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Extent of Adoption as Opposed to Adoption: Case of E-Procurement

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Abstract

Existing literature has given much attention to e-procurement adoption, rather than to the extent of e-procurement adoption. In most countries, e-procurement is being adopted at a slow pace by the corporate world, especially by small and medium enterprises (SMEs) that have traditionally been late adopters of any advanced technologies, due in large part to their resource constraints. This paper describes a project which aims to develop a measure of the extent of e-procurement adoption and to examine the key factors that influence the extent of e-procurement adoption in New Zealand SMEs. An integrated model of the Technology-Organization-Environment (TOE) framework and Diffusion of Innovations (DOI) theory is described and a cross-sectional survey is discussed. The model will be tested using data from the Chief Executive Officers (CEOs) of the SMEs.

Keywords

E-procurement, TOE framework, DOI theory, SMEs, New Zealand.

INTRODUCTION

The internet has encouraged many parties, individuals and organizations alike, to conduct businesses online. This includes purchasing (procurement) and sales on the net, internet based electronic data interchange (EDI), information services, electronic publishing, and extranet. Doing business via the internet and the World Wide Web provides specific efficiencies to all the stakeholders. Consumers gain the benefit of low search cost, whilst manufacturers achieve greater economy of production (Bhatt and Emdad 2001). For procurement, e-commerce has the ability to expedite the purchase ordering process, to simplify purchase payment, to expand supplier bases, to reduce paperwork, and to eliminate order errors (Min and Galle 2003).

E-commerce can occur between businesses (business-to-business or B2B) and between businesses and consumers (business-to-consumer or B2C). This study, however, is framed within B2B e-commerce only. This is because B2B forms a greater portion of the total business activity (Murtaza et al. 2004) as compared to other electronic business models like B2C. Furthermore, the adoption of standardized processes for document exchange (e.g. EDI), shipping, tracking, delivery, and payment among supply chain partners makes B2B e-commerce more successful than other forms (Gunasekaran et al. 2009). Gartner Group estimated the total value of e-B2B activity to exceed \$7 trillion by 2009, compared to \$430 billion in 2000 (Stefan 2008). The largest shares were disclosed in North America (\$2.8 trillion), Europe (\$2.3 trillion), and Asia (\$900 billion). In US, the U.S. Census Bureau has recorded a total sales value of \$3,082 billion for B2B e-commerce in 2007 as compared to the B2C sales value which worth only \$251 billion (<http://www.census.gov/econ/estats>). These data show that e-commerce has a greater impact on B2B transactions than B2C. One element of B2B e-commerce is e-procurement, which is the focus of this study. E-procurement is a main concern since purchasing forms a major part of the expenditure of the organization and the purchased inputs are significant to both the primary and support activities of the value chain of the organization.

This paper is organized as follows. First, a literature review on e-procurement is presented. Second, the research framework of the study is discussed, followed by the progress of the study. The paper concludes with the study's limitations and its implications for both researchers and practitioners.

E-PROCUREMENT

Adoption vs. Extent of Adoption

It is important to distinguish between the terms 'adoption' and 'extent of adoption.' This study defines 'e-procurement adoption' as whether or not the organization is currently using any e-procurement technology.

'Extent of e-procurement adoption', on the other hand, refers to the breadth and depth of e-procurement usage within the organization.

What is E-Procurement?

E-procurement is a comprehensive process in which organizations use information technology (IT) systems to establish agreements for the acquisition of goods or services (contracting) or purchase goods or services in exchange for payment (purchasing) (Gunasekaran and Ngai 2008). Specifically, e-procurement is a B2B purchasing practice that utilizes e-commerce to identify potential sources of supply, to purchase goods and services, to transfer payment, and to interact with suppliers (Harrigan et al. 2008), which is aimed to simplifying commercial transactions between organizations.

