

A PRELIMINARY INVESTIGATION OF ELECTRONIC DATA INTERCHANGE ADOPTION IN BRUNEIAN SMALL BUSINESS ORGANIZATIONS

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ABSTRACT

This first study conducted in Brunei investigates the 84 small and medium enterprises by using a survey approach to find out the key factors that are determinants to EDI adoption. Based upon the existing model, the study uses seven factors grouped into three categories, namely organizational, external and economic factors. The findings indicate that hypotheses related to perceived direct benefits and perceived cost are supported. However, the study could not find support for perceived indirect benefits. All other factors such as: IT knowledge, government support, top management support and trading partner influence remain insignificant. Based upon these findings, recommendations are provided.

Keywords: small and medium enterprises, electronic data interchange, IT adoption

1. INTRODUCTION

Electronic Data Interchange (EDI) is the movement of business documents electronically between organizations in a structured, machine-retrievable, data format that permits data to be transferred, without rekeying, from a business application in one location to a business application in another location (Hansen and Hill, 1989). EDI actually emerged in late 1960s when transportation companies were looking for ways to alleviate delivery delays that resulted from large volumes of paper documentation (Powers and Carver, 1990). The use of EDI however became popular and widespread in late 1980s and early 1990s. Currently, many large organizations in US, Canada, and Europe are using EDI to support their trading activities. The adoption of EDI has also progressed rapidly in Australia (Garner, 1994). The growing use of EDI has drawn the attention of many trade publications and academic literature. A number of success stories (Sehr, 1989; Baker, 1991, Swatman, 1994) were published in the recent years, all of which claimed to have accrued a variety of benefits due to EDI adoption. Several survey studies (Premkumar et al., 1997; Bergeron and Raymond, 1997; Cox and Ghoneim, 1996; Reekers and Smithson, 1994) also confirmed the attainment of some EDI benefits to a varying extent. Several studies claim that EDI will continue to be used as an important communication medium by many business organizations for years to come (Silwa, 2000; Tingle, 2000).

An overwhelming portion of past empirical studies however had focused on EDI use in context to large organizations, and little efforts have so far been expended to understand how EDI is actually being used by small organizations - which lack information systems (IS) sophistication. Traditionally, IS sophistication of small organizations is relatively low as compared to that of large organizations (Cragg and Zinatelli, 1995). Microcomputers in small organizations are primarily used to facilitate accounting systems (Heikkila et al. 1991). This trend has however been changed in recent years. New technology like EDI is now being

adopted by small firms in support of functions other than accounting (Iacovou et al. 1995). It is however reported that setup and running costs of implementing EDI with direct connection with trading partners can be high especially for small organizations (Cheung and Lam, 1995). Moreover, transactions in small organizations are not voluminous. Thus, the use of EDI in small organizations is less than anticipated. As such, it is therefore necessary to examine the extent of EDI use, factors affecting EDI use, and problems as well as benefits arising from EDI use in small organizations, because the findings of EDI studies in large organizations are likely to be different from those of small organizations - which differ substantially from large organizations in many dimensions.

Majority of the current empirical studies on EDI had reported their findings based on either case study or cross-sectional surveys. As such, their findings did not reveal the long-term effects of EDI. It is however, argued that the wide range of EDI benefits as cited in the literature, and are unlikely to be achieved immediately an organization implements EDI. Time is required to integrate EDI with the various internal systems of an organization. Business organizations are likely to progress along a learning curve as they gradually accumulate experience and expertise in EDI operations (Reekers and Smithson, 1994). Therefore, the adoption and success of EDI applications are likely to evolve over time. This is particularly true for small organizations that lack adequate resources and expertise to master EDI technology at a fast pace. As such, case studies and cross-sectional survey studies on EDI only provide a static picture, and fail to depict the evolution of EDI growth. Thus, it is imperative to conduct more empirical research studies to better understand the factors that are determinants to the successful adoption of EDI within the context of small businesses.

In the past considerable research on EDI was conducted for large business; whereas, studies on Small and Medium Enterprises (SMEs) towards the adoption of technology is a recent phenomenon. However, majority of these studies were confined to the USA, Canada and Europe. Comparatively less has been researched in the Asia-Pacific and the numbers of studies on EDI adoption in South-East Asia remain marginal. Unfortunately, not a single empirical study on EDI adoption was undertaken in Brunei Darussalam (henceforth referred to simply as Brunei), a small equatorial island of South-East Asia situated in between Singapore and Malaysia. However, in the past some studies were conducted reflecting the use of IT in general, among the SMEs (Seyal et al. 2001) and adoption of electronic commerce in Bruneian SMEs (Seyal and Rahman, 2003).

Therefore this pioneering study investigates the EDI adoption among Bruneian small and medium enterprises. It examines the Brunei business and technological infrastructure and study the existing EDI practice and major factors contributing toward EDI adoption.

The remainder of this research paper has been organized in the following sequence. First, past empirical studies on EDI are critically reviewed, and a research model is developed with the selection of antecedent variables followed by the development of hypotheses. Second, a research model on EDI adoption in context to small organizations is presented, and hypotheses drawn from the model are postulated. Third, research methodology approach is described. Fourth, research data is analyzed with the discussion and finally, the paper concludes with a summary highlighting contribution to existing body of knowledge. Lastly, recommendations are made for the concerned practitioners and policy makers.

Below we provide an overview of the small business environment and the technology infrastructure in Brunei Darussalam.

2. BRUNEI BUSINESS ENVIRONMENT AND TECHNOLOGY INFRASTRUCTURE

Recent globalization, no doubt, has revitalized the role of small and medium business organizations in the Southeast Asian economies. In a recent Asia-Pacific Economic Council (APEC) survey, it is estimated that for most of the member countries SMEs constitute about 90% of the total business and employ between 50%-80% of their work force. (APEC Reports, 2000).

Brunei Darussalam is a small sultanate of 330,700 people situated on the northwest coast of Borneo Island divided into two areas that are separated by part of the Malaysian state of Sarawak. Its main economic activity is dominated by the oil and gas sectors. Brunei is presently the 14th largest oil producer in the world and 4th largest natural gas producer (HSBC, 2000). The country's gross domestic product per capita was US\$ 13,875 in 1998 (Brunei Statistical Year Book 1999). Brunei is facing negative consequences from its single-minded dependence on oil. Brunei therefore needs to develop more SMEs in economic activity and it is hoped that it will be achieved through its national IT plan. The government, in its eighth development plan (2001-2006) has conceived an IT vision and has taken a range of measures to improve the IT infrastructure and the Internet business environment in the country. The government, with the setting up of Brunei Information Technology (BIT) Council, is determined to provide the basic telecommunication infrastructure in line with other regional economies such as Singapore, Malaysia and Indonesia. Brunei has a very impressive telecommunication infrastructure (RaGAM-21). The "RaGAM-21" is in fact, a broadband network. The core of this includes a high speed switching ATM-based network that is expected to deliver a range of multimedia services and applications (APEC Telecommunication & Information Group, 2001). It is important to the nation to link its IT hubs across the country via domestic communication satellite. This project aims to encourage the various institutions to build linkages amongst business and industry and to provide technological innovations.

