ELECTRONIC DATA INTERCHANGE IN DEVELOPING COUNTRIES: LESSONS FROM SOUTH AFRICA

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ABSTRACT

Electronic Data Interchange plays an important role in improving organizational competitiveness. This research uses empirical evidence to evaluate the state of EDI and the willingness of SMEs to connect electronically to a large distribution centre in South Africa. Practitioners of EDI are aware of the necessity for high penetration levels to make EDI successful. Furthermore, it investigates the EDI adoption rate from the viewpoint of a small business. However, penetration might be hindered by the refusal of small firms to accept EDI. Based on prior research this model incorporates four factors that are hypothesized to have an influence on EDI Adoption. This survey was concerned about four potential strategies for achieving business objectives namely: organizational readiness, external pressure, perceived benefits and security. Data was collected from 105 firms who responded to an e-mail survey. The findings reveal that external pressure was the strongest positive factor associated with the intent to adopt EDI. No support was found for security. In addition, it suggests that there is a general need for more managerial support as well as compatibility with systems among small firms. Finally, these findings add support to the importance of diffusion of Innovation theories, Interorganizational Systems and Technology Acceptance Models.

KEYWORDS: Electronic data interchange, Inter-organizational systems, diffusion, security

JEL: M15

INTRODUCTION

Businesses today operate in an extremely competitive environment, and many new strategies have been implemented successfully to compete in the marketplace. These strategies have one key element in common, information. Since the acquisition and proper use of information could be vital to all business endeavors, it ought to be considered as a valuable asset. In an intensively competitive environment better and more effective use of information may be considered critical in order to succeed.

More important than organizational information systems are Interorganizational systems. Such systems refer to the "the movement of business documents electronically between firms in a structured, machine-retrievable data format that permits data to be transferred without re-keying, from a business application in one location to a business application in another location" (Hansen and Hill 1989). It can alter the business environment by improving data processing efficiency, decrease errors, reduce costs and create barriers to competition.

Robson (1994) estimates that between 1987 and 1994, computer keyed input taken from a computer-produced document, has grown from 17 to 84 percent. This phenomenon set the stage for the advent of electronic data interchange. EDI has been widely accepted as a business tool used to facilitate inter-organizational transactions and to enhance internal operations by integrating internal and external systems (Chen and Williams, 1998). EDI has been discussed as a technology that can provide several advantages to small firms, however according to Bergeron and Raymond (1997) the adoption rate has not met expectations. Clemens and Row (1993) argue if more firms adopt the technology it could increase the

economic welfare of a country, therefore many efforts have been made to understand more about the technology to identify factors affecting the adoption rate.

In the past EDI required extensive set-up costs. This proved to be too costly and complex for small to medium enterprises, which have not been able to realize the benefits of this technology (Bergeron and Raymond, 1997). However due to advances in technology, EDI applications that required main-frame computers to run on can now be used on micro-computers at much lower costs. Small firms are now in a better position to afford this technology.

EDI is used an innovative business tool around the world to enhance business communications. In many developing countries and especially in South Africa , small businesses are the backbone of the economy, but despite this, not many studies have been done on EDI adoption in SMEs. Kuan and Chau (2001) argue that small businesses have certain unique characteristics when compared to larger firms. The general applicability of earlier EDI studies to small firms may therefore be questionable. For this reason, this study extends the investigation of EDI adoption in small to medium firms to a large distribution centre in South Africa.

Different countries in the developing world have different perceptions of the application of EDI. Therefore, it becomes necessary to study the adoption of EDI in various countries, recognizing that the findings in one country could be beneficial to that of another with a similar profile. This study presents the findings of an empirical investigation into adoption barriers affecting EDI among small firms in South Africa. This project builds on the work of Iacovou, Benbasat and Dexter (1995) who developed a model of EDI adoption by small business however, it also includes an additional dimension to the model namely, Security. Their model links together the perceived benefits, organizational readiness and external pressure. The rest of the paper discusses relevant literature, research questions, research methodology, analysis, results and concluding comments.

