Do About the Reluctance to Adopt?

Given the above five identified inhibitors to the adoption of EDI by small businesses, there are a number of things that EDI vendors and advocates can do.

A very crucial finding from this study is the fact that the three most significant inhibitors are all related to the degree of organizational readiness of adopting the technology. Small businesses in the study do not feel that their organizations are ready for the adoption. There are several implications here. First, the lack of readiness can be dealt with in the following ways. Having inadequate knowledge and skills is either an objective or subjective assessment. By objective, we mean that a small business knows it does not actually have the required knowledge and skills. A small firm, however, may in fact have the required knowledge and skills but may simply perceive that it does not have them. This kind of lack of readiness can be viewed as subjective. Nevertheless, both kinds of lack of readiness can be remedied through education and training. By giving appropriate education and training to these small firms, they can on the one hand actually acquire the required knowledge and skills and they can, on the other hand, overcome their worries about not having adequate knowledge and skills on adopting the technology.

The problem of unsatisfactory internal IT support is more difficult to handle. To a certain extent, this indicates a catch-22 situation and seems to be a formidable challenge for small businesses. To improve the level of internal IT support, small firms must invest heavily in training whereby their IT personnel can acquire skills and capabilities with the technology through ongoing exposure to and use of the technology. This is already not an easy task for small businesses. Even if the IT personnel receive adequate training, they may not stay in their jobs long enough for the training to payoff. A significant percentage of skilled IT personnel in small businesses leave for better paying jobs and improved working conditions offered by large firms. The situation then returns to ground zero. A plausible solution to break this vicious cycle may be through strong support from the government or quasi-government authorities. Through highly subsidized training programs/schemes, small businesses can borrow support from external parties and effectively extend their IT resources to include this external support. Given that the financial investments are within an affordable range, small firms may then be willing to, on the one hand, train their internal IT personnel and, on the other hand, use the "savings" to improve the working conditions for their IT staff.

While the above two "problems" can be resolved through financial investment to a certain extent, the non-positive attitude towards adopting EDI by small businesses may need to be dealt through some long-term, non-financial means. Prior studies on IT adoption have suggested that attitudinal beliefs are a complex structure that may include several dimensions such as the usefulness and ease of adopting the technology and the facilitating conditions for the adoption [Taylor & Todd 1995]. Changing an individual's attitude towards a certain activity is a long process that requires both education and training of the technology.

The insignificant influence by relevant industrial parties suggests that both network externalities and the associated "prisoners dilemma" may play a key role here [Keil et al. 1998]. Instead of being the first adopters, small businesses may find it more profitable or comfortable to postpone the adoption of EDI until a majority of business partners have already adopted it. With more and more small businesses adopting the technology, the "herd" effect may then occur. Therefore, what EDI initiators and advocates may do is to set up appropriate help and/or information centers to, on the one hand, encourage the adoption of the

technology and, on the other hand, disseminate information related to the experience of using the technology.

None of the factors related to perceived benefits and costs are identified as inhibitors to the adoption. These perceived factors, however, are not viewed particularly positively by the potential adopters either. (All of these factors have a mean score between 4.00 and 4.70.) In other words, small businesses do not focus on how EDI can bring benefits to them but concern themselves, instead, with whether or not they have sufficient organizational resources to cope with the adoption. This finding provides valuable insights as to what the initiators and advocates of EDI should do and emphasize when promoting the technology and related services. In the case of ValuNet by Tradelink, it seems that the vendor has been focusing on the wrong thing in their promotion activities, i.e., focusing on the potential benefits to be obtained from the adoption. This wrong emphasis in the promotion activities by Tradelink may also explain why small firms are not satisfied with the promotion campaign. The vendor simply has not provided what the small businesses want.

Therefore, instead of emphasizing what benefits ValuNet can bring to the users, the vendor should focus more on how to make the firm feel comfortable and ready for the adoption and implementation, both technically and psychologically. This can be done through detailed demonstrations and presentations on what the technology and the related services are about and through initial and on-going training and support. The key is to make sure that the small firms feel that they have adequate understanding, knowledge and skills about the technology (to overcome the knowledge barriers) and that they can rely on the support provided by the vendor (to alleviate the problem of unsatisfactory internal IT support).