In Brunei, only 8% of total private sector businesses establishments fall in the category of large firms that includes the foreign banks, shipping and insurance companies and Brunei Shell Petroleum. Almost all these firms are technologically well-oriented by using e-banking and e-business focusing on business to business and business to customer aspects of electronic commerce including EDI. The remaining 92% covers the SMEs that fulfill 70% of the nation's employment needs (Bsmenet, 2001). In a survey conducted by Brunei Ministry of Industry and Primary Resources, 1999, around twenty seven percent of the SMEs are under Wholesale and Retail trade businesses. Nineteen percent of these SMEs are Construction-based with further sixteenth percent are classified in Community, Social and Personal Services. The survey results further indicated that overall there has been slow growth both in quantity and quality of entrepreneurs (MIPR 1999). At present, Bruneian SMEs are facing the similar problems as stated by MacGregor et al. (1998). However, most of the Bruneian SMEs' managers have admitted the reasonable IT diffusion, mainly due to the availability of technology and to keep them in line with the business demands (Seyal et al. 2001). Realizing the size of domestic market, Brunei businesses seem to be eager to utilize the Internet business techniques. However, in the absence of empirical evidence, it is difficult to assess how the Internet technology helps these SMEs to overcome difficulties.

3. RELATED LITERATURE: A CRITICAL REVIEW

A dominant portion of past EDI empirical literature had concentrated on EDI adoption in large organizations. The works of Premkumar et al. (1997), Bergeron and Raymond (1997),

Cox and Ghoneim (1996), Masstti and Zmud (1996) and Reekers and Smithson (1994) fall in this group. In contrast, Iacovou et al. (1995) study is the only reported work that had examined EDI use in small organizations. A close look at these studies reveal that regardless of organizational context, case study as well as cross-sectional survey design methods were both employed to explain how EDI was used within organizations. However, with the exception of Bergeron and Raymond (1997), none had employed a longitudinal research design to investigate the long-term effects of EDI use within organizations. The organizational contexts and research methods adopted by the past EDI studies were summarized, and are shown in Table 1. This table indicates that EDI experiences of various business organizations across the globe.

A review of IS literature indicates that most of the empirical studies on EDI had attempted to identify a set of factors that help researchers distinguish between EDI adopters from non-adopters. These factors were drawn from diverse disciplines including organizational behavior, IT diffusion, economics, and information systems. The commonly reported factors were compiled, and are grouped into three broad categories: organizational, environmental and innovation, and are listed in Table 2. Several observations can be made based on Table 2. First, no established pattern of results had emerged from these studies due to contradictory findings reported by the researchers.

Table 1: Organizational Contexts and Research Methods Used by Past Empirical Studies on EDI (1994-2001)

Literature Source	Research Method	Organizational Context	
		Size	Sample size and countries
Reekers and Smithson (1994)	Cross-sectional Survey	Large	117 UK and Germany
Premkumar et al. (1994)	Cross-sectional survey	Large	201 US
Iacovou et. al.(1995)	Multiple-case study	Small	7 Canada
Masstti and Zmud (1996)	Multiple-case study	Large	7 US
Cox and Ghoneim (1996)	Cross-sectional survey	Large	85 UK
Bergeron and Raymond (1997)	Longitudinal Survey	Large	65 Canada
Premkumar et al. (1997)	Cross-sectional Survey	Large	181 US
Lim and Palvia, (2001)	Survey	Large	114 US
Chwelos et al. (2001)	Survey	SMEs	268 Canada
Kuan and Chau (2001)	Survey	SMEs	575 Hong Kong
Chau and Jim (2002)	Survey	SMEs	644 Hong Kong

Second, some factors like competitive pressure and organizational size had received more attention as opposed to other factors. In this study, it is argued that even though past EDI studies had identified a set of factors to facilitate the decision for EDI adoption, none of these studies had ever attempted to relate EDI adoption with its impact, and eventual success. Particularly, it is not clear how EDI adoption influences its use, and how EDI use progresses over a period of time, and how benefits arising from EDI use change over time, particularly from small organizations perspective.

Table 2: Factors Addressed by Past Empirical Studies on EDI' Adoption (1992-2002)

Factors	Literature Source
INNOVATION	
<i>Perceived benefits</i>	Chau and Jim (2002), Chwelos et al. (2001) Premkumar et al. (1997), Iacovou et al. (1995)
COMPATIBILITY	
<i>Complexity</i>	Premkumar et al. (1997)
<i>Cost</i>	Premkumar et al. (1997), Cavaye (1996) Saunders and Clark (1992), Bouchard (1993)
Environmental	
<i>External Pressure</i>	Chwelos et al. (2001), Premkumar et al. (1997) Iacovou et al. (1995)
<i>Competitive pressure</i>	Premkumar et al. (1997) Reekers and Smithson (1994) Bensaou and Venkatraman (1996), Williams (1994)
<i>Customer support</i>	McGowan and Madey (1998), Premkumar et al. (1997), Iacovou et al. (1995) Saunders and Clark (1992), Lim & Palvia, (2001)
<i>Climate</i>	Premkumar et al. (1997)
<i>Net-dependence</i>	Premkumar et al. (1997)
<i>Government support</i>	Chau and Jim (2002), Kuan and Chau (2001)
Organizational	
<i>Management support</i>	Chau and Jim (2002), Kuan and Chau (2001) McGowan and Madey (1998), Sillince et al. (1998) Premkumar et al. (1997), Bergeron et al. (1992)
<i>IT knowledge & Sophistication</i>	Chau & Jim (2002), Chwelos et al. (2001) Kuan and Chau (2001)
<i>Size</i>	Premkumar et al. (1997), Bouchard (1993) Reekers and Smithson (1994) Saunders and Clerk, (1992)
<i>EDI champion</i>	Premkumar et al. (1997), Williams (1994)
<i>Trading partners' influence</i>	Chau and Jim (2002), Chwelos et al. (2001), Kuan and Chau (2001), Chen and William (1998), Vijayasathy and Tyler (1997)

It is evident that initially most of the studies that were conducted on EDI were confined to the large business and produced the mixed results. However, in mid 1990s researchers started asking that how results of these studies can support the SMEs (Thong et al. 1996; Thong 1999). Although many issues related to the adoption of technology were found similar but their contribution were entirely different to the SMEs and they reacted differently to these issues. It is therefore relevant that we investigate the issue of technology adoption from SMEs perspective. Unfortunately, few studies were conducted on EDI adoption within SMEs. Iacovou et al. (1995) work is considered as pioneering effort. They proposed a theoretical model consisting of three factors: perceived benefits, organizational readiness and external pressures that found determinants to EDI adoption in SMEs. Although Iacovou *et al.*'s study was based upon very small sample size of seven organizations investigated by case study methodology yet it provided an insight to formulate the hypotheses for further work.

Raymond and Bergeron (1996) surveyed thirty-nine SMEs to examine EDI adoption by proposing a model of success in SMEs. The result suggests that lack of organizational resources is an important inhibitor for SMEs to reap the potential benefits of EDI adoption.

Chwelos et al. (2001) further extended Iacovou et al.'s study with increased sample size and by adopting a survey approach for 268 Canadian SMEs. Their findings suggest that intent to adopt EDI was influenced by perceived benefits, external pressure and organizational readiness.

Kuan and Chau (2001) in survey of 575 small firms in Hong Kong found factors like perceived direct benefits are considered higher by adopters than non-adopters and perceived lower cost, higher technical competence and higher government pressure rather than industry pressure remain significant. Chau and Jim (2002) in another study of 644 Hong Kong SMEs conclude that perceived direct benefits, perceived cost, IT knowledge, trading partner's influence and government incentive are significant factors for EDI adoption.

Jun and Cai (2003) empirically investigated key EDI obstacles experienced by US small manufacturing firms and then examined the relationship between the identified obstacles and their realized EDI benefits and pointed out the organizational, external, technical and financial factors as dominant barriers to adopt EDI.