In most countries, e-procurement is being adopted at a slow pace by the corporate world especially for small and medium enterprises (SMEs) (Bland 2003) that have traditionally been late adopters of advanced technologies, due largely to resource constraints. Larger organizations, with their more extensive resources, are looking forward to participating in e-procurement in order to be able to take advantage of the significant trading benefits offered by the system. For SMEs, there are challenges to taking part in this platform as it requires significant amounts of investment to initiate and implement the e-procurement system. However, due to increasing competition, ability to get more suppliers in the market, and vulnerability of non-participants, most of business organizations, regardless of their size, are now getting into the technology (Stockdale and Standing 2004). In Australia, for instance, SMEs were rapid at adopting e-procurement (Hawking and Stein 2004). Meanwhile, in New Zealand, e-procurement has become the largest area of e-business interest. A survey by Fairfax Business Research in 2002 revealed that New Zealand businesses are quite solidly committed to e-business investment, with e-business accounting for 9% of total IT projects in New Zealand (Bland 2003). The latest result from the Business Operations Survey in New Zealand shows that as of August 2008, 97% of SMEs in New Zealand were using computers while 95% of them were using the internet, which is a prerequisite for e-procurement (<http://search.stats.govt.nz/search?w=business&af=ctype%3Astatistics>). The same survey also revealed that the internet was used to place orders (68%) and to receive orders (42%) for goods or services. Most of them ordered goods or services via e-mail (30%), followed by online ordering (12%), third party website (10%), and other facilities (5%).

Currently, there are various applications of e-procurement in use, each of which offers many benefits to many organizations. E-procurement technologies include e-ordering, e-sourcing, e-auctions, enterprise resource planning, collaborative supply (Reunis et al. 2004), e-MRO (maintenance, repair and operations), e-catalog, e-tendering, reverse auctions, e-informing, and e-marketplace (Schoenherr and Tummala 2007).

Prior Studies on E-Procurement

This study attempts to examine the following research questions: (1) how to develop a measure of the extent of e-procurement adoption? and (2) what are the key factors that influence the extent of e-procurement adoption in New Zealand SMEs? In answering the research questions, this study intends to bridge several gaps in the literature on e-procurement.

Firstly, many studies on e-procurement (e.g. Gunasekaran and Ngai 2008; Soares-Aguiar and Palma-dos-Reis 2008) focused on the adoption of e-procurement, rather than on the extent of e-procurement adoption. Most commonly, a comparison of the adopters and non-adopters was made using a dichotomous variable (i.e. yes or no/adopt or not adopt). Hence, little is known about the extent of e-procurement adoption or how to develop a measure of the extent of e-procurement adoption. This study is undertaken in order to fill this gap.

Secondly, most of the prior studies on e-procurement were carried out in the United States (e.g. Gunasekaran et al. 2009), Europe (e.g. Soares-Aguiar and Palma-dos-Reis 2008), and Asia (e.g. Teo et al. 2009), but research in the Asia-Pacific context is very limited. This study, therefore, fills this gap by studying the extent of e-procurement adoption in the Asia-Pacific region, i.e. New Zealand, and in New Zealand SME companies in particular. With a population of 4.32 million and good internet facilities, New Zealand has a potential to participate in e-procurement technology. Besides providing information on the extent of e-procurement adoption in New Zealand SMEs, the results will also give some useful insights into whether findings which are germane to the Western countries (e.g. U.S.) and Asian countries (e.g. Singapore) are also relevant to Asia-Pacific region countries like New Zealand.

Thirdly, in relation to the Technology-Organization-Environment (TOE) framework, prior studies on e-procurement used the framework to examine the adoption factors in a large corporate setting (e.g. Soares-Aguiar and Palma-dos-Reis 2008; Teo et al. 2009). It has been argued that less attention has been given by researchers to the adoption of e-procurement in SME businesses (Gunasekaran et al. 2009). Further, there is also a concern whether findings that are applicable to a large corporate setting are also of relevance to the SME environment. Thus, by studying the extent of e-procurement adoption in New Zealand SMEs, this study addresses this gap.

Finally, many of the preceding studies on e-procurement (e.g. Wu et al. 2007) failed to consider influential factors that relate to the Diffusion of Innovations (DOI) theory such as relative advantage, compatibility, and complexity. Taking into account the literature, the present study, therefore, addresses the deficit by integrating both the contextual factors (i.e. TOE framework) and the diffusion of innovations variables (i.e. DOI theory) in examining the key factors that influence the extent of e-procurement adoption in New Zealand SMEs.

