ELECTRONIC COMMERCE SUCCESS MODEL:
A Search for Multiple Criteria *

Didi Achjari
Mohammed A. Quaddus

The current study attempts to develop and to examine framework of e-commerce success. In order to obtain comprehensive and robust measures, the framework accommodates key factors that are identified in the literature concerning the success of electronic commerce. The structural model comprises of four exogenous variables (Internal Driver, Internal Impediment, External Driver and External Impediment) and one endogenous variable (Electronic Commerce Success) with 24 observed variables. The study that was administered within large Australian companies using questionnaire survey concluded that benefits for both internal organization and external parties from the use of e-commerce were the main factor to predict perceived and/or expected success of electronic commerce.

Keywords: electronic commerce; internet; LISREL; structural equation modeling

---

Introduction

Electronic commerce, both internet based or otherwise, is changing the way organizations perform their tasks, interact with customers and, in general, do their business. Electronic commerce is not only 'buying and selling' of product via electronic means, it involves all other activities to support the sale process (Applegate et al. 1996). As such, the current study adopts the definition of electronic commerce provided by Wigand (1997) and Kalakota and Whinston (1997) as follows *"electronic commerce includes any form of business activity conducted via electronics means, which might range from products/services information to selling and/or buying products/savings"*. Undoubtedly, e-commerce is changing the business process and it is also changing the organizational structure to support the new process. Among the myriad of computer and telecommunication based applications in the modern era, the advent of electronic commerce is having the biggest impact on organizations and its customers.

In spite of the need to assess electronic commerce impact, the available measures have been inconclusive. This result in difficulties when assessing the performance of e-commerce relative to alternative strategies (Rose et al. 1999). In the more general IS environment, problem pertains to the measurement of IS success has long been highlighted by DeLone and McLean (1992). They argued that study in this particular area has been elusive since each author may define IS success according to their own measures. In the particular electronic commerce environment, the similar problem is prevalent since there are inconclusive measures to do so. Some people use technical measures such as hit and page view (Kroll 2000; Rose et al.

1999). While others use strategic assessments, for example the firm's goal attainment and competitive advantage. These inconclusive assessments, then, call for a more comprehensive electronic commerce measure that can accommodate multiple criteria of success.

In this vein, the current study aims to develop a framework for assessing electronic commerce success. In doing so, the factors affecting e-commerce success are identified. To which the success has resulted from the interplay of these factors is measured using multiple criteria derived from prior studies. The framework provides four scenarios for factors affecting electronic commerce success. They are classified depending whether they are 'drivers' or 'impediments' of e-commerce success, and whether the impacts are on internal or external organization.

This paper is structured as follows. The next section presents the theoretical background to develop electronic commerce success framework. This followed by elaboration of both drivers and impediments of e-commerce. The hypothesis development is provided next. Then, the target sample, measures and the data analysis method are explained in the research method section. The following section presents and discusses the findings. Finally, the study concludes with the discussion of the implications of this study results.

Theoretical Perspective on Factors Affecting Electronic Commerce Success

This study develops electronic commerce success framework using a blend of multiple criteria. It is argued that the success or failure of electronic commerce is

Table 1. **Electronic Commerce Success Framework**

		Locus of Impact	
		Internal	**External**
Contribution to Success	**Driver**	1. Cost Leadership 2. Reputation *Cell 1* 3. Market 4. Business Entry	1. Product Pricing 2. Time Spent *Cell 3* 3. Convenience 4. External Relationship
	Impediment	1. Financial 2. Risks *Cell 2* 3. Expertise	1. Customer's Expense 2. Delivery Time 3. Transaction Risk *Cell 4* 4. Access

largely determined by the ability to minimize the impediments and to extend the drivers. Therefore, these driver and impediment factors have been accounted into the framework. To obtain comprehensive understanding of electronic commerce impacts, these dimensions need to be differentiated further according to the locus of impact whether they are internal or external. The internal impacts include benefits and impediments of company using e-commerce. The external impacts consist of both benefits and impediments to the external parties such as customers and suppliers. The framework can be seen in Table 1.

Electronic Commerce Drivers and Impediments

The literature suggests the tremendous positive impacts of electronic commerce as well as the inhibiting factors to adopt it. From the positive side, among others, cost saving is the most cited ones. E-commerce enables firms, among others, to reduce the telecommunication costs,

minimize warehousing expenses, and cut down the distribution chain that leading to cost savings. Firms are also benefited by the global reach of electronic commerce since it means the wider market base and opportunities to increase market share. These drivers as seen in the Table 2, undoubtedly attract businesses to plunge into the Internet.

However, authors also suggest some factors that may hinder the benefits of electronic commerce. Financial consideration is often mentioned as inhibitor to the adoption of electronic commerce (PricewaterhouseCoopers 1999). Computer and networking technology is still considered as expensive. Therefore, many companies especially the SMEs cannot afford the total costs of ownership of electronic commerce (De' and Mathew 1999; Nath et al. 1998). In addition, legal and liability issues are also perceived as a matter of concern. There are some other inhibiting factors reported in the literature such as the borderless nature of e-commerce that adds the complexity of the problems.

Table 2 - A Summary of Research on the Factors Affecting Success of Electronic Commerce

Authors	Research Approach	Sample	Industry	Contribution to the Success of Electronic Commerce			
				Internal Drivers	Internal Impediments	External Drivers	External Impediments
(Auger and Gallaugher 1997)	Survey	141	SMEs	✔	✔	✔	✔
(Benjamin and Wigand 1995)	Conceptual overview	N/A	N/A	✔	✔		
(Brynjolfsson and Smith 2000)	Survey	41	Retail			✔	
(Chan and Swatman 2000)	Case study	1	Steel Company	✔			
(De' and Mathew 1999)	Conceptual overview	N/A	N/A	✔	✔	✔	
(Ghosh 1998)	Conceptual overview	N/A	N/A	✔		✔	
(Grover and Ramanlal 1999)	Conceptual overview	N/A	N/A	✔			
(Keeney 1999)	Conceptual overview	N/A	N/A	✔		✔	
(Malone et al. 1987)	Conceptual overview	N/A	N/A	✔			
(Nath et al. 1998)	Interview	10	Mixed	✔	✔		✔
(Ng, Pan and Wilson 1998)	Survey	98	Mixed	✔			
(Palmer 1997)	Survey	120	Retail			✔	✔
(Poon and Swatman 1999)	Survey	59	SMEs	✔			
(Poon and Swatman 1998)	Survey and Case Study	23	SMEs	✔			
(PricewaterhouseCoopers 1999)	Survey and Interview	N/A	SMEs	✔	✔	✔	✔
(Riggins 1999)	Conceptual overview	N/A	N/A	✔		✔	
(Rose et al. 1999)	Conceptual overview	N/A	N/A		✔		✔
(Saunders 2000)	Conceptual overview	N/A	N/A		✔	✔	
(Shon and Swatman 1998)	Delphi survey	19	Mixed			✔	
(Strader and Shaw 1997)	Conceptual overview	N/A	N/A	✔		✔	
(Strader and Shaw 1999)	Survey	48	Mixed			✔	✔
(Venkatraman 2000)	Conceptual overview	N/A	N/A	✔		✔	✔
(Wigand 1997)	Conceptual overview	N/A	N/A	✔			

Electronic Commerce Success Framework

Prior studies suggest that there were no conclusive measures of electronic commerce success. It has always been difficult to measure the impact as well as the success of electronic commerce. Prior studies suggest the use of computer-reported measures that are considered as more objective (Straub et al. 1995). An example of this kind is the 'hit,' which is regarded as an operational approach. However, the use of 'hit' measurement could be less meaningful than other methods and can be misleading (Ayres 2000). Using the hit as a measure, the number of people visiting the web site is counted based on the number of IP addresses that download pages from a site. A problem will arise when visitors use the Internet in public facilities such as offices and schools, since it means the web site will only record one individual from that IP address, regardless the number of people from that particular place visiting the same site. Another problem could emerge from internal maintenance activities. The employee who performs the job will be regarded as visitor; therefore, the 'hit' measure will still count (Rose et al. 1999). Nevertheless, it has nothing to do either with the number of transactions taking place from the web site, or with the profit generated from net buying.