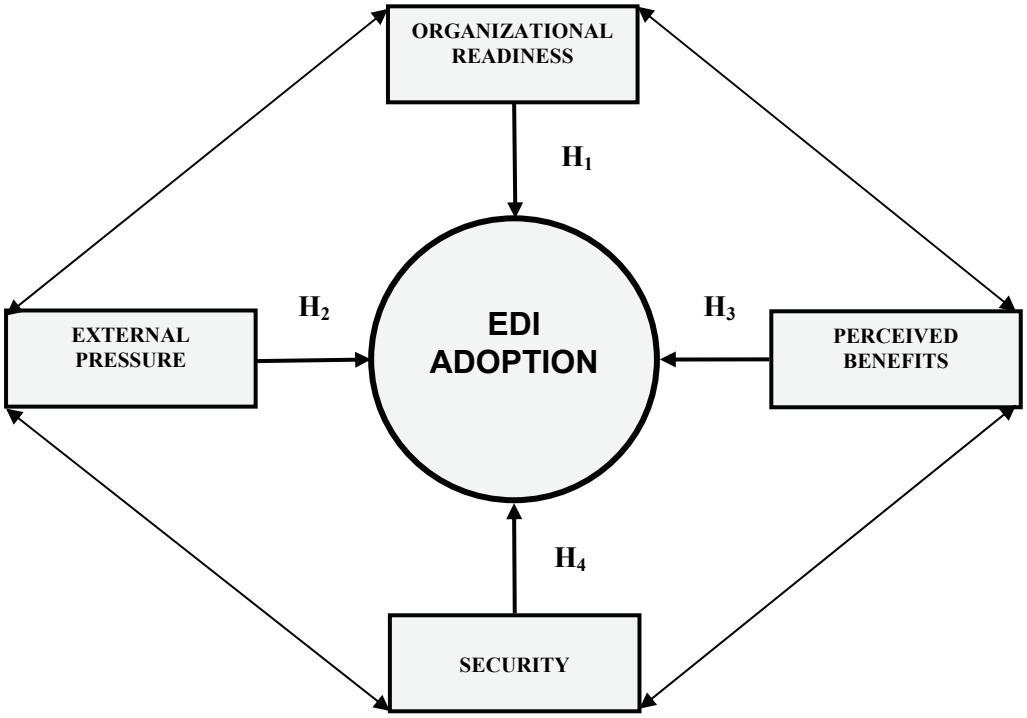
LITERATURE REVIEW

Adoption Model of EDI- Based on the findings of Iacovou et al (1995), factors such as perceived benefits, organizational readiness, and external pressure were found to be the main attributes to adopt EDI. The research in this paper introduces a fourth factor, security. The relationships of these factors are shown in Figure 1.

Organizational Readiness- According to Chwelos, P., Benbasat, I. and Dexter, A. (2001) organizational readiness measures whether the firm has sufficient IT sophistication to undertake the adoption of EDI. IT sophistication does not only refer to the level of technological expertise, but also the management's level of understanding and support in using the technology. More often than not, small firms lack the resources necessary for EDI and Interorganizational redesign (Van Heck and Ribbers, 1999). For a firm to be classified as "technologically ready" it needs to have the minimum office automation equipment, IT usage and IT management.

External Pressure- Refers to the influence arising from several sources within the competitive environment surrounding the firm. Competitive pressure is about the ability of EDI to maintain or increase competitiveness (Chwelos *et al*., 2001). Pressure from third parties relates to the efforts of industry associations to encourage EDI (Chwelos *et al*., 2001). Pressure from trade partners relates to larger firms imposing on smaller firms either to adopt the technology, for their own gains or to be up-to-date with innovative technology (Chwelos *et al*., 2001).

Figure 1: EDI Adoption Model



Research Model: extended from Iacovou et al., (1995). All the variables are closely related. Security was added to this model as it there was insufficient auditability controls in many SMEs.

Perceived Benefits- Refers to the expected advantages that EDI can provide the firm. Benefits include managerial benefits, which could be both direct and indirect (Chwelos *et al*., 2001). Higher managerial understanding of the relative advantage of EDI increases the likelihood of allocation of the managerial, financial and technological resources necessary to adopt EDI (Benbasat *et al.,* 1993). Technological benefits are the use of the technology, new hardware and software as well as skills development. Therefore, small firms with a management team that recognizes the benefits of EDI will be more likely to adopt EDI (Iacovou *et al* 1995). According to Ramaseshan (1997) who surveyed manufactures, distributors and retailers, found that not all barriers to EDI success had negative effects. He furthermore insists that it is important to investigate which obstacles are causing the preclusion in expanding maximum EDI benefits. Murphy and Daley (1999) are of the view that EDI can decrease administrative and transaction costs by a reduction in paperwork and enhanced competitiveness by creating strategic EDI linkages with major firms.