In Summary, the EDI adoption has been studied within the context of SMEs using several approaches and operationalizations. From the review of the existing literature it is evident that there is a number of overlapping divergent models that have been shown to potentially explain the EDI adoption decision by examining different factors. Most of the studies have addressed three factors influencing the EDI adoption or intent to adopt EDI within small business context. These are: organizational, technological and environmental. These factors within their domain have added to the existing knowledge. However, most of the studies on EDI are based on case study method that is a good way of developing hypothesis but unfortunately this method makes it difficult to generalize the results to a large population. So there is a need of conducting more empirical studies to provide statistical validity and generalizability. Researchers across the globe selected different factors that might not be suitable to Asian context. In this case, this study uses the model of Chau and Jim (2002) as the foundation and tests its suitability for Bruneian SMEs.

4. RESEARCH MODEL AND DEVELOPMENT OF HYPOTHESES

On the basis of existing literature and previous Brunei based studies (Seyal *et al*, 1999, 2001) on the usage of technology, a one stage normative model was developed which provides the basis of research objectives. This normative model, depicted in Figure 1, is a one-stage model that relates the independent and dependent variables without any intervening variables. The relationship as shown in the model is associative rather than causal in nature. In this study, adoption of EC is the dependent variable and there are eight independent variables grouped into three categories. Detailed justification for the inclusion of each independent variable in the model is prescribed below.

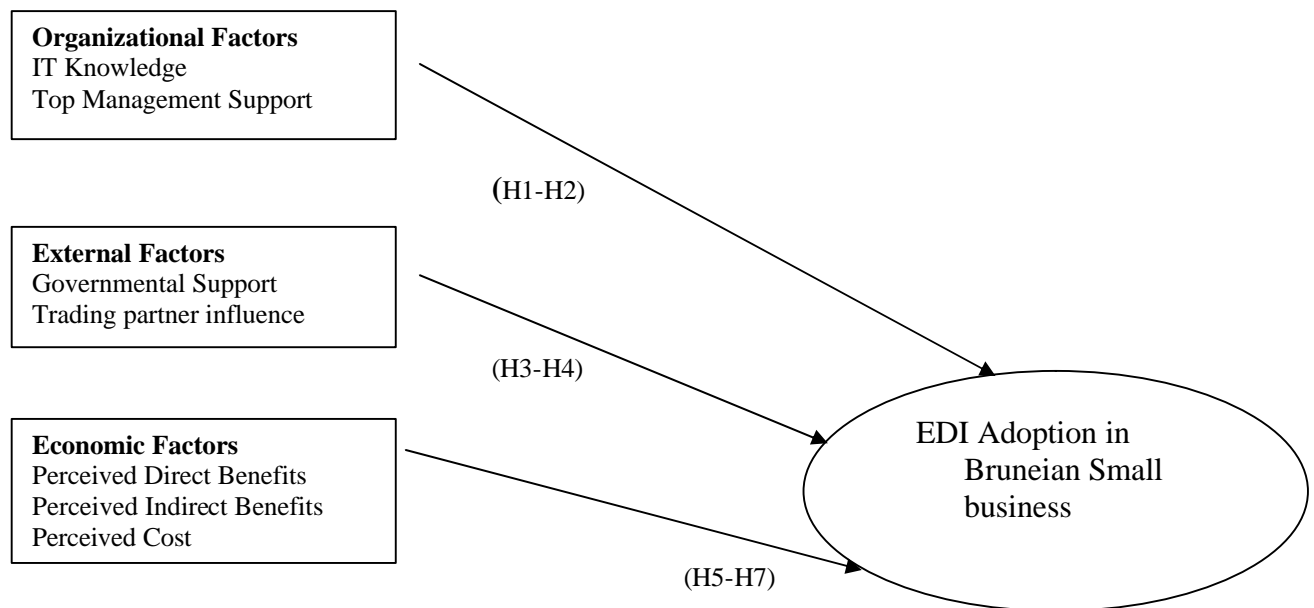


Figure 1: Normative Research Model

4.1 Organizational Factors

In information technology adoption, organizational factors play an important role in the adoption decision (Premkumar and Ramamurthy, 1995). For this study following organizational factors were studied:

IT Knowledge

Product and overall knowledge of Information Technology plays a vital role in the adoption of technology within the organization. Many studies have shown that lack of expertise and lack of IT knowledge is significant barrier in IT adoption. Attewell, (1992) conceptualized lack of the IT knowledge as a main barrier to the technology adoption as many businesses tend to postpone the technology adoption until the barrier is further reduced. Many researchers have found a direct link of IT adoption with the IT knowledge (Cragg and King, 1993; Fink, 1998; Thong and Yap 1995). These studies have identified that IT knowledge remain a barrier to IT adoption in SMEs since a lack of in-house IT expertise is a common situation in SMEs. According to Fichman and Kemerer (1997) having related knowledge makes its easier to acquire and retain new knowledge because it allows better associative connections needed for understanding related knowledge. Chau and Jim (2002) have found that IT knowledge is one of the significant variables that determine EDI adoption in the SMEs. Looi (2005) has found IT knowledge as a significant factor to influence E-commerce adoption in Bruneian SMEs.

Top Management Support

Organization structure is becoming more and more complex and with this complexity the focus was shifted to include factors that directly influence the adoption of technology within an organizational context. Among them the top management support is very commonly studied factor in the IS research. Several studies have brought mixed result of this variable on the adoption decision of the Information Technology. Drury and Farhoomand (1996) have

found the positive attitude towards an innovation has a positive impact on the adoption of the technology. Premkumar *et al.* (1997) examined EDI adoption in the European trucking industry and found top management support were significant along several others in predicting adoption of EDI. It is further advocated that success of IT within an organizations can be determined by considering management commitment to the IT by allocating necessary resources (Ang & Pavri, 1994). Thong & Yap (1995a, 1995b) included top managers and CEO parameters in their studies and found the importance of this variable. Fink (1998) concluded that top management factor could be important for the success of information systems within organizations. Moreover, Tan and Teo (1998) have measured the management support and found it a significant predictor of the Internet adoption. On the other hand, Chau and Jim, (2002) examined 644 SMEs in Hong Kong for EDI adoption and could not find any support of the management attitude.

Based upon these, we therefore propose the following hypotheses:

H1: IT knowledge is positively associated with likelihood of EDI adoption.

H2: Top Management support is positively associated with likelihood of EDI adoption.

4.2 External Factors

Government support

The impact of governmental policies and initiative has been shown to have direct and indirect stimulation to the supply of information that produces faster technology. For many organizations, government has been a source of funding infrastructure (Kettinger, 1994). This study investigates government's involvement and support in EC adoption in SMEs. By establishing a governmental body, Brunei Information Technology Council, Ministry of Communications, His Majesty's Government has further shown its commitment in providing a legitimate and positive leadership role in developing an infrastructure to digitize its economy.