Due to the limitation of the 'hit,' other techniques have been devised to obtain better measures. 'Page view' might be considered as better since it brings time variables rather than merely the number of visitors. It shows the number of page downloaded by visitors over a given period (Kroll 2000). Alternatively, 'stickiness' can also be used to measure a web site's performance. It does tell us how long each visitor remains on a site (Kroll 2000). The longer they are there, the more chance they will buy the products offered. Finally, the 'conversion rate' is the comprehensive one and regarded as more powerful than prior measures. The metric is obtained by dividing the number of visitors over a period with the number of visitors who take action, such as purchase (Gurley 2000).

There is also a strategic approach to measure electronic commerce success. The measures used were adapted from the IT field, as demonstrated by Sethi and King (1991) who attempted to assess the competitive advantage that resulted from the use of IT applications. A similar assessment can be done in an electronic commerce context, measured in terms of the competitive advantage attained. Another study by DeLone and McLean (1992) measured success in terms of the firm's goal attainment. Rather than depending on one approach, the current study uses both operational and strategic approaches to measure electronic commerce success. Combining the key factors affecting such success and the measures thereof, it might be expected that the framework will be both comprehensive and robust.

Description of the Key Factors of Electronic Commerce Success and Hypotheses

This section describes some factors believed to affect electronic commerce success.

Internal Driver

The higher the 'internal driver,' the more successful the electronic commerce. The internal driver is defined as *perceived/ expected benefits in using e-commerce.*

Cost Leadership. The more cost saving is gained from the use of electronic commerce, the higher the internal driver. The literature shows that electronic commerce can reduce the costs associated with the information processing needed to perform the company's primary process (Auger and Gallaugher 1997; Benjamin and Wigand 1995; Grover and Ramanlal 1999; Malone et al. 1987; Ng et al. 1998; Poon and Swatman 1999; Venkatraman 2000; Wigand 1997). Such cost saving can be attained by using net-based catalogues, automatic credit card authorization and minimizing human error (Auger and Gallaugher 1997). Chan and Swatman (2000) demonstrate that electronic commerce can reduce the inventory cost. The presence of electronic commerce reduces the layers of intermediaries that in turn reduce the distribution cost (Benjamin and Wigand 1995; Ghosh 1998; Ng et al. 1998; Riggins 1999). Therefore, e-commerce is extra channel to distribute products –even in some cases, bypassing existing channels. Some authors argue that e-commerce is a low cost marketing medium since it enables firms to disseminate information regarding products and services globally at minimum cost (Auger and Gallaugher 1997; Nath et al. 1998; Poon and Swatman 1999; Strader and Shaw 1997). Auger and Gallaugher (1997) shows that the decision to establish an internet presence is highly influenced by the promotional benefits.

Reputation. The higher an organization's reputation to be gained from the presence on the Internet, the higher the internal driver. E-commerce is reported as to have ability to increase the company's reputation (Auger and Gallaugher 1997; De' and Mathew 1999; Nath et al. 1998; Poon and Swatman 1999). This is even more prevalent for larger businesses than smaller ones (Auger and Gallaugher 1997).

A study by Nath et al. (1998) reveals that the presence of an organization on the Internet may be triggered by like action on the part of their competitors. It might be considered that the company's image will be undermined if it does not follow a competitors' action.

Market. The higher market improvement gained from the use of e-commerce, the higher the internal driver. The Internet has opened new opportunities to access a broader market. Electronic commerce can help firms to sell products and services to an overseas market more easily (Nath et al. 1998; Riggins 1999). Furthermore, Auger and Gallaugher (1997) reveal that the Internet consumers are more affluent and educated than the average people. Indeed, they are a potential target market for particular products and services such as computer hardware and software, insurance, and banking. Also, e-commerce allows firms to 'learn' about their consumers' preference when tracking visits to particular web sites. In doing so, sometimes consumers and visitors are asked to fill in questionnaires or membership forms. Alternatively, firms use particular software such as 'cookies' to collect such information. Often, consumers and visitors are not aware that they are under 'surveillance' and that their actions can be tracked. In addition, information collected using these techniques can be used to conduct market research (Auger and Gallaugher 1997; Ng et al. 1998; Poon and Swatman 1999).

Business Entry. The greater equality of entry, the higher the internal driver. It is considered that e-commerce has a low barrier to entry even for small businesses (Nath et al. 1998). Since there is no single party can claim to be the owner of the Internet, it is open to everybody including business.

Based on the discussion on these internal driver factors, it is possible to suggest the following hypothesis:

H_1: *There is a positive and significant relationship between the 'internal driver' and electronic commerce success.*

Internal Impediments

The lower the 'internal impediment,' the more successful the electronic commerce. 'Internal impediment' is defined as *perceived constraint or likely constraint in using e-commerce.*

Finance. The lower the financial concern in regard to the use of electronic commerce, the lower the internal impediment. The Internet is believed to be able to deliver goods and services more cheaply. This provokes some people to seek bargains on the Internet. However, this phenomenon does not necessarily mean more profit for the businesses concerned. While the number of transactions might go up on one hand, on the other, there could be a decrease in profit margin per transaction (Benjamin and Wigand 1995). Another financial concern regarding the implementation of electronic commerce is the total cost of ownership (De' and Mathew 1999; Nath et al. 1998; Saunders 2000) such as set-up costs, connection costs, hardware costs and maintenance costs, among others. The total amount of costs together with unpredictable results may result in barriers to participate in e-commerce.

Risks. The lower the risks of electronic commerce, the lower the internal impediment. Kalakota and Whinston (1996) define security threat as "a circumstance, condition or event with the potential to cause economic hardship to data or network resources in the form of destruction, disclosure, modification of data, de-

nial of service, and/or fraud, waste and abuse." Online businesses have certain security risks, such as viruses and hackers, due to the presence of a web server on their sites (Saunders 2000). Further risk factors include the fact that the web-based databases might be copied, stolen, altered or destroyed by unauthorized users. The results might range from spoilt reputation to serious damage, even lost of a whole database (Saunders 2000). Although many techniques such as a firewall can be used to protect the online database, the risks are still there since hackers will always attempt to find the security loopholes. Indeed, the real threat often exists within the business boundaries rather than from external sources (Rose et al. 1999).

Another impediment is that online businesses often find it difficult to monitor the use of the web site (Auger and Gallaugher 1997). Although statistics from the visitors who log on to the website may help, a lot of visitors' information remains unknown. Some companies require registration procedures before someone is granted an authorization to visit the web site and require that cookies be placed in the user's computer. This mechanism allows the company to analyze the visitor's pattern of use.

Nath et al. (1998) demonstrated that legal issues are an important consideration in conducting online business. A subsequent study by *PricewaterhouseCoopers* (1999) validates these findings. There are many questions regarding legal and liability issues. The enforceability of cyber law, legal jurisdiction, intellectual property rights and electronic evidence validity are some of these questions (Pricewaterhouse Coopers 1999).

Expertise. The easier it is to find experts in electronic commerce, the lower

the internal impediment. Electronic commerce involves some areas of expertise such as the web developer, the content provider and customer service (Nath et al. 1998). The market need for people with these skills is quite high. Therefore, it is not an easy task and could be expensive to acquire and employ these people internally. Outsourcing, therefore, then becomes a possible answer to such problems.

The extensive discussion above leads to the suggestion regarding the relationship between impediment factors and e-commerce success:

H_2: *There is a negative and significant relationship between the 'internal impediment' and electronic commerce success.*

External Driver

The higher the 'external driver,' the more successful the electronic commerce. The external driver is defined as *perceived/ expected benefits to the external parties as a result from the company using e-commerce.*

Product Pricing. *The cheaper products and services are priced on the Internet compared to their retail shop price, the higher the external driver.* Theories suggest that online shops might be able to deliver better value for money on products and services than retail shops due to cost savings. Strader and Shaw (1997) argue that the presence of an electronic market in regard to particular products and/or services such as, books, music and airline tickets, has reduced the likelihood of consumers being overcharged due to limited information regarding other prices. This notion is supported by their subsequent study (Strader and Shaw 1999). Additionally, Brynjolfsson and Smith (2000) in which they found that Internet prices are lower than retail outlet prices depending on the products' cost structures and product types. However, this is not always the case. According to Palmer (1997), although the mean web store price is the lowest, price differences between a web store and other formats such as catalogue and cable TV are not significant.