RESEARCH FRAMEWORK

This study develops an integrated model of the TOE framework and DOI theory. TOE framework can be used for studying different types of innovations. These types of IS innovations include 'Type I innovations' which reflect the information systems (IS) functional task (e.g. data administration), 'Type II innovations' which support the administration of the business (e.g. accounting systems), and 'Type III innovations' which incorporate IS with the core technology of the business (e.g. e-procurement) (Swanson 1994). However, the effect and significance of the TOE factors in relation to the adoption will vary, depending on the type of an innovation (Cho and Kim 2002).

TOE framework identifies three contextual factors, namely, technological, organizational, and environmental that may influence management's decision to adopt an innovation. TOE framework was found to be comprehensive in identifying factors influencing innovation adoption like IT (e.g. Premkumar 2003), internet (e.g. Teo and Pian 2003), and e-business (e.g. Zhu and Kraemer 2005). In relation to e-procurement, empirical evidence has shown that e-procurement adoption is driven by the combination of the technological, organizational, and environmental contexts (e.g. Teo et al. 2009). DOI theory, on the other hand, represents the 'perceived' critical characteristics of innovations (Soares-Aguiar and Palma-dos-Reis 2008) with respect to the contextual factors mentioned earlier, and it has been found to be a solid theoretical foundation and consistent empirical support (Beatty et al. 2001). Zhu et al. (2006) suggested that diffusion of innovation can be better understood by including both contextual factors and the innovation characteristics. It is, therefore, believed that an integrated model of the TOE framework and DOI theory is a useful approach and an appropriate theory foundation for this study.

Generally, there are five main components of innovation characteristics, namely, relative advantage, compatibility, complexity, observability, and trialability (Rogers 1995). However, only relative advantage, compatibility, and complexity were found consistently related to the innovation adoption (Tornatzky and Klein 1982) and, consequently, these three variables were included in this study.

Research Model and Hypothesis

In this study, it is hypothesized that the extent of e-procurement adoption is influenced by the technological, organizational, and environmental contexts (Figure 1). The dependent variable of this study is represented by the extent of e-procurement adoption, which is defined as the breadth and depth of e-procurement usage within the organization. The independent variables of this study, on the other hand, are categorised into three main dimensions, that is, technological, organizational, and environmental contexts.

Technological context refers to the existing technologies in use and new technologies relevant to the organization. Three factors specified within the technological context are relative advantage, compatibility, and complexity. **Relative advantage** is the degree to which e-procurement technology is perceived as being better than "a competing or preceding idea" (Rogers 1995). The degree of relative advantage can be measured in economic terms, social prestige, convenience, and satisfaction (Rogers 1995). The primary criteria for making the decision to adopt a new technology are generally based on the transition costs to the new technology and benefits from its introduction (Cho and Kim 2002). The relative advantages of e-procurement include reduction of administration costs, improvement in operations efficiency, enhancement of customer services, and strengthening of relationships with business partners. A positive relationship has been found between relative advantage and adoption behaviors (e.g. Chwelos et al. 2001; Looi 2005). It is argued that organizations that do not perceive the benefits of e-procurement to be significant would consider the implementation of the system to be unnecessary. Thus, it is hypothesized that there is a positive relationship between relative advantage and extent of e-procurement adoption (H1).

Compatibility is the degree to which e-procurement technology is perceived as being consistent with the company's existing values, past experiences, and the needs of the potential adopters (Rogers 1995). Adopting a new technology demands changes to the existing development procedures and skills (Cho and Kim 2002). E-procurement systems, for instance, must be capable of integrating multiple supplier catalogs into an integrated, buyer-managed view of the catalog (Rajkumar 2001). Compatibility has been found to be the strongest driver in technology adoption compared to the other innovation characteristics (e.g. Grandon and Pearson 2004; Zhu et al. 2006). This implies that when the innovation is more compatible with the current situation and existing needs of a potential adopter, there is a greater degree of adoption of the innovation. Thus, it is hypothesized that there is a positive relationship between compatibility and extent of e-procurement adoption (H2).