6. Suggested Steps to EDI Initiators and Advocates

To carry out what we have discussed above, the following steps are suggested for EDI initiators and advocates to consider when formulating their EDI development and expansion plans.

Step 1: Assessment of IT/EDI Capability of Small Businesses

As the lack of EDI capability, either in the genuine or perceived sense, is identified as the most serious inhibitor to EDI adoption in small businesses, a crucial task, therefore, is to formulate a methodology to assess the IT/EDI capability of a small business. Appropriate assessment instruments must be developed to measure the readiness or preparedness level of each potential EDI adopter. The instruments should address both the subjective and objective aspects of the level of readiness. In other words, the assessment should include both objective questions testing the technical competency of the firm's IT staff regarding EDI and subjective questions evaluating the perception of the technical competency of the IT staff in the eyes of both the key decision makers of the firm and the IT staff themselves. The interview guide developed by Iacovou et al. [4] may be used as a base for the development of such instruments. The assessment should be able to be conducted either in a self-assessment manner (using pencil-and-paper or possibly on the Web) or through a short face-to-face interview by the EDI initiators and advocates if needed. The key purpose of this first step is to find if a firm has an understanding of what specific problems regarding organizational readiness the company has. Over time, the EDI vendor may also collect sufficient data to understand what "general" problems of organizational readiness among small businesses are. A sufficient understanding of these problems is important to the formulation of appropriate technical and financial assistance plans to be discussed in Step 2.

Step 2: Formulation of Technical and Financial Assistance Plans

With both the general and specific problems identified in Step 1, technical and financial assistance plans can then be formulated. To tackle the problem of lack of knowledge and skills about EDI, vendors and/or initiators can develop packages that offer appropriate technical assistance such as training of EDI at different levels of technical depth and on-site support to potential adopters and new users. Doing so can, on the one hand, alleviate the problems of lack of (confidence in) knowledge and skills on EDI and, on the other hand, extend the IT resources of these small firms in an indirect but effective way.

Financial assistance to go with the technical assistance plan may also be needed. Although perceived costs to be incurred along with the adoption were not identified as significant inhibitors in our study, the introduction of the financial assistance may help break the vicious cycle discussed above (i.e., to acquire the necessary knowledge and skills the technology requires substantial investments in IT personnel who after having been trained properly might leave the small firm for larger organizations). Small businesses generally do not have a big budget for IT. Financial support can be in the form of discounted hardware and software, subsidized or discounted training courses and subsequent upgrades and/or maintenance of the EDI systems.

Step 3: Promotion of EDI Use and Enactment of Influence Strategy

The key purpose of the above two steps is to help the firm become ready for the adoption, in both the technical and the financial aspects. Another equally important dimension is to promote or cultivate an environment that facilitates or fosters the adoption of the technology in order to tackle the attitudinal aspect of adoption. This facilitation can be performed by a "pull" strategy (i.e., creating an environment in which the firms can see the benefits of the use of the technology) or by a "push" strategy (i.e., creating an environment in which the firms would feel the need or pressure to adopt the technology).

The bottom line for a firm to adopt a new IT is that the benefits must outweigh the costs of adopting the technology. In other words, the firm wants to get the most benefits out of the adoption. Therefore, a key task for EDI initiators and advocates is to promote effectively the benefits that EDI can bring to the firm when it adopts it, including not just direct, operational benefits but also indirect, long-term strategic benefits. As small businesses generally tend to rely on external parties to develop their internal knowledge base on current technological trends and developments, how these external parties perform and what they emphasize are both crucial to the success of the promotion of the technology. Therefore, the promotion tasks should not be efforts of the EDI vendors alone. The government, EDI vendors, trade associations and IT vendors should all work together to make a concerted effort in promoting the use of the technology.

Three areas of efforts are suggested. First, promotion activities such as seminars, talks and exhibitions can be organized on a regular basis by various parties to promote the benefits of the use of the technology at various levels in both layman and professional terms. Second, with the assistance and support by EDI initiators and advocates, user groups can be established and regular meetings and conferences can be organized not simply to allow current adopters to share experiences but also to allow potential users to learn from the success of the adopters. EDI help centers or resource centers, either in a physical form or virtually on the web, can be set up to provide appropriate, real-time assistance and support to both current and potential adopters.