Time Spent. *The higher the time saving from the use of e-commerce, the higher the external driver.* One benefit of electronic commerce for consumers is time saving (Lynch and Lundquist 1996). Kalakota and Whinston (1997) use 'time compression' as an expression to illustrate the capability of electronic commerce in shortening the business cycle. As such, time required in certain processes of product purchasing, including order time, processing time, queuing time and payment time could be reduced considerably. In doing so, many web sites are offering facilities, for instance online catalogues, shopping carts and online payments. For particular products such as software, these web sites are often able to deliver the product online (Riggins 1999).

Convenience. *The more convenient the e-commerce, the higher the external driver.* For some people, doing transactions online is considered more convenient than at the 'bricks and mortar' shop due to certain factors including flexibility of business hours. Electronic commerce allows businesses to open their virtual outlets 24 hours x 7 days a week (Saunders 2000) so consumers can 'go shopping' at their convenience. Furthermore, some online businesses offer online payment mechanisms using credit cards. However, it is recognized that many people are concerned about the use of credit cards in online payment. Therefore financial transaction systems to overcome that problem have been developed, for instance by us-

ing 'internet payment systems' (Shon and Swatman 1998). Another e-commerce convenience is the possibilities of delivering streamlined transactions as well as personalized service (De' and Mathew 1999; Ghosh 1998; Venkatraman 2000). Customers can accomplish the transactions simply in one click. The need for repeated information and multiple forms can be minimized using 'software agents' that automate tasks (Riggins 1999).

External Relationship. The better the external relationship, the higher the external driver. The presence of electronic commerce can lead to better and easier interaction with customers as well as suppliers (Ghosh 1998; PricewaterhouseCoopers 1999). Customer service functions can benefit from the interactive nature of web-based applications that facilitate customer feedback and enquiries through various means, for example e-mail and online survey (Auger and Gallaugher 1997; Riggins 1999). To give such easy, 24 hours-a-day availability, with the possibility of quick response, online businesses may offer an online help desk —such as "FAQ" facility— to provide answers to the customers' enquiries with less direct human involvement. An online survey by *Pricewaterhouse Coopers* (1999) revealed the most significant potential benefit of electronic commerce realized by small and medium enterprises (SMEs) is customer-focused service and information exchange. The study results suggest that there is growing awareness of the possibilities of enhanced and more efficient customer-supplier relationship (B2B) among SMEs.

Considering the literature related to the external drivers of e-commerce, it is possible to suggest the following hypothesis:

H_3: *There is a positive and significant relationship between the 'external*

driver' and electronic commerce success.

External Impediment

The lower the 'external impediment,' the more success the electronic commerce. The external impediment is defined as *perceived/expected impediments faced or likely to be faced by external parties in dealing with the company using e-commerce.*

Customer's Expense. The lower the cost to participate in e-commerce, the lower the external impediment. To be able to participate in an e-market, consumers have to get access to the Internet. While some consumers may use free access in the office or at school, others have to pay an internet connection fee and telephone charges which vary among service providers. Strader and Shaw (1999) who named these costs 'market costs' stated that in an e-market consumers have market costs that they do not pay in the 'bricks and mortar' market. In addition, they argued that the extent to which these costs can be minimized would determine the choice between e-market and traditional market. A similar view was presented by Keeney (1999) who addressed the role of 'value proposition' —which includes the benefits and costs of ordering product online— in influencing the means of purchasing products and/or services.

Delivery Time. The faster the delivery time, the lower the external impediment. Compared to other retail formats, the online store seems to lag behind in terms of the deliveries of products and services (Palmer 1997). Most products cannot be delivered immediately with the exception of digital products such as software, which can be downloaded and used almost instantly. Hence, to compete with

retail shops or other formats, online businesses have to minimize the delivery time. Otherwise, many people will seek the medium which offers the quickest delivery time.

Transaction Risks. The lower the transaction risks, the lower the external impediment. Undoubtedly, many people are reluctant to shop online due to 'perceived' security issues (Auger and Gallaugher 1997; Furnell and Karweni 1999). The Internet is often seen as unsecured place to conduct business transactions. When transaction data is sent through the Internet, there is always a chance that someone —wherever he or she is— will eavesdrop and intercept that information to use it for his or her own interests (Nath et al. 1998). Credit card fraud is classical example of this kind: using someone else's credit card details, one attempts to buy goods from online shops. It is argued that such problems mostly tend to be a managerial rather than a technological problem (Rose et al. 1999). Another risk that may hinder B2C electronic commerce is privacy. The challenge is to convince customers that their information details are safeguarded, strictly confidential and will only be used for delivering superior value to them (Rose et al. 1999). Further, the cyber privacy intrusion in the form of unsolicited e-mail and the use of 'cookies' to track the users behavior may be seen by many as a disincentive to the use of e-commerce.

Access. The higher the Internet access speed, the lower external impediment. To attract visitors' interest, web sites often use high-resolution graphics, video and audio streaming, which are usually large files. Therefore, a high-speed Internet access is required, which unfortunately is not always easy to obtain (Auger and Gallaugher 1997). Otherwise, web

site presentation might be slow, delayed and disrupted leading to visitors' dissatisfaction. Indeed, Rose et al. (1999) argue technological impediment is not merely a matter of file size. It also pertains to the nodes' configuration technology, the infrastructure of the network as well as bandwidth connection.

Based on the discussion above, it is possible to hypothesize the relationship between the external impediments and e-commerce success:

H_4: *There is a negative and significant relationship between the 'external impediment' and electronic commerce success.*

Research Method

Sample and Procedure

The samples of this study were obtained from *Australia's Business Who's Who Directory* –September 2000 edition. The selected sample companies that had homepage and/or e-mail address as proxy of the e-commerce existence were invited to participate in both pilot test and main survey. The pilot test was done in order to assess the research instrument. In this step, 32 companies in Western Australia were selected. Responses from 8 companies were received which one of them was incomplete. Based on the responses from 7 samples, there were few typos found and some suggestions received. Then, the minor revisions had been done to develop the final questionnaire.

In the main survey, the top 999 Australian companies based on annual revenue were selected from the directory. The mail questionnaire was sent to each company that included the questionnaire, a letter explaining the purpose of the research and a reply paid envelope. The

target respondents were IT managers and/ or CEOs. However, we asked the person who received the research instrument to hand over the questionnaire to the most appropriate person if they were not. In this stage, 101 responses were returned. However, it was found that 2 responses were incomplete that left 99 usable responses. In addition, there were 22 undelivered questionnaires and 3 companies were declined to participate for some reasons.

In order to improve the response rate, the reminder was sent to 593 companies. This attempt was resulted in 41 undelivered questionnaires, 14 companies declined to participate, 2 incomplete and 23 usable responses. Therefore, 122 usable responses obtained from the main survey. Since there were only minor corrections in pilot test, then the responses from the prior stage were added into the main survey results. Thus, it resulted in final sample of 129 responses (13.3% response rate). The low response rate was probably caused by 'over researched' phenomena in which one target samples may have received too many questionnaires from various sources. This notion was indicated by the letters from some respondents who declined to participate in the study due to unmanageable questionnaires they received.

The returned questionnaires showed that the responses were mostly in the context of the entire company (87.1%) rather than their specific business unit (12.9%). In terms of business types, 43.4 percent of respondents perform both B2B and B2C. Meanwhile, respondents who conduct B2C only and B2B only are accounted for 10.1 percent and 24.8 percent, respectively. Further, the majority of participants (56.3%) have been using e-commerce for 1-3 years; the remaining participants have been using it less than one year (17.5%) and more than 3 years (26.2%). Next, the

responses demonstrate that 36.5 percent of samples able to conduct online orders and online customer service, 29.8 percent of samples have website without any advanced capability, 26 percent of participants able to perform complete transactions and receive payment over the web, and 2.9 percent of participants only have very basic internet capabilities. In regard to the payment systems, the most respondents (52.1%) still rely on conventional methods of payment, yet some of them (27.7%) do the online order. Only few participants (2.1%) ask the customers to have membership before they can make order and payment. 13.8 percent of participants asked for credit card details when their customers make online order. The combination of above-mentioned payment systems has been used by 21.3 percent of participants. Finally, the market base for companies that use e-commerce is still Australia-wide (55.8%). This includes those companies that operate in one state and accept customer from that state. 42.3 percent of respondents have customers from both Australia and overseas. The minority of samples (1.9%) focuses on overseas market only.