Complexity refers to the degree to which e-procurement technology is perceived as difficult to learn, understand, and use. Technological innovations such as e-procurement are considered to be a complex technology that exposes unfamiliar attributes to the adopting unit. In general, diffusion of adoption is faster for ideas that are readily understood and simpler to understand than for those that require new skills and understanding (Rogers 1995). Prior literature suggests that difficulties in understanding and applying a new technology may result in slower recognition of its value, fear of failure, and resistance (Cho and Kim 2002). In a study by Grandon and Pearson (2004), complexity was perceived by the top managers of the SMEs as the most influential factor in e-commerce adoption. In this study, complexity of e-procurement technology is expected to negatively influence the extent of e-procurement adoption. Thus, it is hypothesized that there is a negative relationship between complexity and extent of e-procurement adoption (H3).

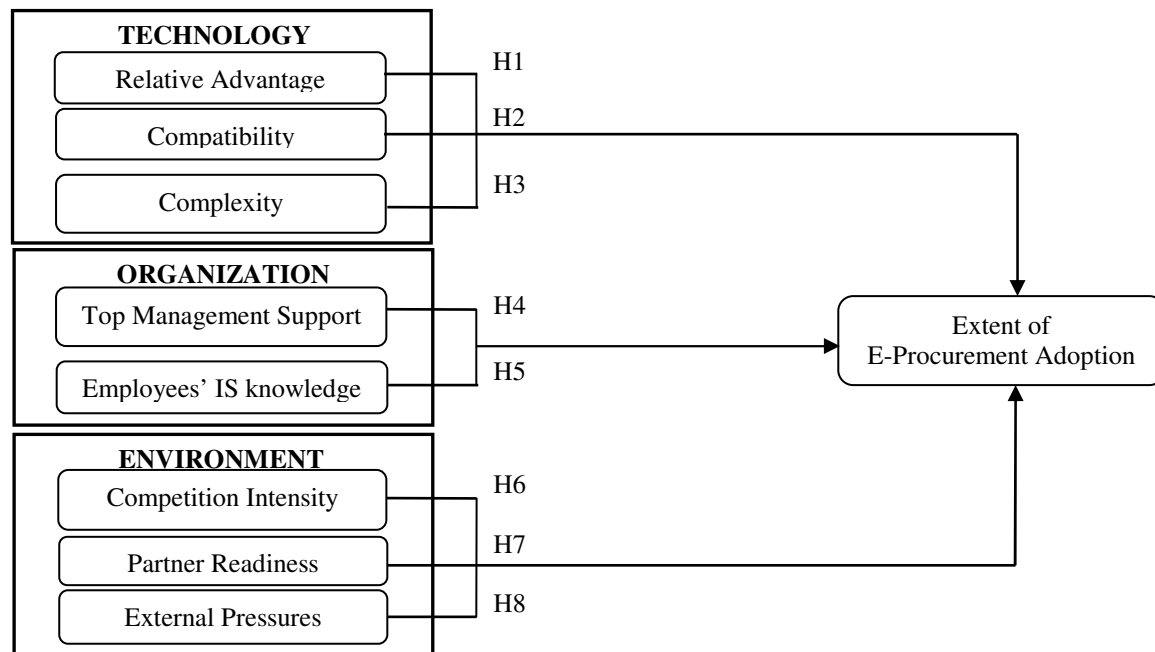


Figure 1: Research Model

Organizational context refers to descriptive measures of the organization such as its scope, size, and the amount of slack resources available internally (Zhu and Kraemer 2005). Two factors covered under the organizational context are top management support and employees' IS knowledge. **Top management support** refers to the extent of commitment and resource support given by the top management for the innovation (Premkumar 2003). Top management is generally the decision maker of the SME and his/her support is, therefore, significant to ensure that there is commitment to resourcing the implementation of innovation (Grover 1993) and to overcoming barriers and resistance to change and innovation (Teo et al. 1998). It is argued that the top management's belief about the positive impact of e-procurement on the organizations' performance will influence their decision regarding the adoption and the amount of resources committed to the adoption. Prior studies confirmed that top management support is positively associated with an innovation adoption (e.g. Premkumar 2003; Teo et al. 2009). Thus, it is hypothesized that there is a positive relationship between top management support and extent of e-procurement adoption (H4).