Security- refers to the level of security regarding the protection of data within a firm. The lack of experience and knowledge of security, control and auditability in respect of EDI has contributed to false impressions of unreliability, enforceability of electronic transaction records and legal uncertainty in the electronic trade area (Ratnasingham, 1998). Inadequate or poor information security may be considered both by adopters and non-adopters to be a serious disadvantage (Warwick, 1993 and Weiss, 1993). According to Lim and Jameson (1994), EDI external security risks are partially under the control of other parties such as trading partners and VAN's. They furthermore assert that it includes lost messages, data transferred to the incorrect recipient, or sending fake confirmations. In a study by Coopers and Lybrand (1990), 50% of their respondents had no internal audit involvement in EDI projects, and more than 80% had no EDI control review, as they were not familiar with the security issues. In analyzing the environment on what the firms should be doing regarding security, Banerjee and Golhar's research (1993) suggests that disclosure of messages, modification of message contents and repudiation will be a serious

concern in the future as the tenacity of managers in firms are not strong to ensure that audit and control procedures are in place. They argue that when audits and control procedures fail to detect such security risks, this collapse could severely damage partnerships between firms.

EDI Adoption- Intention to adopt EDI refers to the process in which small firms believe they have the necessary equipment, expertise and financial support to adopt EDI. Therefore, higher perceived benefits, higher organizational readiness, higher external pressure and greater security would lead to a greater intent to adopt EDI. In a Northern Ireland study conducted by Philip and Pedersen (1997) found problems such as return on investment, implementation costs and impact on the firm as some of the barriers affecting EDI Adoption.

DATA AND METHODOLIGY

To investigate the constructs of the EDI model, we collected data by means of an electronic survey conducted between April and May 2006. We applied the survey method in this study because it allows for a "systematic" collection of information and "structured questionnaires" that are the preferred means used for gathering information from a sample, which the researcher is interested in (Baker, 2003). To meet the constraints of the questionnaire we updated some of the previously validated measures.

Where necessary, measures were updated with more current terminology or revised to comply more closely to the general principles of item construction e.g., leading questions, confusing or ambiguous questions avoiding double barreled questions and providing filters for non-opinions (Fowler, 1993). To test the respondents understanding of the questions, we used random probes to check for content validity. As there were two questionnaires, for ease of identification, the headings where printed in different colors. The respondent needed to complete only one questionnaire and specific instructions on how the questions ought to be answered were included.

Sample-The target population was identified as small to medium companies who are conducting business in the Fast Moving Consumer Goods (FMCG), and supplying their products to a large distribution centre. Their names were extracted from the database of a Value Added Network (VAN) company, who was assisting the large distribution centre in the EDI implementation process. 500 email addresses for small to medium firms were used as the population. The unit of analysis for the study was at the organizational level. Purchasing Managers, IT Managers, CEO's and Senior Management were targeted as suitable candidates.

Pilot Study- Piloting the questionnaire is important as it ensures that the questions presented are understandable and it ensures the content validity of the instrument. Multiple items were used to measure most of the constructs. The intention of the pilot questionnaire was to test the questions on Purchasing Managers, IT Managers, CEO's and senior management in 5 companies. After the pilot phase, the questions were modified and reworded where applicable. According to Straub (1989) layout and wording of the questions plays an important role in receiving a good response rate. Further modifications were made such as the sequencing of the questions.

Survey Procedure- Firstly, a cover letter was emailed with the survey package stating the purpose of the study and the strict confidence of the data. The confidentiality of responses was assured and a summary of the results as indicated on the questionnaire would be available to them upon request. Furthermore, the letter stressed the importance of the research and only one questionnaire needed to be completed which would take approximately 15 minutes. We created an email address on the internet under gmail.com. We requested the respondents to email their completed questionnaires to edisurvey@gmail.com or fax to 086 680 9654. Due to spamming alerts, which were setup on most of the small firm's emails, the researcher decided to send the survey package in batches of twenty. The outgoing email consisted of the EDI

covering letter, Adopters Questionnaire and Non Adopters Questionnaire. Secondly, due to a poor initial response, a second reminder letter attached with the survey package was emailed again to all the companies who had valid email addresses. Another two weeks was allowed for responses to come in.