Measures

The measures used in the study were adopted from the past literature. The six-point Likert scale ranged from strongly disagrees to strongly agree was used in all independent observed variables, item ECS1 and item ECS2. Meanwhile, the five-point Likert scale was used in ECS3-ECS6.

Data Examination

Before the data were analyzed, it was necessary to assess its properties. The raw data showed some missing values, which

then was imputed using Estimated Means (EM) method. Next, the data were tested for assumption of multinormality. Although the results showed that the Kolomogorov-Smirnov normality test showed the distribution anomalies in all items, the skewness and kurtosis of each item fell within the acceptable range (± 2).

In terms of number of cases, some people argued the minimum cases to run structural equation analysis was about 200 and/or ten times the number of observed variables in the most complex construct. However, the recent article by Gefen et al. (2000) demonstrated that the required minimal sample size was around 100-150 cases. Thus, this study with 129 cases was con-

sidered appropriate to run the LISREL program.

The Analytical Model

The analytical model as seen in the Figure 1 was created according to hypothesizes stated above. The data was analyzed using the Lisrel 8.3 software.

In terms of the variables, there are 4 exogenous variables (Ksi) and one endogenous variable (Eta). *The first exogenous* variable is the 'internal driver' that includes following observed variables items —cost leadership, reputation, market and business entry. *The second* Ksi is 'internal impediment' contains several observed variables such as financial, risk and exper-

Figure 1. Electroninc Commerce Success Model
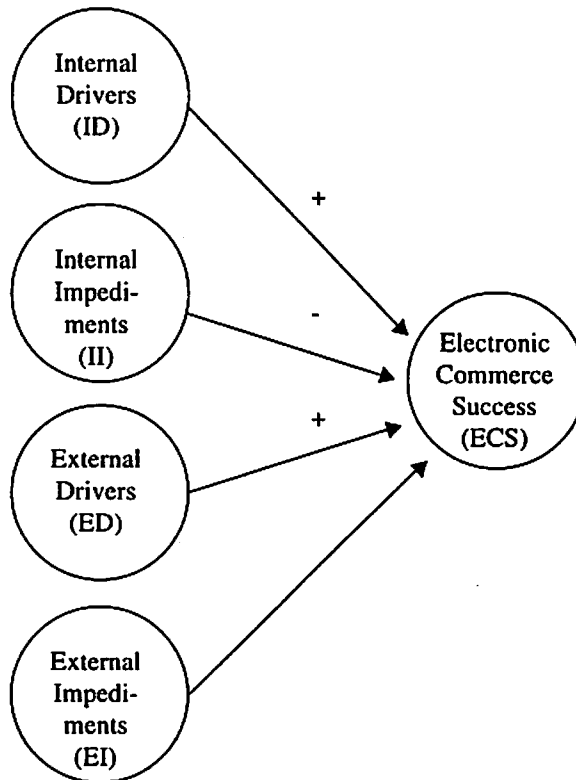
tise. *The third* latent variable is 'external driver' includes following items: product pricing, time spent, convenience, and external relationship. *Finally*, the exogenous variable 'external impediment' comprises items as follows: customer's expense, delivery time, transaction risk and access. The only endogenous variable (Eta) in this model is 'electronic commerce success' which is measured by observed variables 'competitive advantage,' 'firm's goal,' 'conversion rate,' 'page view,' 'stickiness' and 'hit.'

Before conducting the full SEM analysis, it was necessary to examine the measurement properties of the model. This stage can be done using one-factor congeneric measurement model (Holmes-Smith 2000). The use of one-factor congeneric measurement model was to overcome the need of large data set in LISREL, which sometimes was unrealistic in very small population. In doing so, an iteration using LISREL was performed on each construct. In the case that the particular construct had 6 observed variables then the data set of 129 cases as in this study was more than enough to satisfy ten cases for each observed variables. The similar step was undertaken on each construct in the model. Thus, using such procedure, it was expected that the results were better than the iteration was conducted at once with all constructs. This procedure was also expected to produce robust constructs that included tests of construct reliability (r > 0.50), convergent validity (parameter t-value > 1.96) and discriminant validity. Each construct was examined to find out a nonsignificant parameter, which could be fixed to zero or deleted. The results were parsimonious constructs with reasonable fit indicators such as RMSR, GFI and Normed Chi-Square.

Results

Assessment of Measurement Properties

Assessment of Convergent and Discriminant Validity. The one-factor congeneric measurement model was applied to each construct. The model re-specifications were undertaken to improve the fit of the model. This included the deletion of nonsignificant estimated parameter and freed the parameters that share large error variance. The estimated parameter that is also known as loadings is one of reliability assessment. The procedure was undertaken until the satisfactory fit of the model was reached and there was no statistical and theoretical justification for further modifications. The step-by-step model re-specification on each construct can be seen in Table 3.

The results of one-factor congeneric measurement model that was performed on each construct were 5 latent variables and 24 measures left (see Table 4). This suggested that there were reduction in the number of independent observed variables from 30 items to 20 items and reduction the number of dependent observed variables from 6 items to 4 items. The remaining measures were regarded as support the convergent validity requirements because they demonstrated the significant t-values.

In terms of discriminant validity, data showed a problem on ID and ED constructs if we use a formula suggested by Holmes-Smith (2000) who cited Fornell and Larcker (1981). Holmes-Smith (2000) maintains that the requirement of discriminant validity is that the correlation between constructs should be less than the average variance extracted for two con-

Table 3. Assessment of Unidimensionality and Convergent Validity using the Congeneric Model

Item	Fit Indices					

Electronic Commerce Success (ECS)

Hypothesized Model	ECS1 ... ECS6	$X^2 = 88.3$	df=9	p=0.00	GFI=0.81	RMSR=0.15
Iteration 1	ECS1, ECS3-ECS6	$X^2 = 23.48$	df=5	p=0.00027	GFI=0.93	RMSR=0.061

In the interest of parsimony, item ECS2 was deleted because ECS2 shared significant error variance with ECS1, but ECS2 has lower loading than ECS1. Theoretically, this attempt can be justified since company's goals may compriseof achieving the competitive advantage.

Iteration 2	ECS1, ECS3, ECS4, ECS6	$X^2 = 2.98$	df=2	p=0.21	GFI=0.99	RMSR=0.031

In the interest of parsimony, item ECS5 was dropped since it shared significant standardized residuals with other two items (ECS4 and ECS6). The results show the final model.

Internal Driver (ID)

Hypothesized Model	ID1 ... ID9	$X^2 = 79.14$	df=27	p=0.00	GFI=0.88	RMSR=0.085
Iteration 1 and 2	ID1 ... ID7	$X^2 = 68.65$	df= 14	p=0.00	GFI= 0.87	RMSR=0.098

Items ID8 and ID9 respectively were dropped because they had practical non-significant loading. Hair et al. (1998) suggest that to be practical significant, the loading factor score should be above ± 0.30.

Iteration 3	ID1,ID3 ... ID7	$X^2 = 18.91$	df=9	p=0.026	GFI=0.95	RMSR=0.062

In the interest of parsimony, item ID2 was dropped since it shared significant standardized residual with ID3 and it had lower loading factor.

Iteration 4	ID1,ID4 ... ID7	$X^2 = 3.86$	df=5	p=0.57	GFI=0.99	RMSR=0.033

In the interest of parsimony, ID3 was deleted because it shared significant error variance with ID1 and it had lower loading factor. The results show the final model.

Internal Impediment (II)

Hypothesized Model	II1 ... II6	$X^2 = 13.40$	df=9	p=0.15	GFI=0.97	RMSR=0.60
Iteration 1	II2 ... ID6	$X^2 = 3.32$	df=5	p=0.65	GFI=0.99	RMSR=0.034

Item II1 was deleted since it had non-significant t-value. The results show the final model.