All the above promotion efforts are "non-coercive" influence strategies. Coercive tactics that make a firm feel the need or the pressure to adopt the technology might also be used to push the adoption. The closing of the physical counters for trade declarations in the Hong Kong's ValuNet case and the mandatory requirements by the government in Singapore's TradeNet case are two examples. The requirements that all small business partners be EDI-capable has also been pursued by large organizations such as several U.S. large automobile manufacturers. Given that the small firms already possess high levels of readiness (in terms of technical, financial and attitudinal aspects) to adopt, such coercive strategies may also be effective in facilitating the rate of adoption.

7. Conclusion

Small businesses are the backbone of the economy in many countries. While they are very important in the economic development process of a country, they also generally face severe constraints in financial resources and trained IT personnel, which make them, on the one hand, face substantially greater risks in information systems implementation than larger organizations do and, on the other hand, lag behind larger businesses in the use of IT. Adoption of EDI is an example of the kind of dilemma that many small businesses are facing.

This article reports a study that sought through a preliminary step to identify significant factors that inhibit small businesses from adopting EDI. The results strongly suggest that small businesses do not adopt EDI because they feel that they are not capable of adopting the technology in terms of technical knowledge and skills and they do not perceive that adopting EDI is good for their businesses. Furthermore, small firms do not feel strong industrial pressure to adopt the technology nor are they satisfied with the promotion campaigns by the vendor. Finally, the findings suggest that the kind of benefits to be obtained from the adoption are not a main concern to small businesses. The "ability to adopt" is more important than the "benefits of the adoption" in the eyes of small businesses when considering adoption of EDI.

Looking to the future, as the "digital economy" continues to emerge, EDI and many other inter-organizational information systems will become increasingly important in the electronic commerce world. In order for EDI to be viable in the small business environment, there needs to be a far greater understanding about why small firms are reluctant to adopt EDI and about what EDI initiators and advocates can or should do to remove, or at least alleviate, those inhibitors to the adoption. This study has identified several inhibitors and has provided some suggestions on how to cope with them.

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REFERENCES

- Attewell, P. Technology diffusion and organizational learning: The case of business computing. *Organizational Science*. 3, 1 (1992), 1-19.
- Davis, F. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*. 13, 3 (1989), 319-340.
- Hart, P. and Saunders, C. Power and trust: Critical factors in the adoption and use of Electronic Data Interchange. *Organization Science*. 8, 1 (1997), 23-42.
- Iacovou, C.L., Benbasat, I. and Dexter, A.S. Electronic Data Interchange and small organizations: Adoption and impact of technology. *MIS Quarterly*. 19, 4 (1995), 465-485.
- Igbaria, M., Zinatelli, N., Cragg, P. and Cavaye, A.L.M. Personal computing acceptance factors in small firms: A structural equation model. *MIS Quarterly*. 21, 3 (1997), 279-305.
- Keil, M., Cule, P.E., Lyytinen, K. and Schmidt, R.C. A framework for identifying software project risks. *Communications of the ACM*. 41, 11 (1998), 76-83.
- MacGregor, R.C., Waugh, P., Bunker, D.J. and Courtney, J.F. Adoption of EDI by small business: Are the advocates in tune with the views of small business – A pilot study. *Proceedings of the Thirtieth Annual Hawaii International Conference on System Sciences*. (1997), 42- 47.
- Moore, G.C. and Benbasat, I. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*. 2, 3 (1991), 192- 222.
- Raymond, L. Organizational characteristics and MIS success in the context of small business. *MIS Quarterly*, 9, 1, (1985), 37-52.
- Swanson, E.B. Information systems innovation among organizations. *Management Science*. 40, 9 (1994), 1069-1092.
- Taylor, S. and Todd, P.A. Understanding information technology usage: A test of competing models. *Information Systems Research*. 6, 2 (1995), 144-176.
- Teo, H.H., Tan, B.C.Y. and Wei, K.K. Organizational transformation using Electronic Data Interchange: The case of TradeNet in Singapore. *Journal of Management Information Systems*. 13, 4 (1997), 139-166.
- Thong, J.Y.L. Yap, C.S. and Raman, K.S. Top management support, external expertise and information systems implementation in small businesses. *Information Systems Research*. 7, 2 (1996), 248-267.