Thirdly, a postcard reminder and a thank-you letter was sent out as a final cut off date to encourage those who did not respond to the first two requests to complete the questionnaire. The gross response rate, with a reduction for returns to sender and notifications of refusal to participate was 105 out of 500 or 21%. From the 105 responses, 74 were completed, as firms who had adopted the technology and the balance of 31 were non-adopters. Therefore 70.5 percent were adopters and 29.5 percent were non-adopters. Seven responses were precluded because two had incomplete information and five fell into the category of large businesses of (201+).

Data Collection- The data collection methods include the unit of analysis and the process by which the responses were acquired. The questionnaires were based upon the interview guides developed by Iacovou et al., (1995). The guides in this study were mostly closed format questions therefore, statistical analysis of the answers was possible. The survey package consisted of an EDI Cover Letter, Non Adopters Questionnaire and the Adopters Questionnaire.

RESULTS

The findings were generated from two structured questionnaires. The completed questionnaires were captured in a program called Survey Craft and thereafter imported into a statistical software programme, SPSS for Windows (version 13.0) for analysis.

Classification of Firms Investigated

Questions 1, 2 and 3 collected information about firm demographics, size and the method of information exchange. Two respondents graded themselves in the "other" category, however it was later established that they were part of the "Perishables" cluster. The frequency distributions for non-adopters are illustrated in Table 1.

Table 1: Frequency Distributions For Non-Adopters

Retail Cluster	Number of Respondents
FMCG Dry Goods	12
Hardware	3
Stationery	3
Liquor	1
Fruit & Veg	4
Perishables	6
Other	2

This table shows the frequency distributions for non-adopters. Non-Adopters are those suppliers who refused to adopt EDI as they were mainly concentrating on their core business, e.g. , farmers, bakeries who were in most cases lacking in computer skills

Table 1 shows that a majority of the Non Adopters are in the FMCG dry goods sector (38.7 percent) followed by perishables then by fruit and vegetables, hardware and stationary had equal percentages, and liquor being the least.

Organizational Readiness

The rating scales used for financial readiness was one being "not very important" and five "very important. For scales one and two, a score of 32.3% was rated between 10 firms and a score of 35.5% for scale three on 11 firms. On scales four and five 32.2% was scored amongst 10 firms. It is reasonable to

expect that financial costs decrease after the adoption of EDI however, these decreases do take time and require patience. Thirty three percent of respondents indicated that they had the financial resources to adopt EDI (see Table 2).

It was found that financial indicators are one of the distinguishing factors that separated adopters from non-adopters. Although 33% were financially stable, it could be that they did not have the necessary technical skills or the required hardware. On IT, sophistication 35.5% was scored on technological resources on both scales "not very important" and "very important." Twenty nine percent were unsure of their technological resources. On the question of providing a better information structure, 41.9% indicated it as being a priority and 16.1% found it to be not very important. On the item of computer technology, 32.2% or 10 firms indicated that it had a simple infrastructure and 35.5% or 11 firms had sophisticated systems. The remaining 10 had no idea of the level computer sophistication within their firms. Fifty-five percent of firms were of the opinion that they had insufficient financial resources to adopt EDI and 64.5% confirmed that their management was not prepared to adopt the technology. Furthermore, 74.2% of respondents indicated that their firms did not attempt to budget for the adoption of the technology.

In actual EDI adoption situations with distribution centers, the researcher found that many small firms actually could afford the initial set-up costs, but lacked the managerial support. EDI requires a high initial capital expenditure, as there could be a later need to integrate EDI transactions to other systems such as accounting systems thereby realizing the full benefit of the technology. Sixty percent of small firms responded that they lacked technical expertise and resources. Therefore having the necessary financial and technical resources is crucial in the adoption of EDI in small firms.