Several researchers in the recent years have studied the governmental role. Ang and Pavri, (1994) found direct intervention of the government can be considered as important in promoting technological innovation although the degree of influence on firms may vary between countries. Seah and Fjermestad (1997) emphasized that both government and private sector play a vital role in supporting the pillars of EC framework. An understanding of the roles of government as facilitator for EDI would flourish and mature the strategic framework for EDI. Papazafeiropoulou and Pouloudi (2000) argued that government should recognize the unique qualities of the Internet and new EC environments and should treat the different groups of stakeholders differently according to their specific need. Utomo and Dodgson (2001) in their IT diffusion among Indonesian SMEs have further confirmed that government can play an effective role as facilitator in providing assistance to SMEs that have limited IT resources. In several Singapore-based studies, researchers Yap et al. (1994) examined the impact of government incentive program on IT in forty small businesses. Evidence has shown that governmental incentive in form of economic, financial and technological support had lowered the barrier of IT adoption. Goh (1995) suggested that government could play a leadership role in the diffusion of innovation. Tan and Teo (1998); Teo and Tan, (2000) have discussed the government role and support for the Internet adoption studies. Chan and Al-Hawamdeh, (2002) in their Singapore-based study discussed the dynamic role of Singapore government in the diffusion of technology. Recently, Scupola (2003) showed that SMEs desire governmental intervention both in term of influence and regulation and such intervention should concentrate on knowledge deployment, subsidies and mobilization.

Governmental support is measured in the present study by construct used by Tan and Teo for their Singapore-based study.

Trading Partner Influence

Trading partners' influence is noted as one of the crucial factors to influence EDI adoption. Prior studies Provan (1980), Bouchard (1993) has supported the influence of trading partner on the adoption of EDI. Chwelos et al. (2001) has used this variable to measure the dependency on trading partner to capture the potential power of a trading partner to encourage EDI adoption however, it was remained insignificant. Chau and Jim, (2002) have pointed out that in order to get more benefits, an organization that has already adopted EDI would like to see its trading partner adopt the technology as well. In their study of EDI adoption among SMEs in Hong Kong, the influence of trading partner remained significant predictor of EDI adoption.

Based upon this we therefore propose the following hypotheses:

H3: Governmental support is positively associated with EDI adoption.

H4: Trading partner influence is positively associated with EDI adoption

4.3 Economic Factors

Perceived benefits (direct and indirect)

Perceived benefits refer to the potential benefits that an organization can get while adopting to EDI. These benefits can be either direct or indirect. Chwelos et al. (2001) have pointed out that *direct benefits* include operating cost saving and other inter-organizational efficiencies arising from reducing paper work and reducing errors rate. On the other hand, *indirect benefits* are opportunities that emerge from the use of EDI including customer service. Previous researchers like Banerjee and Golhar (1994), Drury and Farhoomad (1996), Premkumar and Ramamurthy (1995) have identified and validated the various perceived benefits as a significant determinant of EDI adoption. Moore and Benbasat (1996) study have concluded that compatibility of the innovation with the existing set of values and perceived benefits were the most influential determinants of the technology usage. Chwelos et al. (2001) have concluded in addition to other findings that higher perceived direct benefits would lead to greater intent to adopt information technology. The construct perceived benefits used in this study is adapted after Chau and Jim (2002)

Perceived cost was found to be another important factor in EDI adoption decision. However, the cost remains as one of the barriers to adopt EDI within the context of small businesses that faces the acute shortage of financial resources. SMEs perceived EDI requiring initial large investment and ongoing investment in training and in updating the EDI investment. The cost factor was studied by various IS researchers like Premkmar et al. (1997), Drury and Farhoomad (1996), Cox and Ghoneim (1996) and found a direct relationship of cost with the adoption of technology. Chwelos et al. (2001) have studied the cost factor by using different measurement and related this concept with the availability of financial resources and found it significant.

Based upon these, we propose the following two hypotheses:

H5: Perceived direct benefits are positively associated with EDI adoption.

H6: Perceived indirect benefits are positively associated with EDI adoption.

H7: Perceived cost is negatively associated with EDI adoption.

5. METHODOLOGY

5.1 Instrument Design

From the review of literature, an instrument was developed with the aim of covering the basic research objectives. The questionnaire was divided into four parts. Part A captured the data about the demographic profile covering organizational characteristics, such as, nature, type, size and revenue of business and managerial profile such as age, gender, ownership of PC, and their educational level. Part B of the instrument measures items on various constructs used for the study along with the source is shown in Table 3.

Table 3: Summary of All Measures

Constructs & items	Source
IT knowledge	Chau and Jim (2002)
IK1. End users experience in using Microsoft window-based software on PC.	
IK2. End users experience on using Microsoft Internet explorer.	
IK3. End users experience on using other Web-based software.	
Top management support	Tan and Teo (1998)
TMS1. Top management attitude towards EDI.	
TMS2. Top management support towards EDI.	
TMS3. Top management allocation of resources towards EDI.	
Government support	Tan and Teo (1998)
GR1. Government plays an important role in promoting EDI.	
GR2. Existing governmental policies and mandatory measures facilitating EDI.	
Trading partner influence	Iacovou et al. (1995), Chau & Jim (2002)
TP1. Requested by important business partners	
TP4. Recommended by important business partners	
Perceived direct benefits toward EDI	Cox and Ghoneim, (1996)
PB1. Improve data accuracy.	
PB2. Improve data security.	
PB3. Improve operation efficiency.	
PB4. Speed-up application process	
PB5. Reduce clerical errors	
Perceived indirect benefits	Chau and Jim, (2002)
PIB1. Improve organizational image	
PIB2. Improve competitive advantage	
PIB3. Benefit other business practices	
PIB4. Improve customer services.	
PIB5. Improve relationship with business practices	
Perceived cost	Premkumar <i>et al.</i> (1997)
PC1. High setup cost.	
PC2. High running cost.	
PC3. High training cost.	

5.2 Instrument Reliability and Validity

Several techniques were used to assess the reliability Cronbach's (1951) coefficient (α) and to assess face, construct and convergent validity. In order to ascertain face validity, an initial questionnaire was passed through the routine editing after it was given to the panel of experts (academics, practitioners and business managers). They were asked to respond the questionnaire and based upon their comments; questionnaire was reworded to enhance the

clarity. Table 4 shows the reliability coefficients and convergent validity for the various constructs.

Table 4: Reliability & Validity Analysis

Constructs	No of items	Mean	Alpha value (.60 and above)	Variance explained	Reliability Alpha in Chau & Jim (2002) study
IT knowledge	3	3.71	.82	.67	.81
Top management support	3	3.72	.88	.77	.89
Government support	2	3.32	.86	.74	.86
Trading partner influence*	2	3.05	.25		.77
Perceived direct benefits	5	3.90	.86	.74	.90
Perceived indirect benefits	5	3.81	.78	.61	.93
Perceived cost	3	3.20	.72	.51	.86

(* construct is dropped out from the model because of very low reliability alpha coefficient and of very low variance)

Table 5: Varimax Rotated Component Matrix

Items/Factors	1	2	3	4	5	6
User experience of SW on PC	.837					
User experience of the Internet	.821					
User experience on Web-based SW	.736					
Top management attitude		.784				
Top management support		.902				
Top management allocation of resources		.812				
Government plays an important role			.589			
Existing government policies to promote EDI			.986			
Improve data accuracy				.786		
Improve security of data				.816		
Improve operational efficiency				.851		
Speed up application process				.893		
Reduce clerical errors				.843		
Improve organizational image					.811	
Improve competitive advantages					.787	
Benefit over other business practices					.672	
Improve customer service					.714	
Improve relationship with business partners					.559	
High setup cost						.867
High running cost						.876
High Training cost						.827
Eigenvalue	8.68	2.7	2.1	2.0	1.32	1.16
Percentage of Variance	37.58	11.82	9.52	8.92	5.77	5.08

In general, validity refers to the degree to which instrument truly measure the constructs for what it is intended to measure. There are several types of validity measures that include the face validity and constructs validity. Campbell and Fiske (1959) propose two types of validity: convergent and discriminating validity. Convergent validity is measured by average variance extracted for each construct during the reliability analysis that should be 0.5 or 50% or better (Igbaria and Iivari, 1995). Table 4 shows the reliability values for the various constructs Cronbach's alpha for the constructs ranged from 0.72 to 0.88 indicating a sufficient level of reliability of all constructs excluding trading partners; influence that is 0.23.