Employees' IS knowledge refers to the extent of the employees' IS knowledge and their ability to perform specific tasks using computers. Having knowledge in IS, especially purchasing knowledge and skills (Pearson and Gritzmacher 1990) have a greater impact on the strategic purchasing in the organization (Carr et al. 2000). However, employees in small businesses are generally lacking in IS knowledge and the required technical skills. Many businesses are tempted to postpone adoption of the innovation until they have sufficient internal expertise and the barriers to adoption are lowered or circumvented (Looi 2005). Further, inadequate knowledge in e-procurement may consequently contribute to the non implementation of the e-procurement system in an organization (Gunasekaran and Ngai 2008). However, overcoming the lack of knowledge will lead to greater likelihood of adopting the technology (Looi 2005). Thus, it is hypothesized that there is a positive relationship between employees' IS knowledge and extent of e-procurement adoption (H5).

Environmental context is the arena in which an organization conducts its business. It includes the industry, competitors, government, and the customers and suppliers in the supply chain in which the business operates. Three factors within the environmental context are competition intensity, partner readiness, and external pressures. **Competition intensity** is the degree to which the actions of the organization are deeply influenced by

other organizations or competitors in the market. Generally, competition increases the likelihood of an innovation adoption (Looi 2005). This implies that organizations that are facing more intense competition in the market tend to attribute more value to the IS innovations. A higher level of competition among organizations in an industry may, therefore, increase the pressure on an organization to adopt an e-procurement technology. Due to the pressure, the competitors will feel it necessary to follow the first movers in order to remain in business (Gebauer and Segev 1998). Empirical evidence has shown that competition intensity is significant to the adoption of technological innovations like e-business (e.g. Zhu and Kraemer 2005) and e-commerce (Looi 2005). Thus, it is hypothesized that there is a positive relationship between competition intensity and extent of e-procurement adoption (H6).

Partner readiness is the degree to which the customers and suppliers of the organization are willing and ready to conduct their business activities electronically (Barua et al. 2004). In an electronic business environment, it is necessary that all trading partners adopt compatible electronic trading systems and provide internet-enabled services for each other so that they can engage in electronic interactions and transactions simultaneously. This is because some organizations may be motivated to adopt e-procurement and be ready to adopt the technology, but are unable to do so due to the lack of readiness on the part of the trading partner. In the manufacturing sector, for instance, organizations rely on business partners to perform important activities, from logistics to assembly to distribution (Gebauer and Segev 1998). A recent e-procurement study (e.g. Soares-Aguiar and Palma-dos-Reis 2008) has identified partner readiness as a significant antecedent of e-procurement adoption. Thus, it is hypothesized that there is a positive relationship between partner readiness and extent of e-procurement adoption (H7).

External pressures refers to the extent of pressures exerted by the competitive environment and the imposition by trading partners, parent company, or regulations (Joo and Kim 2004). Teo and Pian (2003) argued that organizations that invest in IS due to pressures from customers or competitors may gain competitive advantage compared to others that fail to do so. Hence, when more competitors become e-procurement-capable, SMEs are more inclined to adopt e-procurement technology in order to maintain their competitive position. Further, requests from powerful partners to adopt certain innovations generally have more influence on SMEs than similar requests from less powerful partners (Iacovou et al. 1995). Prior studies revealed that external pressure is statistically significant to the technology adoption (e.g. Grandon and Pearson 2004; Teo et al. 2009). Thus, it is hypothesized that there is a positive relationship between external pressures and extent of e-procurement adoption (H8).

Measurement of Variables

The dependent variable of this study is the extent of e-procurement adoption. Various measures of the extent of IT/IS adoption have been used in prior studies, including volume (e.g. Gebauer and Shaw 2004), functionality (e.g. Gebauer and Shaw 2004), percentage (e.g. Zhu and Kraemer 2005), and time (e.g. Batenburg 2007). In Gebauer and Shaw (2004), for instance, the usage of mobile business applications was measured by the functionality of mobile business applications and the volume (i.e. the number of instances the task is performed wirelessly). Batenburg (2007), on the other hand, operationalized the extent of e-procurement usage by the percentages of total purchases conducted online. The current study, however, conceptualized the extent of e-procurement adoption in New Zealand SMEs via the concepts of (1) breadth and (2) depth.