External Driver (ED)

Hypothesized Model	ED1 ... ED9	$X^2 = 82.27$	df=27	p=0.00	GFI=0.88	RMSR=0.091
Iteration 1	ED1,ED3 ... ED9	$X^2 = 43.15$	df=20	p=0.002	GFI=0.92	RMSR= 0.068

Item ED2 shared significant error variance with ED3. In the interest of parsimony, ED2 was deleted because it has lower loading factor.

Continued from Table 3

Item	Fit Indices				
Iteration 2 and 3	ED1,ED3, ED5 ... ED8	X^2 =12.73	df=9	p=0.18	GFI=0.97	RMSR=0.055
	ED9 and ED4 were deleted since they shared significant standardized residual while to correlate them cannot be justified theoretically.					
Iteration 4	ED3,ED5 ... ED8	X^2 =6.83	df=5	p=0.23	GFI=0.98	RMSR=0.044
	ED1 was deleted since it had non-significant t-value. The results show the final model.					

External Impediment (EI)

Hypothesized Model	EI1 .. EI6	X^2 =77.17	df=9	p=0.00	GFI=0.83	RMSR=0.14
Iteration 1	EI2 .. EI6	X^2 = 50.79	df=5	p=0.00	GFI=0.86	RMSR= 0.13
	Item EI1 was dropped because it showed a non-significant t-value.					
Iteration 2	EI2 .. EI6	X^2 = 3.92	df=4	p= 0.42	GFI= 0.99	RMSR= 0.046
	The error terms of item EI4 correlated with item EI5. It was justified since both items tap into the same treat —Transaction Risks. The results show the final model.					

Table 4. The Results of One-Factor Congeneric Measurement Model on Each Construct

Internal Driver
ID1	E-commerce enables cost savings in performing business activities.
ID4	Marketing costs become lower using e-commerce.
ID5	Using e-commerce leverages the firm's reputation.
ID6	E-commerce enables the firm to expand the base of consumers both nationwide and overseas.
ID7	E-commerce enables the firm to collect information from consumers and web visitors.

Internal Impediment
II2	The organization is concerned about the total cost of e-commerce ownership (e.g. set up cost, connection cost, hardware cost, and maintenance cost).
II3	E-commerce increases security risks.
II4	It is difficult to monitor visitor activities in firm's web site.
II5	Legal issues are matter of concern in e-commerce transactions.
II6	It is difficult to obtain experts in e-commerce

External Driver
ED3	E-commerce allows consumers to find and select products faster.
ED5	E-commerce allows the firm to offer personalized services for customers.
ED6	E-commerce allows consumers to pay online.
ED7	Consumers can perform transactions easily.
ED8	E-commerce enables the firm to provide 24 hours, 7 days a week customer service.

External Impediment
EI2	Delivery cost is a consumer's concern when conducting transaction online.
EI3	Delivery time is a consumer's concern when conducting transaction online.

Continued from Table 4

EI4   Security is a consumer's concern when conducting transaction online.

EI5   Privacy is a consumer's concern when conducting transaction online.

EI6   Slow internet access is a barrier for consumers in conducting transactions online.

Electronic Commerce Success

ECS1   In general, e-commerce contributes significantly to meeting the organization's goal.

ECS3   The conversion rate of my company's e-commerce is:

ECS4   The number of unique visit visiting a site.

ECS6   The length of time visitors remain on a site.

Table 5. Assessment of Discriminant Validity (Holmes-Smith 2000)

	Construct	Average Variance Extracted	Square of Correlation between Construct
ID with:	II	0.277314	0.0324
	ED	*0.301101* *	*0.7225* *
	EI	0.342964	0.0004
II with:	ED	0.256645	0.0289
	EI	0.298509	0.0361
ED with:	EI	0.322296	0.0025

*Note: *The italic fonts indicate problem of discriminant validity*

structs. Table 5 indicated all but one (ID with ED) entry examined satisfy discriminant validity criteria. However, if discriminant validity was measured using Venkatraman (1989) and Sethi and King (1991) procedures, the results satisfied the discriminant validity requirement. Table 6 demonstrated that all unconstrained models fit were significantly lower (better) than the constrained models fit. This meant the tested constructs were different.

The complementary analysis procedure that was performed was predictive validity (Venkatraman 1989; Sethi and King 1991). As such, this study examined the validity of the exogenous variables to predict the endogenous variable, the e-commerce success. The results shown in

Table 7 suggested a support for predictive validity of two key driver factors, ED and ID because both factors were significantly associated with the success of electronic commerce. On the contrary, the other two impediment factors failed to predict ECS factor. Although both factors II and EI showed negative correlation with ECS, which were supported by literature, such correlations were not significant. In general, the assessment of four exogenous variables and one endogenous variable provided partial support for the predictive validity of these constructs.

Assessment of Reliability. As suggested by Holmes-Smith (2000), in order to obtain the degree to which a set of measures indicate the common latent con-

Table 6. Assessment of Discriminant Validity (Venkatraman 1989)

Description	ML Estimate ϕ	T-Value	X^2 Statistics Constrained Model (df)	Unconstrained Model (df)	Diference
ID with:					
● II	0.04	1.56	101.95 (35)	58.50 (34)	43.5*
● ED	0.12	2.41	90.33 (35)	59.33 (34)	31*
● EI	0.01	0.41	79.02 (34)	38.12 (33)	40.9*
II with:					
● ED	0.02	1.06	92.93 (35)	51.41 (34)	41.52*
● EI	0.05	1.53	100.05 (34)	69.43 (33)	30.62*
ED with:					
● EI	-0.01	-0.48	172.71 (34)	58.95 (33)	113.76*

* $p < 0.001$

Table 7. Predictive Validity

Factors	ECS γ	T-value
Internal Driver	0.75	3.95 **
Internal Impediment	-0.04	-0.28
External Driver	0.62	2.34 *
External Impediment	-0.09	-0.78

* $p < 0.05$ ** $p < 0.01$

Table 8. Construct Reliability

Construct	ρ_η
Internal Driver (ID)	0.687353
Internal Impediment (II)	0.579409
External Driver (ED)	0.645446
External Impediment (EI)	0.700712
Electronic Commerce Success (ECS)	0.679726

Table 9. Goodness-of-Fit Indices and Gamma Loadings of the Initial Structural Model

Loading	ID	II	ED	EI
ECS	0.70 (t=3.95)	-0.19 (t=-1.50)	0.38 (t=2.06)	-0.16 (t=-1.75)
Goodness-of-Fit Indices				
X^2= 511.53	P = 0.000	d.f. = 248	RMSR = 0.13	GFI = 0.75

struct, therefore, construct reliability (r) was examined using the following formula:

$$\rho_\eta = \frac{(\Sigma \lambda_i)^2}{(\Sigma \lambda_i)^2 + \Sigma \, \epsilon_i}$$

The results indicate that all 5 constructs have satisfactory reliability, considering that all ρ are greater than 50 percent. The construct reliability scores for all 5 constructs is shown in Table 8.

Assessment of the Structural Model

The constructs that had been assessed for its reliability and validity were again examined in terms of structural model. Four latent independent variables (Ksi) with 20 measures and one latent dependent variable (Eta) with 4 measures were included into the structural model. The initial structural model then was respecified to improve the model fit. However, it is worth noting to interpret and evaluate the results from re-specified model fit cautiously. Such attempt should be viewed as "data driven exploratory model fitting" (Segars and Grover 1993: 521) rather than model confirmatory. The hypothesized (initial) model depicted in Figure 2 produced the goodness-of-fit indices and loading scores from ECS to ID, II, ED and EI.