This constructs measuring two items regarding main trading partners' request and main trading partners' recommendation were dropped out from the model due to the lowest alpha value. To further analyze for convergent and discriminating validity of these six constructs, principal component method with varimax rotation was used to assess the variance explained. Testing discriminant validity require checking the cross loading of items on multiple factors. All items loaded highly on their associated constructs but not with other factor loadings. Thus fulfilling the Hair *et al.* (1979) criteria of adequate discriminant validity. In general results show that both validities are satisfied. The results are provided in Table 5.

5.3 Data Collection

A questionnaire was sent to 130 SMEs according to stratified random sampling plan. Out of these eighty-seven organizations responded, where as, responses from three organizations were dropped, as their managers did not fill it. So the samples of eighty-four organizations were retained for further interpretations. This makes the response rate of 65%, sufficient enough to make logical conclusions.

6. FINDINGS AND ANALYSIS

Eighty-four questionnaires received were analyzed using SPSS version 10 for descriptive analysis, correlation and multiple regression analysis to predict EDI adoption. The data showed that about 42% of the businesses are sole proprietors, 14% are partnership based, 22% are small corporations and 22% are limited companies. Table 6 describes the characteristics of respondent companies.

Table 6: Characteristics of Respondent Companies

No of Employees	%	Types of IT Facilities	
10-20	41	Availability of PC	93
21-50	29	Internet Account	93
51-100	30	E-mail	93
Industrial Classification		Homepage	57
1. Banks & Insurance	7	In-house Web server	47
2. Hotel/Food Catering	5	Vendor support Web server	10
3. Travel & Shipping	2	Other IT facilities	37
4. Retailers & Wholesalers	24	Mainly Using EDI for	
5. Construction & Engineering	14	Info gathering	34
6. IT related Organizations	13	E-advertising	11
7. Printing & Publishing	15	Business enquiries	24
8. Miscellaneous	19	Selling products	20
Types of business		Buying products	11
Sole proprietors	42		
Partnership	14		
Small Corporations	22		
Limited	22		

The respondents were asked to assess their current level of EDI adoption (dependent variable) on five point Likert scale; starting from 1- not at all adopted to 5-for fully adopted. 67% percentages of the respondents have mentioned below average use of EDI. 13% has mentioned the average EDI usage and about 20% of respondents have mentioned above average EDI adoption. The mean EDI adoption remains as 2.60.

6.1 Determining the Factors Contributing towards EDI Adoption

In line with the principles of multivariate data analysis, we conducted a zero-order correlation between the independent and dependent variables as shown in Table 7. The correlation provides directional support for the predicted relationship and shows that colinearity among the independent variables is sufficient low so as not to affect the stability of regression analysis (Hair et al. 1979). Perceived direct and indirect benefits and perceived cost are significantly correlated with EDI adoption. It is apparent from the Table 7 that none of the variables are highly inter-correlated, so the problem of multicollinearity does not exist thus fulfilling Hair et al. (1979) criterion that says that variables to qualify for multicollinearity should have a coefficient of correlation 0.80 or higher.

Table 7: Pearson Correlation between EDI Adoption and Antecedent Variables (n=84)

	1	2	3	4	5	6
IT knowledge (1)	1.0					
Top Management support (2)	.481**	1.0				
Government support (3)	.024	.026	1.0			
Perceived direct benefits (5)	.402**	.435**	-.405	1.0		
Perceived indirect benefits (6)	.321**	.422**	-.021	.696**	1.0	
Perceived cost (7)	.174	.273	.019	.287**	.386**	1.0
EDI Adoption	.001	-.046	-.028	.411**	.380**	-.370**

(** Indicate statistically significant at $p < 0.05$, construct 4 is dropped out for lowest reliability)

Prior to the regression analysis data were screened for outliers and cases with standard deviation greater than 2 and cases with missing values were removed. The result of a stepwise regression analysis is presented in Table 12 that confirmed the above result. The table data further concluded that four of six independent variables are significantly contributing toward regression equation. The effect of multi-collinearity was studied by examining the VIF values for each of the regression coefficients. It was found that values for all the coefficients were all less than 10 and as such multi-collinearity was not a problem to distort the regression analysis. The model has high and significant F ratio indicating good fit of the model and statistically significant in explaining the adoption of EDI by SMEs. The Beta's (standardized coefficient) indicate the relative importance of the independent variables in explaining the adoption of EDI by the SMEs. They are used to compare the relative importance of each independent variable directly in relation to the dependent variable. The highest Beta coefficient of 0.483 among the three attributes shows that "perceived cost" is the most important variable in the adoption of EDI. To investigate the problem of autocorrelation, the Durbin-Watson statistic further indicated the absence of correlated residuals. Moreover, 35% of the variance is shared by the three independent variables indicating that model is effective in predicting adoption. Thus in their final analysis two out of three hypotheses H5, H7 are supported.

Table 8: Step-Wise Regression Analysis

Independent Variables	Beta	T-value	VIF	Significant	Remarks
Perceived direct benefits	.359	2.277	1.169	0.026**	H5 supported
Perceived indirect benefits	-.410	-2.593	1.324	0.011**	H6 Not supported
Perceived cost	-.483	-4.071	1.294	0.000**	H7 supported

Dependent Variable (DV): EDI Adoption

** Indicates Statistical significant at $p < 0.05$

$R^2 = .349$, Adjusted $R^2 = .32$, $F = 6.927$, $Sig = 0.00$, Durbin-Watson = 1.88

7. DISCUSSION

One of the objectives of this study was to identify the EDI adoption within Bruneian SMEs. On a five point Likert scale the mean adoption is 2.60 which shows a gloomy picture of EDI adoption among SMEs but indicates a consistency among similar research in developing countries of Asia and Asia-Pacific. As mentioned previously, 20% of the surveyed organizations have adopted some kind of EDI. Although 93% of businesses have Internet accounts, they are mainly using them for the purpose of communicating through E-mail. 20% of the organizations are using EDI for selling purposes and only 11% are using EDI for buying purposes.

7.1 Organizational Factors

Out of the three factors studied only economic factors are found to be significant in determining EDI adoption among Bruneian SMEs. The organizational factors such as IT knowledge and top management support remained insignificant. Apparently, it seems logical that those organizations with greater IT knowledge tend to adopt EDI more rapidly compared with organizations deficient in IT knowledge. However, in our case it implies that less knowledge of IT is not a barrier to EDI adoption. A previous study (Attewell, 1992) indicated that many SMEs in general, lack IT knowledge and tactical skills, but our result shows that this does not apply to Bruneian SMEs. The results are in contrast with Iacovou et al. (1995), Chau and Jim, (2002), Chwelos et al. (2001) and Looi (2005).