Regarding internal IT technical expertise and whether firms required the services of consultants to assist with their setting up of EDI, the results showed that 58% of small firms had the required technical expertise. This implies that non-adopting firms are capable of adopting EDI with minimal technical support. In order to maintain their relationships with their trader partners 29% adopted Internet EDI. Internet EDI allows the smaller firms to find alternate trading partners they can conduct business with, who are less coercive and more helpful with the sharing of benefits (Angeles, R., Nath. R. and Hendon, D.W 1998). A few decided to provide links with their trade partners, but due to the lack of technical expertise and resources found difficulties in doing so. In the Hardware, Stationery and Liquor sectors, the level of computerization was very low. It had no IT staff and in many cases, the owner performed multiple tasks.

The correlations between perceived benefits (.585) and external pressure (.358) are significant with organizational readiness. Therefore small firms must have financial resources, good computer systems and resources. The findings indicate that the relationship between organizational readiness and adoption is not very strong. Specifically, on the computer hardware where 32% of the firms had very simple systems and 36% had sophisticated systems therefore trade partner dependency could explain this inconsistent finding.

Table 2: Organizational Readiness

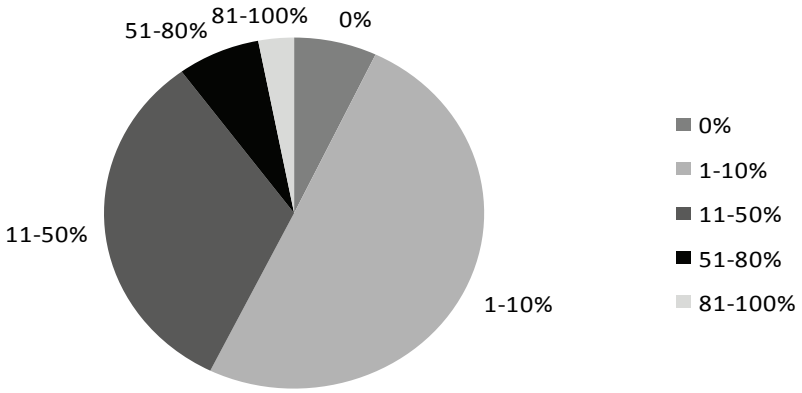
Variable	Min	Max	Mean	Standard Deviation	N
Financial Readiness	1	5	3.7	1.15	31
IT Sophistication	2*	5	3.3	.82	31
Resource Indicators	1	5	3	1.34	31
Composite Score	**2***	**5**	**3.3**	**.74**	**31**

This table shows Organizational Readiness. 2 Question was answered from scale 2 onwards. Organizational readiness means how proactive these firms were in aligning themselves to modern technological and global advances in business.*

External Pressure

Three items relating to pressure from competitors were computed. Figure 2 illustrates the responses of firm's competitors using EDI. Sixteen firms or 51.6% indicated that at least 10% of their competitors were already using EDI. Another 32.3% of firms indicated that close to 50% of their competitors were using the technology. Only one response indicated that between 81 and 100 percent of their competitors was using the technology. Therefore, there is huge pressure from competitors to start utilizing the technology and this is confirmed in the literature that most firms adopted the technology at the same time. Furthermore, 74.2% indicated that they would adopt EDI if their competitors were also using it.

Figure 2: Competitors using EDI



This figure shows the responses of firm's competitors using EDI

Sixty-eight percent responded that they were approached by their trade partners to adopt EDI. Trade partner pressure was the significant contributor to the external pressure summed score. Most firms had close relationships with their trade partners and it implies that they ought to follow what is requested from their bigger partners, since a loss of them could jeopardize their businesses. Some firms indicated that they were pressured into adopting EDI without having known the need for it and without having the necessary resources for the technology. This is consistent with the findings in the literature on a study conducted by Banerjee and Golhar, (1994).

The results indicate that up to 50% of firms are more likely to adopt EDI if required or encouraged by their customers or trade partners, than on a voluntary basis. However, it was found that if a firm's competitor was using EDI, not much pressure was placed on that firm to do so as well. This is in contradiction to the literature, which states that as firms adopt the technology their competitors will follow suit. A majority of respondents (74%) cited that the need to remain competitive was a reason to adopt EDI.