The initial structural model supported hypothesizes H_1 and H_3, although the model fit showed the marginal satisfactory goodness-of-fit indices. Unfortunately, hypotheses H_2 and H_4 were not confirmed since both Internal and External Impediment showed nonsignificant negative effect on Electronic Commerce Success. The model re-specification can be undertaken because the results indicated some factors —individually and/or share with other factors— have high residuals, and the presence of nonsignificant loadings. In doing so, Holmes-Smith (2000) suggests that the nonsignificant parameters can be fixed to zero, which indicates no relationships between the parameters. Therefore, in the revised structural model, loadings EI – ECS and II–ECS were fixed to zero in the first iteration. Then, to further improve the model fit, item ECS6 was correlated with ECS3 since the first iteration results showed that it shared high residual with ECS3. The correlation between ECS6 and ECS3 in the second iteration was plausible since people may try to find the products information before they take an action such as buying them. This attempt has slightly improved the Normed Chi-square (χ^2/d.f.) from 2.06 to 2.02 as well as the RMSEA from 0.091 to 0.089. Finally, the revised structural model results as seen in Table 10 supported hypotheses H_1 and H_3. Both Internal Driver (g= 0.68, t= 3.94) and External Driver (g= 0.54, t= 2.42) factors

Figure 2. The Electronic Commerce Success - Initial Model
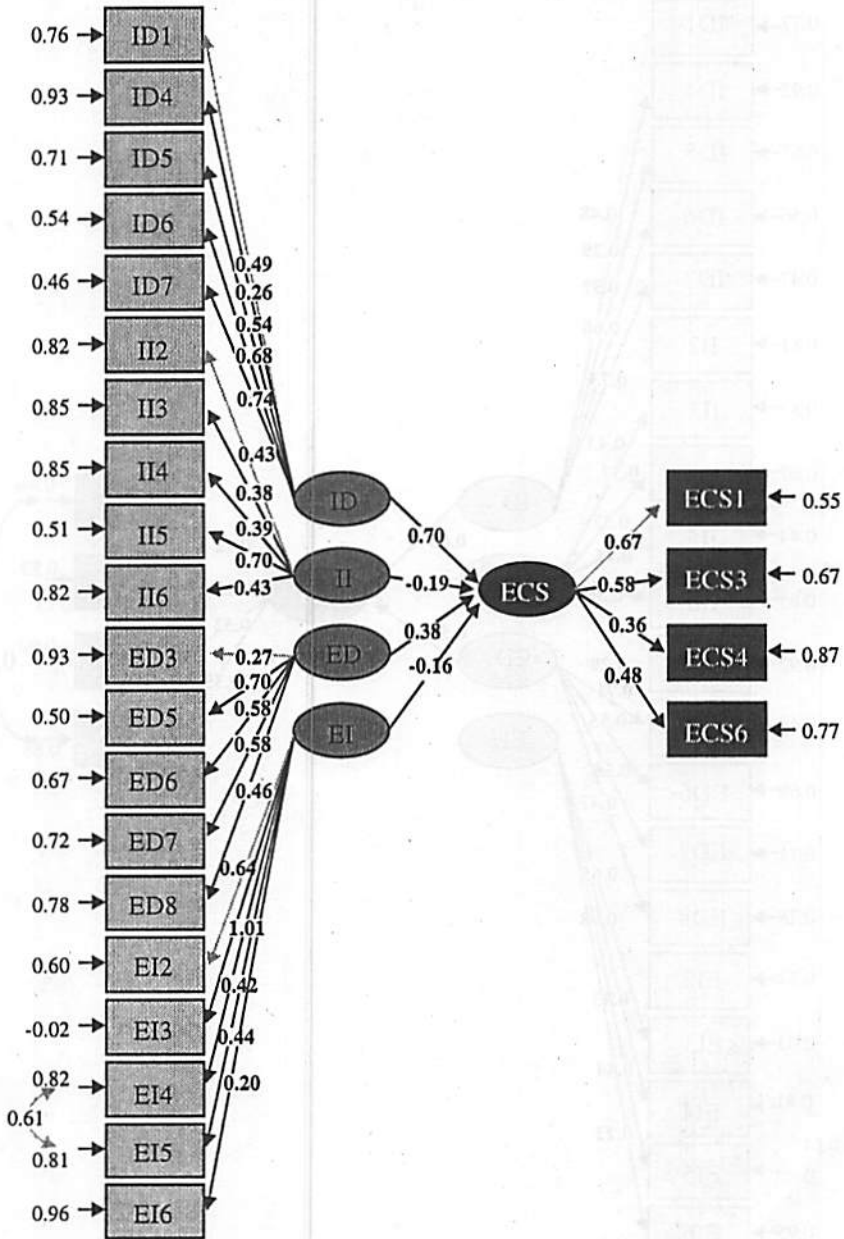
Chi-Square= 511.53, df= 248, P-value= 0.00000, RMSEA= 0.091

Figure 3. The Electronic Commerce Success - Revised Model
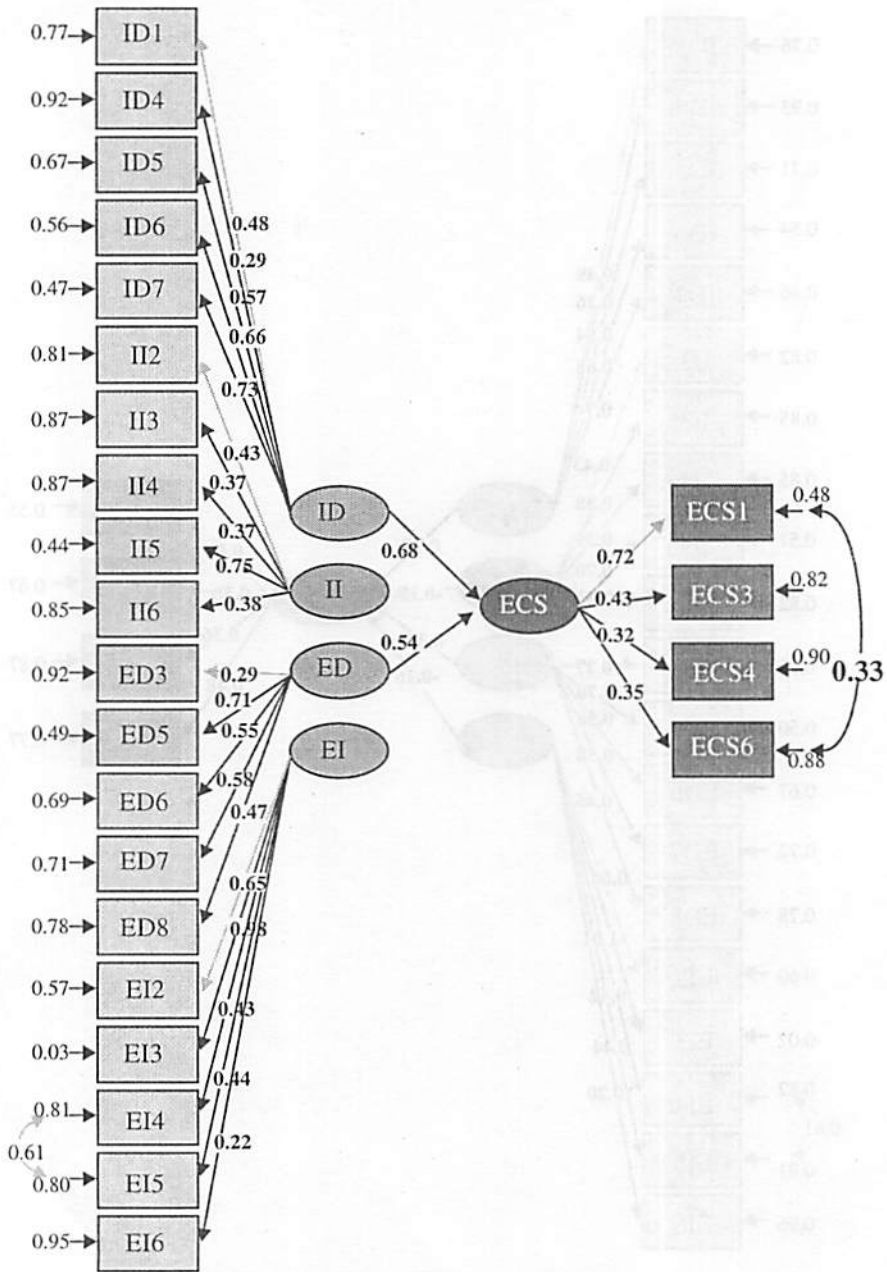
Chi-Square= 503.71, df= 249, P-value= 0.00000, RMSEA= 0.089

Table 10. Goodness-of-Fit Indices and Gamma Loadings of the Revised Structural Model

Iteration 1: Loading II and EI were fixed to zero

Loading	ID	II	ED	EI
ECS	0.69 (t=3.89)	-	0.41 (t=2.14)	-

Goodness-of-Fit Indices

X^2= 519.96	P = 0.000	d.f. = 250	RMSR = 0.13	GFI = 0.75

Iteration 2: Correlate ECS3 with ECS6 because they shared high residuals. This attempt can be justified since the longer customer visit the website, the higher chance to buy something there.