Similarly, top management support towards EDI adoption is also insignificant. This suggests that management support in these surveyed SMEs is deemed unnecessary for EDI adoption. This is a new finding emerging from this study and is in contrast with various other Brunei-based studies on Electronic Commerce adoption (Seyal and Rahman, 2003 and 2004). This might be due to the fact that the top management of these SMEs might have faced other organizational factors that were not included in this study and contributed to the adoption decision indirectly. The result is in contrast with the findings of Ang & Pavri, (1994); Thong and Yap, (1995a, 1995b); Seyal et al. (1999) and Tan and Teo, (1998). Our result supports Chau and Jim, (2002) and further suggests that in earlier studies the decision to adopt technology was made under social and voluntary situations whereas, the adoption decision among Bruneian SMEs is mandatory and adopting organizations decided to adopt EDI not by choice and might have faced greater pressure from other environments. We also agree with the justification of Chau and Jim, (2002) that sometimes the type of innovation helps to explain the insignificant top management attitude and support.

7.2 External Factors

In several EDI studies, researchers have suggested the importance of external factors such as government support and trading partners' influence as significant motivators to adopting EDI (Premkumar et al. 1997; Raymond and Bergeron, 1996; Chau and Jim, 2002). However, our

results indicate that external factors have no significance relationship with the adoption of EDI among Bruneian SMEs.

Government support was not found a significant factor influencing EDI adoption. Previous researchers have studied the relative importance of this variable as a factor in the SME's decision of technology adoption (Goh, 1995; Teo and Tan, 1998; Chan and Al-Hawamdeh, 2002). Chau and Jim, (2002) believe that the greater government incentives and enforcement as perceived by an organization, the higher is the likelihood of the organization adopting EDI. The insignificant result of this study suggests that most of the SMEs are either unaware of the government efforts to support the technology adoption or most of these SMEs would be considering implementing EDI without government incentives. Our findings do not support the prior studies of Yap et al. (1994); Tan and Teo, (1998) and Teo and Tan (2000). Our findings are however, in line with Seyal et al. (2003) and Looi (2005).

Unfortunately, variable trading partners' influence was initially included in the model but was dropped after assessing the lowest reliability coefficient and variance. This reflects the Bruneian small business practices of technology adoption. This could mainly be due to the fact that among Bruneian small business, technology is not being adopted strategically as reported by Seyal *et al.* 1999, 2003. Therefore the trading partners' influence might not be considered as a motivator to adopt EDI. The results further support the Chau and Jim's (2002) study that trading partners' influence have a negative influence on EDI adoption suggesting that organizations that are not influenced by trading partners are more likely to be an adopter and vice versa.

7.3 Economic Factors

Perceived benefits (direct and indirect) and perceived cost are found to be important predictors in determining EDI adoption among SMEs. The findings illustrate the unique business practices of Bruneian SMEs. These results were expected and are in line with previous research in technology adoption in general and EDI adoption in particular (Cragg and King, 1993; Premkumar et al. 1997; Chau and Jim, 2002). This is especially true to the SMEs as Fink (1998) has pointed out that the decision making process in SMEs is very short term, intuitive and mainly influenced by the owner. Therefore organizations generally pay more attention to short term and obvious benefits rather than long term benefits. The management of these SMEs considered the perceived benefits as an important pre-requisite to decide on technology adoption. If the benefits are not viable they might not decide on the technology. Perceived benefits can act as motivators to encourage the adoption of an innovation because direct benefits are more viable and are easier to measure. So this study supports the prior studies of Moore and Benbasat (1996) and Chwelos et al. (2001) that suggest that perceived benefits are the most influential determinants of the technology adoption. However, the indirect benefits were found to have a negative influence on EDI adoption. This further suggests that an organization that is not influenced by the indirect benefits is more likely to adopt EDI and vice versa, which is contrary to the existing results. The plausible explanation is that adopters in our study considered direct benefits as major motivators to adopt EDI and ignored the indirect benefits.

Similarly, perceived cost was found to be another significant but negatively related variable in EDI adoption. This confirms the previous studies of Cox and Ghonein, (1996) and Chau and Jim, (2002) and reinforces the idea that innovation, regardless of the benefits it provides, if it is inexpensive will be more likely to be adopted. It seems true that SMEs have few resources compared with large organizations. Therefore, these small organizations pay more attention to financial resources. Iacovou et al. (1995) have pointed out that cost is a critical factor in the adoption decision. Chau and Jim, (2002) have further advocated that

many SMEs might not having an IT budget or IT plans and therefore consider EDI adoption as an unexpected expenditure. In our study, the perceived cost shows an inverse relationship with EDI adoption. That is the more the cost of the adoption, the less likely are organizations inclined to adopt EDI. The results further support the study of Chau and Jim, (2002).

8. CONCLUSION

The study was based upon a survey of 84 SMEs examining EDI adoption in Brunei. The study identified various factors predicting EDI adoption within surveyed organizations. Clearly, the results of this study cannot be generalized to the entire SME population and local influences need to be considered. The findings support similar other regional Asia-Pacific studies. However, further research is required to investigate the effects of EDI use on the SMEs. This study represents a significant starting point for further investigations.

At the outset, the EDI adoption was measured on the five point Likert scale. The mean EDI adoption was measured at 2.60 with 20% of the organizations having adopted EDI. The statistics indicated that 57% of the organizations which have homepage are using them only for e-advertising purposes. Also 93% of the organizations that have Internet accounts are using them mainly for the e-mail purpose of simply communicating with customers, vendors or suppliers. It is obvious that some of these responding organizations have actually misinterpreted the term EDI. This is mainly due to the reason that a single response from each SME was collected regarding the extent of EDI adoption. This further leads to the possibility of response bias and, in fact, is a major limitation of the present study. However, the problem was not considered to be of a serious nature, in the presence of sufficiently high validity and reliability coefficients. Secondly, as such, the responses were filled-in by the top managers with decision making authority. As this is a pilot study the problem could be overcome by specifically asking a group of questions regarding EDI adoption. Question regarding interactive, transactive and fully integrated EDI in future studies would eliminate the response biases.

The study examines the adoption of EDI using factors contributing to organizational, external and economic levels. The economic level is the sole determinant of EDI adoption among Bruneian SMEs. Out of three economic factors, perceived direct benefits and perceived cost are the significant motivators of EDI adoption. Overall, three factors accounted for 35% of the variance in intent to adopt. These results support the findings of previous studies and improve the generalizability. The technology providers should further consider the perceived costs as a prime consideration. These SMEs would rapidly adopt EDI if they were provided with benefits and the perceived cost would be reduced through properly developing an EDI system. Although top management support is insignificant factor yet there is a strong need to enhance top management support and to redesign the role of the government bodies primarily focusing on SMEs so that they adopt a more proactive approach to gearing up the task of technology adoption.

Future research could further extend the sample size and include several more variables such as competitive pressure, external pressure and national and organizational culture that will not only increase the shared variance, but will also bring a broader perspective to EDI adoption.