Powerful and larger firms do have a tendency to coerce smaller firms to adopt EDI. In some cases this aggressive approach may not be a very sensible approach because in this study one supplier in the Fruit and Vegetable sector was supplying the DC with a valuable commodity, had a much stronger advantage not to adopt EDI. Third Party pressure was significant in affecting external pressure. Seventy-two percent responded that third party partners had confronted them to adopt EDI. On a face-to-face interview with a few small firms, we found that if their firms did not follow the bigger firms, they were not allowed to conduct business with them. Although 87% responded that they would communicate with other trade partners once they have adopted the technology, more specific focus should be on specific EDI applications such as payments or procurement processes, instead of a broad range of systems as

discovered in this study. Forty eight percent of SMEs that adopted EDI indicated that they were pressurized to adopt the technology by third parties. Furthermore, 13% responded that the initiative came from them. This could mean that these SMEs are probably conducting business on a global market where EDI is known to be the preferred method. It could also be that these firms have sufficient IT and technical resources and that their management have long recognized the advantages of being EDI compliant. Surprisingly only 17% of SMEs who have adopted EDI found a big change in the relationship between themselves and third parties.

Pressure from trading partners, which seemed to be the biggest driver of EDI adoption, had a response rate of 67.7%. The literature suggests that this is the case in most small companies where large companies who have all the resources to implement the technology, expect their smaller suppliers to follow suit. In many cases, it is the larger firms that enjoy most of the benefits. When firms were requested to adopt EDI by their most important trading partners, 51.6% "agreed" that they would and 29% "entirely agreed" to the suggestion. This indicates that small firms are obligated to the larger companies, reason being if they do not comply with the larger companies' requests, they would simply loose the business. Third party companies are mostly in the government and chandling supply industry. The researcher had previous experience in the chandling industry and is aware of the huge profits that could be made especially with international firms. Seventy one percent of firms "agreed" and "entirely agreed" to adopt the technology in order to be part of the tendering process.

Table 3: External Pressure

Variable	Min	Max	Mean	Standard Deviation	N
From Competitors	1	4	3	.77	31
From Trade Partners	2	5	4	.89	31
From Third Parties	1	5	4	.10	31
Composite Score	**2**	**4**	**3.3**	**.55**	**31**

This table shows the external pressures from the various type of suppliers. In many situations SMEs are being pressurized by the bigger corporate s to introduce the technology in their firms because bigger firms will reap the benefits more quicker and be responsive to global pressures as well.

Perceived Benefits

Sixty eight percent of the responses indicated that there would be a reduction in the paper flow within their firms, and 26% responded that it was not very important in their companies. On the question "reduction of response time" which is one of the major benefits in EDI technology, 78% found this to be extremely important in their firms and only 13% responded as not being important. Quality of data becomes an integral part of EDI, as the data is now consistent from the time it leaves the large distribution computer systems until it reaches the receiving companies. Firms realized that this was a huge benefit and the response rate to this question was 81% rating from being important to very important. Furthermore, 74% on both accessibility of information and an increase in efficiency as being important was achieved.

Reduction in costs refers to setting up of trading agreements, company deals, rebates, mailing and faxing of data. Costs are also minimized in the reduction of staff, as less people are now required to maintain accounts. On the question of "reduction in the costs" 74% indicated that it was a very important factor in their firms. Surprisingly, on the question of "cost advantages," 29% indicated that this was not important and 23% were not sure if there were any. However, 48% seemed to realize that there were definite cost advantages once the technology has been adopted. The effect of EDI can only be seen once there are improvements business processes and less human errors. In retrospect, it seems that the need of small firms for new technology was the motivating factor to adopt EDI as well as the need to establish inter-

organizational relationships with their trade partners. The perceived benefits by non-adopter firms on all item responses were satisfactory. It could be seen that smaller firms are not as well informed as larger firms therefore, more awareness should be made to inform smaller firms about the benefits of the technology, which in turn could attract a faster adoption rate.

Notable in the results is the fact that one of the most discussed and important benefits (i.e., a reduction in the costs) was significantly higher at 74% in the case of non-adopters. However, these results were not shown to be significant. Many firms believed that EDI is a tool used to reduce costs. Repeatedly firms argue whether the costs of EDI compared to the benefits received are justifiable. In this study 71% responded that EDI would be justified meaning that small firms were aware of the high costs for adopting and implementing the technology. However, it must be understood that the savings will only occur once high volumes are obtained since it takes small firms a while to gain economies of scale to warrant their initial investment. The researcher has observed whilst working with small firms, that many managers were lacking awareness and knowledge of EDI and this increased the resistance to adopt the technology. Thus, this nervousness of technology could have an adverse effect on trading partners adopting the technology.