Loading	ID	II	ED	EI
ECS	0.68 (t=3.94)	-	0.54 (t=2.42)	-

Goodness-of-Fit Indices

X^2= 503.71	P = 0.000	d.f. = 249	RMSR = 0.13	GFI = 0.75

have positive direct effect on the success of electronic commerce. The final model is shown in Figure 3.

Discussion

The research procedures in terms of reliability, validity, one-factor measurement model, and structural model assessment have been undertaken to attain a robust and parsimonious model of the electronic commerce success. The one-factor congeneric model assessment screened the items on each construct. Items with low squared multiple correlation, which suggested problematic item reliability were then dropped. As results, only reliable items were used in the structural assessment. This followed by construct reliability evaluation that resulted in satisfactory score on each construct. In terms of discriminant validity assessment, although there were somewhat different results of the two different tests, it could be said that in general the results satisfied the discriminant validity requirements. Then, the predictive validity test, which was the optional procedure provided lack support for factors II and EI to predict ECS.

In congeneric measurement model phase, the number of observed variables decreased from 36 in the initial model to 24 in the final model. In terms ECS factor, two items ECS2 and ECS5 were dropped from the measurement model. Item ECS2 that measure the competitive advantage achieved from the use of electronic commerce, highly correlate with item ECS1 that measure the contribution of e-commerce to meeting the organization's goals. In the interest of parsimony, item ECS2 was dropped for the following reasons. Statistically, item ECS2 had lower loading than item ECS1 and theoretically, the idea of item ECS2 was tapped into the item ECS1. In addition, the deletion of item ECS5 that measure the 'page view' was reasonable since it showed a complex pat-

tern of relationship and its idea was similar to 'hit.'

The one-factor measurement model for construct Internal Driver resulted in 4 items were omitted. Item ID8 that assess the quality of the Internet customers compare to the retail shop customer received a weak support. The practical nonsignificant loading (Hair et al. 1998) might be caused by the item ID8 may not fit well with the higher level of abstraction Internal Driver. Alternatively, the respondents might not have the idea about the difference between the Internet customers and 'brick and mortar' shop customers. Further, another weak support was received by item ID9. The explanation for this is the idea of 'no barrier for entry' might not be clear enough. There was a chance that the respondents regarded some sorts of impediment as the barrier for entry into the e-commerce. In addition, in the interest of parsimony, both items ID2 and ID3 were deleted. This may due to items ID2 and ID3 that assess the reduction in warehousing and distribution costs reflected the general idea of cost savings as in item ID1. Therefore, the item ID1 was appropriate to absorb the idea of items ID2 and ID3.

In terms of Internal Impediment factor, the data did not support item ID1. The idea of reduction of profit margin per product might be misunderstood as the reduction in the company profit. Alternatively, this reflects the reality that the respondents see no such profit reduction due to e-commerce transactions. Moreover, the data indicates such a low support for external impediment item EI1, which assess the higher costs incurred by the customers in performing online transaction rather than in retail shopping. Another interesting finding is that items EI4 (security concern) covaries with EI5 (privacy concern) in the model re-specification pro-

cesses. This is consistent with the common view that both issues are intertwined —the security breach can harm the privacy and vice versa. As suggested by literature, both 'transaction risks' are seen as major problem to hinder the people to perform online transactions (Auger and Gallaugher 1997; Furnell and Karweni 1999; Nath et al. 1998; Rose et al. 1999).

Items ED1, ED2, ED4 and ED9 in External Driver factor were dropped during one-factor measurement model procedures. Item ED2 was regarded not as a robust measure of external driver since it shared significant residuals with item ED3 and it had lower loading factor than ED3. Thus, the notion of less time spent to shop online could be more appropriate to be represented by how fast the customers can find and select product online. In the interest of parsimony, items ED9 and ED4 were dropped since they shared significant residuals while to link them could not be justified theoretically. Finally, item ED1 was deleted because it had nonsignificant t-value.

Concerning the structural model, the findings showed that hypothesis *H1* was supported. This was consistent with literature in which Internal Driver factor predicted the perceived success of electronic commerce. In addition, hypothesis H_3 that suggested the association between External Driver and Electronic Commerce Success was also confirmed. Arguably, organizations seek to attain the superior values for external parties by utilizing the capabilities of e-commerce. Hence, these results that provided support for the benefit of e-commerce implementation for both organization adopters as well as customers validated the importance role of perceived usefulness in IT adoption and diffusion. While prior studies mainly focused on the internal benefit obtained by indi-

vidual user and organization adopter to represent the notion of usefulness, this study contributed to IT research domain by suggesting the importance of the benefit for the external organization such as customers. Hence, the Internet technology has enabled organizations to widen their IT orientation from internal support like automation of clerical tasks and data processing using traditional IT, into the more external orientation that incorporate and improve stakeholders' benefits.

The negative and nonsignificant relationship between the impediment factors and ECS factors (H_2 and H_4) indicated lack of support for both relationships. The negative relationships of the impediment factors and ECS indicated that the higher presence of these impediment factors lead to the lower perception of e-commerce success. Although both relationships showed the right direction, unfortunately the data did allow us to safely maintain the association of these factors and the success of e-commerce. This meant that amongst the Internet adopter organizations, the impediment factors were not regarded as important issues. Thereby, organizations perceived the e-commerce success in terms of the potential benefit obtained, which might be more visible rather than the reduction of impeding factors. As consequence, it is understandable that many *dotcoms* cannot maintain their business since they see primarily internal and external drivers as the precedent of electronic commerce success. The matter of fact, the importance of the impediment factors to determine the e-commerce success story is often less concerned.

To understand the unpredicted results on hypotheses H_2 an H_4, the target sample was then consulted. Considering

the nature of the samples that were the Internet adopter, the results on the impeding factors were plausible. The items in the corresponding construct could be more appropriate for 'would-be adopter' than for the real adopter since they were mostly related to the situation when respondent have not used the e-commerce. For instance, one item asked about the respondent's concerns on the total cost of ownership. Such question might not be relevant for the organization that has adopted e-commerce.

The presence of problem with regard to unprecedented results of hypothesis H_2 and H_4 revealed the limitation of this study, particularly, in instrument development. The future study could address this weakness by undertaking more rigorous procedure to obtain more robust instruments. Other limitation found in this study, among others, was the problem of discriminant validity. The results as seen in Table 5 that were examined using formula suggested by Holmes-Smith (2000), showed such problem. However, this problem could be mitigated since another test using Venkatraman's (1989) procedure yielded satisfactory results. The problem was also found in the predictive validity assessment. Two factors II and EI failed to predict the e-commerce success. Although predictive validity assessment was optional procedure, the results were concerned. Another limitation, the use of e-mail to send reminder letters with the questionnaires may lead to problems in improving the response rate. Although cheaper and faster, e-mail questionnaire is sensitive to the issues of computer virus and privacy. Nevertheless, these limitations make this study results should be interpreted cautiously.

Concluding Remark

To evaluate the success of electronic commerce, businesses need metrics. Past studies demonstrate the extensive use of operational measures such as the hit, the page view, the stickiness and the more recently, conversion rate. Additionally, to be comprehensive, the framework also incorporates strategic measures gleaned from the IT field. These measures capture the impact of electronic commerce on the businesses' goal attainment and competitive advantage. The literature also suggests some key factors that affect the performance of electronic commerce. Based on the direction of impact, the framework differentiates these factors into driving and impeding factors. These factors are then differentiated according to their contribution to the success of electronic commerce and according to the locus of impact. As an attempt to confirm the a priori framework, the current study proposes the analytical model using structural equation model.