REFERENCES

- Ang, J. and Pavri, F. (1994) A Survey and Critique of the Impact of Information Technology, *International Journal of Information Management*, 17, 3, 122-130.
- Angeles, R. (2000) Revisiting the Role of Internet EDI in the Current Electronic Commerce Scene, *Logistics Information Management*, 3, 1, 45-57.
- APEC Telecommunication and Information Group Report (2001), Ministry of Communications: Brunei Darussalam, March.
- Attewell, P. (1992) Technology Diffusion and Organizational learning: The case of Business Computing, *Organization Science*, 3, 1, 1-19.
- Baker, R.H. (1991) *EDI: What Managers Need to Know about the Revolution in Business Communications* McGraw-Hill Blue Ridge Summit, Pennsylvania, USA.
- BDEC (2000) Report of the Brunei Darussalam Economic Council, Office of the Prime Minister, Jan www.brudirect.com
- Benerjee, S. and Golhar, D.Y. (1994) Electronic Data Interchange: Characteristics of Users and Non-users, *Information and Management*, 26, 1, 65-74.
- Bensaou, M. and Venkartraman, N. (1996) Inter-organizational Relationship and Information Technology: A Conceptual Synthesis and a Research Framework, *European Journal of Information Systems*, 5, 2, 84-91.
- Bergeron, F. and Raymond, L. and Rivard, S. (1992) Organizational Benefits of Electronic Data Interchange: An Empirical Study *Proceedings of ISOP, 3rd Australian Conference on IS*, R. MacGregor et al. (eds), Wollongong, Oct, 563-577.
- Bergeron, F. and Raymond, L. (1997) Managing EDI for Corporate Advantage: A Longitudinal Study, *Information and Management*, 31, 319-333.
- Bouchard, L. (1993) Decision Criteria in the Adoption of EDI *Proceedings of the 13th International Conference on Information Systems*, Orlando, Fl, USA. 365-376.
- Brunei Darussalam Statistical Year Book (1999), Statistic Review of Economy, Economic Planning Unit, Ministry of Finance: Brunei Darussalam.
- Brunei press (2004) *Borneo Bulletin Brunei Year Book 2004* Key Information on Brunei, April.
- Bsmenet (2001) Small & Medium Enterprises in Brunei <http://www.bsmenet.org.bn/bsmeweb>
- Campbell, D.T and Fiske, D.W. (1959) Convergent and Discriminant validation by the Multi-trait, Multi-method Matrix, *Psychological Bulletin*, 56, 86-105.
- Cavaye, A.L.M. (1996) Implementation of Customer Oriented Systems, *European Journal of Information Systems*, 5, 2, 103-119.
- Chan, B. and Al-Hawamdeh, S. (2002) The Development of e-Commerce in Singapore: The Impact of Government Initiative, *Business Process Management Journal*, 8, 3, 278-288.
- Chau, P.Y.K. and Jim, C.C.F. (2002) Adoption of Electronic Data Interchange in Small and Medium Sized Enterprises, *Journal of Global Information Management*, 10, 4, 61-85.
- Chen, J.C. and Williams, B.C. (1998) The Impact of EDI on SMEs: Summary of Eight British Case Studies, *Journal of Small Business Management*, 36, 4, 68-72.
- Chervany, N.L. and Dickson, G.W. (1972) An Experimental Evaluation of Information Overload in a Production Environment, *Management Science*, 20, 10, 1335-1344.
- Cheung, B.Y.H. and Lam, I.S.K. (1995) Application of EDI in Hong Kong: Survey Evidence on Accountants, *Proceedings of Pan Pacific Conference on IS, June 29th-July 2nd*, Singapore, 448-456.
- Chwelos, P. Benbasat, I. and Dexter, A.S. (2001) Empirical Test on EDI Adoption Model, *Information Systems Research* 12, 1, 304-321.
- Cox, B. and Ghonein, S. (1996) Drivers and barriers to adopting EDI: A Sector Analysis of UK Industry, *European Journal of Information Systems*, 5, 24-33.

- Cronbach, L.J. (1951) Coefficient Alpha and the Internal Structure of Tests, *Psychometrika*, 16, 297-334.
- Cragg, P.B. and Zinatelli, N. (1995) The Evolution of Information System in Small Firm, *Information and Management*, 29, 1, 1-8.
- Dearing, B. (1990) The Strategic Benefits of EDI, *Journal of Business Strategy*, 11, 1, 4-6.
- Drury, D.H. and Farhoomad, A. (1996) Innovation Adoption of EDI. *Information Resource Management Journal*, 9, 3, 5-13.
- Emmelhainz, M. (1993) *EDI: A Total Management Guide*, New York: Van Nostrand Reinhold.
- Ferguson, D.M and Hill, N.C. (1988) The State of US EDI in 1988, *EDI Forum*, 1, 21-29.
- Ferguson, D.M, Hill, N.C. and Hansen, J.V. (1990) Electronic Data Interchange: Foundations and Survey Evidence on Current Use, *Journal of Information Systems*, 4, 1, 81-91.
- Fichman, R.G. and Kemerer, C.F. (1997) The Assimilation of Software Process Innovations: An Organizational Learning Perspective, *Management Science*, 43, 10, 1345-1363.
- Fink, D. (1998) Guidelines for the Successful Adoption of Information Technology in Small and Medium Enterprise, *International Journal of Information Management*, 18, 4, 243-253.
- Garner, B. (1994) EDI: For Better or Worse? *Charter*, Oct. 28-29.
- Goh, H.P. (1995) The Diffusion of Internet in Singapore: A Content Analytic Approach, *Faculty of Business Administration, National University of Singapore*.
- Hart, P.J. and Saunders, C.S. (1997) Power and Trust: Critical Factors in the Adoption and Use of EDI, *Organization Science*, 8, 1, 23-42.
- Hart, P.J. and Saunders, C.S. (1998) Emerging Electronic Partnership, Antecedents and Dimensions of EDI Use From the Supplier's Perspective, *Journal of Management Information Systems*, 14, 4, 87-111.
- Hair, J.F. Anderson, R.E., Tatham, R.L and Grablovsky, B.J. (1979) *Multivariate Data Analysis*, Tulsa, OK: Petroleum Publishing Company.
- Heikkila, J., Saariness, T. and Saaksjavri, M. (1991) Success of Software Packages in Small Businesses: An Exploratory Study, *European Journal of Information Systems*, 1, 3, 159-169.
- HSBC Report. (2000), Hong Kong Shanghai Banking Corporation, Country Report, 10th Ed., <http://www.hsbc.com/>
- Igbaria, M. and Iivari, J. (1995) The Effects of Self-efficacy on Computer Usage, *OMEGA*, 23, 6, 587-605.
- Iacovou, C.L., Benbasat, I. and Dexter, A.S. (1995) Electronic Data Interchange and Small Organizations Adoption and Impact of Technology, *MIS Quarterly*, 19, 4, 465-485.
- Johnston, H.R. and Vitale, M.R. (1988) Creating Competitive Advantage with Inter-organizational Information Systems, *MIS Quarterly*, 12, 2, 152-165.
- Jun, M. and Cai, S. (2003) Key Obstacles to EDI Success from the US Small Manufacturing Companies' Perspective, *Industrial Management and Data Systems*, 103, 3, 192-203.
- JPKE (2003) *Brunei Darussalam Statistical Year book 2003*, Economic Planning Unit (JPKE) Brunei Darussalam Government Printer
- Kettinger, J. (1994) National Infrastructure Diffusion and U.S. Information Super Highway, *Information and Management*, 27, 6, 357-369.
- Kuan, K.K.Y. and Chau, P.Y.K. (2001) A Perception-based Model for EDI Adoption in Small Business Using a Technology-Organization-Environment Framework, *Information & Management*, 38, 8, 507-521.
- Lim, D. and Palvia, P.C. (2001) EDI in Strategic Supply Chain: Impact on Customer Service, *International Journal of Information Management*, 21, 3, 193-211.