Sixty four percent of managers suggested that linking up with their customers and trade partners with EDI would improve services such as customer relations and a reduction in human errors especially with order quantities. This is particularly relevant to firms who are in the fresh line and perishables industry, where maintaining the cold chain is critical. Smaller firms are often cited as having better customer service and being more convenient where larger companies such as distribution centers benefit on operational and strategic functionalities.

Many firms responded that remaining competitive and following what their competitors were doing was an important consideration in EDI adoption as are the needs to reduce response time and increase in efficiency company processes. Although the results indicate a positive correlation between perceived benefits, external pressure, organizational readiness and adoption and a very low significant value to the complete model, the findings suggests that perceived benefits also influences the adoption level of EDI.

The highest mean score (4.23) of the benefits for EDI regarding non-adopters, primarily focused on the "accessibility of information," indicating that small firms are lacking the necessary information in adopting EDI. Top managerial support and end user support attitude in the adoption of EDI seems to be another barrier. Research by Moore and Benbasat (1991), have concluded that there is a strong association between the attitude towards the use of technology and the intention to use. Therefore, one may conclude that if the managers or owners of small firms do not have a positive attitude, they will not adopt EDI.

Security

The results on password controls are consistent with the findings in literature, which is common for larger firms to have the financial or technical resources to train their staff on security issues. The changing of passwords was generally present in all firms, but the period for changing it was not as prevalent as in larger firms. A plausible reason could be that many small firms do not have the dedicated IT personnel to administer the network or computer systems.

Control of internal systems and measures may be limited to only a few people and due to this, it would increase the possibility of illegal transactions. Respondents were accessed on various operational and application controls designed to enhance the effectiveness of internal audits on IT. Most of the firms' (71%) scores were extremely low, indicating minimal effort on these audits to enhance the effectiveness of internal controls. As for requesting or receiving confirmation receipts on data exchange 39% of

responses indicated that this was not taking place. Security is ranked the third most important issue in IT management across countries and its importance has steadily been increasing.

Finally, when a firm concerns itself on the issue of EDI security, it must consider the security of its own internal systems as well. Password changes (45%) seemed to have increased in the firms that have already adopted EDI. This could be attributed to the increase use of EDI applications such as Electronic Funds Transfer (EFT) and sensitive data transfer which trading partners require. However, a very low score of 23% indicates that although they have adopted EDI, computer audits were still not being done in their firms. This should be a major concern for managers.

Intent to Adopt EDI

Ten firms or 32% responded that they do not intend adopting the technology. Ten percent of firms indicated that they intended to adopt EDI within 6 months, 23% within a year, 23% within two years and 13% only after 2 years. Firms who responded that they would only adopt after 2 years would probably not do so as the researcher has had the experience with these types of firms who have shown an interest just to remain in business with its trading partners and use the period to prolong its adoption.
Eventually these firms would be removed from the database once the Purchasing managers sourced a new suppliers who are willing to conduct business using EDI. Those firms who indicated "no intention to adopt EDI" were removed from the large distribution centre's database. Table 4 illustrates intention to adopt by period in months.

Table 4: Time Frame to Adopt EDI

Planning to adopt EDI?	FMCG	H/Ware	Liquor	Perishables	Other	Total
No	5	2	1	2	0	10
6 months	1	0	0	2	0	3
12 months	3	1	0	2	1	7
24 months	2	2	0	2	1	7
24 +	1	1	0	2	0	4
Total	**12**	**6**	**1**	**10**	**2**	**31**

This table shows the period in which SMEs would adopt EDI. Experience from the researcher has seen that many of the micro enterprises often do not adopt the technology as they simply do not have the managerial skill and ability to introduce the technology in their firms. These firms are the ones that actually lose business from the bigger firms.

One significant finding of this study is that although external pressure was the strongest driver of EDI adoption, organizational readiness, perceived benefits and security are all closely related to the degree of adopting the technology. Small firms feel that they do not have to adopt EDI, but because of the external pressures, they have to. Furthermore, they feel that there are many issues surrounding security of their data, and feel that although their data is either being transmitted by a VAN or Internet EDI, not enough has been done to convince them on legal issues and risks. Most of the small firms had the necessary organizational readiness resources but actually perceived not to have them. As many small firms do not have IT managers or EDI personnel, this could become a difficult issue to resolve, as 74% indicated that they would hire outside consultants to prepare them for the adoption of the technology.