The current study results indicate that the e-commerce's promised benefits for both internal organization as well as customers still the dominant factors to shape the perception of e-commerce success. This can also be interpreted that the main purpose of the e-commerce use by respected organizations is to attain the e-commerce advantages like cost savings and providing personalized service for customers, which may not available in the traditional IT. Further, the findings also suggest that organizations may not see the impeding factors, for instance security and privacy risk, as the important factors that can undermine the success of their e-com-

merce. Overall, while the literature maintain that the success story of e-commerce usage is built upon the ability to gain the promised benefits and to mitigate the impeding factors, this study concludes that organizations often experience 'IT myopia,' which only view the potential advantages of IT use while in the same time unaware of the factors may hinder the benefits attainment.

This study is by no means exhaustive or definitive. Further empirical study, as well as further extension of the variables delineated herein might be expected to improve and develop the suggested framework. The use of other analytical tools such as Partial Least Square based SEM maybe worth noting for the future studies. . A study extension could be undertaken using the more focused target sample such as SME to validate the study results. Further, as found in other study, the results of the current study are limited to the context of the Australian business context. According to Davis (1996), a study certainly has limitation in terms of generalizability. The current study is not an exception in which the findings are bound to the Australian business environment, which may not be applicable to other contexts. In addition, the nature of samples that are not randomly selected leads to the limited generalizability of the findings to the specific context (Sekaran 2000). Finally, the Electronic Commerce Success framework is an attempt to assess the factors relate to the perceived and/or expected success of e-commerce. Combination of multiple criteria to develop such framework is expected to contribute to the study of electronic commerce.

Reference

Applegate, L. M., C. W. Holsapple, Kalakota, R., F. J. Radermacher, and Whinston, A. B. 1996. Electronic commerce: Building blocks of new business opportunity. *Journal of Organizational Computing and Electronic Commerce* 6 (1): 1-10.

Auger, P., and J. M. Gallaugher. 1997. Factors affecting the adoption of an internet-based sales presence for small business. *The Information Society* 13: 55-74.

Ayres, C. 2000. Websites not a hit with net auditor. In *The Australian*: 55.

Benjamin, R. and R. Wigand. 1995. Electronic market and virtual value chains on the information superhighway. *Sloan Management Review* (winter): 62-72.

Brynjolfsson, E., and M. D. Smith. 2000. Frictionless commerce? A comparison of internet and conventional retailers. *Management Science* 46 (4): 563-585.

Chan, C. and P. M. C. Swatman. 2000. Case study - from EDI to internet commerce: the BHP steel experience. *Internet Research: Electronic Networking Applications and Policy* 10 (1): 72-82.

Davis, D. 1996. *Business Research for Decision Making* (4th Ed.). Belmony: Duxbury Press.

De', R., and B. Mathew. 1999. Issues in the management of web technologies: A conceptual framework. *International Journal of Information Management* (19): 427-447.

DeLone, W. H., and E. R. McLean. 1992. Information systems success: The quest for the dependent variable. *Information Systems Research* 3 (1): 60-95.

Fornell, C., and D. F. Larcker. 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research* XVIII (February): 39-50.

Furnell, S. M., and T. Karweni. 1999. Security implications of electronic commerce: A survey of consumers and businesses. *Internet Research: Electronic Networking Applications and Policy* 9 (5): 372-382.

Gefen, D., D. W. Straub, and M. C. Boudreau. 2000. Structural equation modeling and regression: Guidelines for research practice. *Communications of the Association for Information Systems* 4 (7): 1-77.

Ghosh, S. 1998. Making business sense of the internet. *Harvard Business Review* (March-April): 126-135.

Grover, V., and P. Ramanlal. 1999. Six myths of information and markets: Information technology networks, electronic commerce, and the battle for consumer Surplus. *MIS Quarterly* 23 (4): 465-495.

Gurley, J. W. 2000. The one internet metric that really matters. *Fortune* (March 6): 392.

Hair, J. F., R. E. Anderson, R. L. Tatham, and W. C. Black. 1998. *Multivariate Data Analysis* (5th Ed.) Upper Sadle River, New Jersey: Prentice-Hall Inc.

Holmes-Smith, P. 2000. *Introduction to Structural Equation Modeling Using LISREL.* Elsternwick: School Research, Evaluation and Measurement Services.

Kalakota, R., and A. B. Whinston. 1996. *Frontiers of Electronic Commerce.* M.A.: Addison-Wesley, Reading.

Kalakota, R., and A. B. Whinston. 1997. *Electronic Commerce - A Manager's Guide.* Massauchusetts: Addison Wesley Longman Inc.

Keeney, R. L. 1999. The value of internet commerce to the customer. *Management Science* 45 (4): 533-542.

Kroll, K. M. 2000. Beyond Hits. *I-merchant* (June): 25-28.

Lynch, D., and L. Lundquist. 1996. *Digital Money: The New Era of Internet Commerce,* Wiley Publishing Company.

Malone, T., J. Yates, and R. Benjamin. 1987. Electronic market and electronic hierarchies. *Communications of the ACM* 30 (6): 484-497.

Nath, R., M. Akmanligil, K. Hjelm, T. Sakaguchi, and M. Schultz. 1998. Electronic commerce and internet: Issues, problems, and perspectives. *International Journal of Information Management* 18 (2): 91-101.

Ng, H. I., Y. J. Pan, and T. D. Wilson. 1998. Business use of the world-wide web: A report on further investigations. *International Journal of Information Management* 18 (5): 291-314.

Palmer, J. W. 1997. Electronic commerce in retailing: Differences across retail formats. *The Information Society* 13: 75-91.

Poon, S., and P. Swatman. 1999. A longitudinal study of expectations in small business internet commerce. *International Journal of Electronic Commerce* 3 (3): 21-33.

Poon, S., and P. M. C. Swatman. 1998. A combined-method study of small business internet commerce. *International Journal of Electronic Commerce* 2 (3): 31-46.

Pricewaterhouse Coopers. 1999. *SME Electronic Commerce Study.* APEC, TEL, BFSG, TEL05/97T.

Riggins, F. J. 1999. A framework for identifying web-based electronic commerce opportunities. *Journal of Organizational Computing and Electronic Commerce* 9 (4): 297-310.

Rose, G., H. Khoo, and D. Straub. 1999. Current technological impediments to business-to-consumer electronic commerce. *Communications of the Association for Information Systems* 1 (16): 1-58.

Saunders, G. 2000. Commercial use of the internet: Some pros and cons. *The Journal of Applied Business Research* 16 (1): 1-7.

Segars, A. H., and V. Grover. 1993. Re-examining perceived ease of use and usefulness: A confirmatory factor analysis. *MIS Quarterly* 17 (4): 517-525.

Sekaran, U. 2000. *Research Methods for Business: A Skill Building Approach* (3rd Ed.). New York: John Wiley and Sons.

Sethi, V. and W. R. King. 1991. Construct measurement in information systems research: An illustration in strategic systems. *Decision Sciences* 22 (3): 455-472.

Shon, T. H., and P. M. C. Swatman. 1998. Identifying effectiveness criteria for internet payment systems. *Internet Research: Electronic Networking Applications and Policy* 8 (3): 202-218.

Strader, T. J., F. R. Lin, and M. J. Shaw. 1999. Business-to-business electronic commerce and convergent assembly line supply chain management. *Journal of Information Technology* 14: 361-373.

Strader, T. J., and M. J. Shaw. 1997. Characteristics of electronic markets. *Decision Support Systems* 21: 185-198.

Strader, T. J., and M. J. Shaw. 1999. Consumer cost differences for traditional and Internet Markets. *Internet Research: Electronic Networking Applications and Policy* 9 (2): 82-92.

Straub, D. W., M. Limayem, and E. Karahanna. 1995. Measuring systems usage: implications for IS theory testing. *Management Science* 41 (8): 1328-1342.

Venkatraman, N. 1989. Strategic orientation of business enterprises: The construct, dimensionality, and measurement. *Management Science* 35 (8): 942-962.

Venkatraman, N. 2000. Five steps to a dot-com strategy: How to find your footing on the web. *Sloan Management Review* (Spring): 15-28.

Wigand, R. 1997. Electronic commerce: Definition, theory, and context. *The Information Society* 13: 1-16.