- Looi, H.C. (2005) E-Commerce Adoption in Brunei Darussalam: A Quantitative Analysis of Factors Influencing Its Adoption, *Communications of the Association for Information Systems*, 15, 3, 61-81.
- MacGregor, R.C., Bunker, D.J. and Waugh, P. (1998) Electronic Commerce and Small/Medium Enterprises in Australia: An EDI Pilot Study, *Proceedings of 11th International Bled E-Commerce Conference*, Bled Slovenia, June 8th-10th, 284-294.
- Massetti, B. and Zmud, R.W. (1996) Measuring the Extent of EDI Usage in Complex Organizations: Strategies and Illustrative Examples, *MIS Quarterly*, 20, 3, 331-345.
- McGowan, M.K and Madey, G.R. (1998) The Influence of Organization Structure and Organizational Learning Factors on the extent of EDI Implementation in US Firms, *Information Resources Management Journal*, 11, 3, 17-27.
- MIPR (1996) Report on SME, Ministry of Industries and Primary Resources, Brunei Darussalam, www.mipr.gov.bn.
- Mohta, P. (1997) The Internet: Where Businesses do Business, *Electronic Commerce World*, 7, 9, 20-21.
- Moore, G. and Benbasat, I. (1996) Development of an Instrument to Measure the Perception of Adopting and Information Technology Innovation, *Information Systems Research* 2, 3, 192-222.
- Papazafeiropoulou, A. and Pouloudi, N. (2000) The Government Role in Improving EC Adoption *In the Proceedings of the European Conference on Information Systems*, Vienna, Austria, 709-716.
- Powers, W.J. and Carvar, T. (1990) EDI: Control and Audit Issues, *EDP Auditor Journal*, 1 25-33.
- Premkumar, G., Ramamurthy, K. (1995) The Role of Inter-organizational and Organizational Factors on the Decision Mode for Adoption of Inter-organizational Systems, *Decision Sciences*, 26, 3, 303-336.
- Premkumar, G., Ramamurthy, K. and Crum, M. (1997) Determinants of EDI Adoption in the Transportation Industry, *European Journal of Information Systems*, 6, 107-121.
- Provan, K.G. (1980) Recognizing, Measuring and Interpreting the Potential/Enacted Power Distinction in Organizational Research, *Academy of Management Review*, 5, 4, 549-590.
- Raymond, L. and Bergeron, F. (1996) EDI Success in Small and Medium Sized Enterprises: A Field Study, *Journal of Organizational Computing and Electronic Commerce*, 6, 2, 161-172.
- Reekers, N. and Smithson, S. (1994) EDI in Germany and in the UK: Strategic and Operational Use, *European Journal of Information Systems* 3, 3, 169-178.
- Rivard, S. and Huff, S.L. (1984) User Developed Applications: Evaluation of Success from the DP Department Perspective, *MIS Quarterly*, 8, 1, 30-35.
- Saunders, C.S. and Clark, S. (1992) EDI Adoption and Implementation: A Focus on Inter-organizational Linkages *Information Resources Management Journal*, 5, 1, 9-19.
- Scupola, A. (2003) Government Intervention in SMEs E-Commerce Adoption: An Institutional Approach, *In the Proceedings of 7th Pacific Asia Conference on Information Systems*, Adelaide, South Australia, July 10th-13th, 184-195.
- Seah, T.S. and Fjermestad, J. (1997) Roles of Government and the Private Sector: Electronic Commerce in Singapore, <http://www.hsb.baylor.edu/ramsower/ais.ac.97/papers/seah.htm>.
- Sehr, B. (1989) Levi Strauss Strengths Customer Ties with Electronic Data Interchange: Levilink Network Carries Order and Shipment Information, *Computerworld*, 30, Jan.

- Seyal, A.H., Rahim, M., Rahman, M.N. and Yussof, A.M (1999) A Survey of IT Usage between Small and Medium Business Organizations in Brunei Darussalam, *In the Proceedings of Conference on IT in Asia (CITA 99)*. Kuching, Malaysia Sept 16-17, 1999.
- Seyal, A.H., Rahman, M.N. and Yussof, A.M. (2001) Organizational Characteristics, Computer Literacy and Attitudes of CEOs' Toward the Use of Information Technology: A Study of Bruneian SMEs, *In the Proceedings of 5th Pacific-Asia Conference on Information Systems (PACIS 2001)* Seoul, Korea. June 19th –21st.
- Seyal, A.H. and Rahman, M.N. (2003) A Preliminary Investigation of Electronic Commerce Adoption in Small and Medium Enterprises in Brunei, *Journal of Global Information Technology Management*, 6, 2, 6-26.
- Seyal, A.H., Awais, M.M., Shamail, S. and Abbas, A. (2004) Determinants of Electronic Commerce in Pakistan: A Preliminary Evidence from Small and Medium Enterprises, *Electronic Markets*, 14, 4, 372-387.
- Seyal, A.H. and Rahman, M.N. (2006) Predictive Indicators of Electronic Commerce Adoption in Regional Small and Medium Enterprises, In. N. Al-Qirim (Ed) *Global Electronic Business Research: Opportunities and Directions*, 282-318, Hershey, PA: Idea Group Publishing.
- Sillince, J.A.A., MacDonald, S., Lefang, B. and Frost, B. (1998) Email Adoption, Diffusion, Use and Impact within Small Firms: A Survey of UK Companies, *International Journal of Information Management*, 18, 231-242.
- Silwa, C. (2000) In B-to-B marketplace, Reality Bites: Firms Wait on XML Increase Use of EDI, *Computerworld*, 34, 18, 1-2.
- Swatman, P.M.C. (1994) Business Process Redesign Using EDI: The BHP Steel Experience, *Australian Journal of Information Systems*, 2, 1, 55-73.
- Tan, M. and Teo, T.S.H. (1998) Factors Influencing the Adoption of the Internet, *International Journal of Electronic Commerce*, 2, 3, 5-18.
- Teo, T.S.H. and Tan, M. (1998) An Empirical Study of Adopters and Non-Adopters of the Internet in Singapore, *Information and Management*, 34, 6, 339-345.
- Teo, T.S.H. and Tan, M. (2000) Factors Influencing the Adoption of Internet Banking, *Journal of the Association for Information Systems*, 1, 5, 1-42.
- Thong, J.Y.L and Yap, C. S. (1995) CEO Characteristics, Organizational Characteristics and Information Technology Adoption in Small Business, *Omega, International Journal of Management Science*, 23, 4, 429-442.
- Thong, J.Y.L and Yap, C. S. (1995) An Information Technology Adoption Model for Small Business. *In the Proceedings of the IFIP WG8.6 Working Conference in Diffusion, and Adoption of Information Technology*, Oslo, Norway, 14th-17th Oct, 14.
- Thong, J.Y.L and Yap, C. S. (1996) Top Management Support, External Expertise and Information Systems Implementation in Small Business, *Information Systems Research*, 7, 2, 248-267.
- Tingle, A. (2000) EDI: Antiquated or Ready for Rebirth, *Apparel Industry Magazine*, 61, 1, 58-60.
- Utomo, H. and Dodgson, M. (2001) Contributing Factors to the Diffusion of IT within Small and Medium Sized Firms in Indonesia, *Journal of Global Information Technology Management*, 4, 2, 22-37.
- Vijayasathy, L.R. and Tyler, M.L. (1997) Adoption Factors and EDI Use: A Survey of Retail Companies, *International Journal of Retail and Distribution Management*, 25, 286-292.
- Williams, L.R. (1994) Understanding Distribution Channels: An Inter-organizational Study of EDI Adoption, *Journal of Business Logistics*, 15, 2, 195-203.

Yap, C.S., Thong, J.Y.L. and Raman, K.S. (1994) Effect of Government Incentive in Computerization in Small Business, *European Journal of Information Systems*, 3, 3, 191-200.