Hypothesis Testing

The hypotheses were tested using Bivariate Correlation Analysis. The association between each of the independent variables and dependent variable was analyzed using Spearman's rho. Significant correlations at the 5% level were found between EDI Adoption and Perceived Benefits as well as Organizational Readiness. At the 1%, level significant correlations were found between EDI Adoption and External Pressure. Table 5 contains these results. This supports hypothesis 1, 2 and 3. Hypothesis 4 on security was not supported.

Table 5: Correlations

Spearman's rho		EDI Adoption	Perceived Benefits	Security	Firm Readiness	External Pressure
EDI Adoption	Corr. Coeff.	1.000	.368*	.245	.374*	.663*
	Sig. (2-tailed)	.	.042	.184	.0.38	.000
	N	31	31	31	31	31
Perceived Benefits	Corr.Coeff.	.368*	1.000	.150	.589**	.416*
	Sig. (2-tailed)	.042	.	.419	.000	.020
	N	31	31	31	31	31
Security	Corr. Coeff.	.245	.150	1.000	.158	.077
	Sig. (2-tailed)	.184	.419	.	.395	.680
	N	31	31	31	31	31
Firm Readiness	Corr. Coeff.	.374*	.589**	.158	1.000	.434*
	Sig. (2-tailed)	.038	.000	.395	.	.015
	N	31	31	31	31	31
Ext. Pressure	Corr.Coeff.	.663**	.416*	.077	.434*	1.000
	Sig. (2-tailed)	.000	.020	.680	.015	.
	N	31	31	31	31	31

This table shows the association between the independent and the dependent variables.
***. Correlation is significant at the 0.01 level (2-tailed).*
**. Correlation is significant at the 0.05 level (2-tailed).*

Among the independent variables, significant inter-correlations were found at the 5% level between External Pressure and Perceived Benefits, Organizational Readiness and External Pressure. At the 1%, level significant inter-correlations were found between Perceived Benefits and Organizational Readiness. The strong correlation between EDI adoption and External Pressure is corroborated in the literature confirming that there is huge imposition from large companies, trade partners and competitors. There was very little or no significance between Security and hypothesis 1, 2 and 3.

Multiple Regression Analysis

Multiple regression analysis was computed against the four independent variables with EDI adoption as the dependent variable. The adjusted R-square value of .41 indicates that all the independent variables together explain 41% of the variation in the dependent variable.

The individual scores for the independent variables with their significance and coefficients are shown in Table 6 the variable External Pressure is highly significant at the 0% and the direction of the coefficient is positive thereby providing support for hypothesis 2. The greater the perceived benefits of organizational readiness and security the stronger the likelihood that small firms would adopt the technology. However, although the direction of the variables is positive no significance was found at the 10% level.

Table 6**:** Regression Summary Coefficients against Technology Adoption

Variable	Technology Adoption
Security	0.005
Perceived Benefits	-0.062
External Pressure	1.610***
Organizational Readiness	0.236
R-squared (adjusted)	0.410
Intercept	-3.441
P-value	**≤ 0.00**

*This table shows the regression summary of security, perceived benefits, external pressure and organizational readiness. * p<0.05; **p<0.01; ***p<0.001*

CONCLUDING REMARKS

Given the sample size, the findings cannot be confirmed as conclusive, however they do highlight critical EDI related matters. From this study, a few types of firm responses in relation to EDI adoption can be found. Firms that see the benefits of EDI, firms that cannot justify EDI in their business and those who are in a niche market and are confident that their trading partners cannot pressurize them into adopting EDI. On the issue of security, viewed in the light of the responses, the overall effectiveness desperately requires the leadership of management awareness of potential problems with EDI security and support controls.

This study has shown that although there are many benefits, there are more important factors, which requires attention. Organizational readiness, which includes financial readiness, IT sophistication and security, are critical factors that small firms need to consider before adopting the technology. Since EDI demands huge resources in small firms, this strategic importance of EDI should be carefully examined and thereafter presented to top management before the investment can be made. Finally, the success of EDI depends mostly on the adoption rate by SME's and larger corporations must consider non-coercive plans to accelerate the adoption of EDI among their suppliers and customers.

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