Breadth refers to the extent to which an organization takes advantage of the variety of e-procurement functionalities available. It has been found that the adoption or non-adoption of e-procurement takes place at the level of e-procurement tool which is defined as an e-procurement functionality or set of e-procurement functionalities that enters the organizational system and is transferred throughout the organization as one entity (Reunis et al. 2004). Breadth of e-procurement adoption is, therefore, operationalized by the number of distinct e-procurement functionalities which are in use in an organization. For this reason, the entire spectrum of e-procurement functionalities are covered and grouped into three main categories, namely, (a) information gathering and negotiation, (b) making orders, and (c) receiving goods (Table 1).

Information gathering is the stage where the buyer identifies their needs, evaluates potential sources of supply, and gathers information about market conditions, goods or services, and suppliers (Gebauer and Segev 1998). At this stage, instead of looking for suppliers electronically, buyers also gather information like suppliers' financial status (Pearson and Giunipero 2008) and price quotes (Lancioni et al. 2003), electronically. Further, the e-procurement system enables purchasing personnel to review product purchase profiles through e-catalog and facilitate them to communicate or negotiate with suppliers in return (Lancioni et al. 2003; Gunasekaran et al. 2009), especially with regard to the availability of goods or services (Teo et al. 2009) and price and delivery terms (Gebauer and Segev 1998). Negotiation generally takes place starting from the period of the first communication between buyer and supplier until the final signing of the contract. Example of negotiation includes acquiring a discount on the requested products from the suppliers.

In making orders, buyer software enables users to focus on the buying organization's activities such as submitting (Gebauer and Shaw 2004), tracking, and changing of purchase requisitions electronically. Further, the software also allows users to generate (<http://home.eperolehan.gov.my/>), track, change, cancel (Gebauer and Shaw 2004), and transmit purchase orders to suppliers electronically (MacManus 2002). The purchase order commonly includes an order number, product descriptions, the unit price, and the number of units required.

Table 1. Breadth of E-Procurement Adoption

	E-Procurement Functionalities	Source
Information gathering and negotiation	Search for suppliers electronically	Pearcy and Giunipero (2008)
	Check suppliers' financial status electronically	Pearcy and Giunipero (2008)
	Check supplier price quotes electronically	Lancioni et al. (2003)
	Check availability of goods/services electronically	Teo et al. (2009)
	Negotiate with suppliers electronically (via email, etc.)	Lancioni et al. (2003)
Making orders	Submit purchase requisitions electronically	Gebauer and Shaw (2004)
	Track purchase requisitions electronically	<i>New item</i>
	Change purchase requisitions electronically	<i>New item</i>
	Generate purchase orders electronically	http://home.eperolehan.gov.my/
	Track purchase orders electronically	Gebauer and Shaw (2004)
	Change purchase orders electronically	Gebauer and Shaw (2004)
	Cancel purchase orders electronically	Gebauer and Shaw (2004)
	Transmit purchase orders to suppliers electronically	MacManus (2002)
Receiving goods	Notify electronically of deliveries as goods/services arrive	Gebauer and Shaw (2004)
	Track ordered goods/services electronically	Gebauer and Shaw (2004)
	Receive goods electronically	<i>New item</i>
	Receive services electronically, over computer network	<i>New item</i>
	Send goods received notes to suppliers electronically	Gebauer and Shaw (2004)
	Make payments to suppliers electronically	MacManus (2002)

At the receiving goods stage, the e-procurement system notifies electronically of deliveries as goods or services arrive, allows buyers to track ordered goods electronically, sends goods received notes to suppliers electronically (Gebauer and Shaw 2004), and make payments to suppliers electronically (MacManus 2002) after receiving the ordered goods (e.g. software download) or services (e.g. software update) from the suppliers electronically.

Depth refers to the extent to which procurement activities are conducted online. In relation to this, each of the e-procurement functionalities listed in Table 1 is measured based on whether each of them is used extensively or not used at all in an organization. Further, the depth of e-procurement adoption is also operationalised by the percentage of direct or indirect goods, and direct or indirect services are procured online (Gottschalk and Abrahamsen 2002).

However, in measuring the breadth and depth of e-procurement adoption, it is necessary to initially differentiate between the adopters and non-adopters of e-procurement technology. This is because the breadth and depth of e-procurement adoption can only be measured if the SMEs are currently using the technology. Hence, SMEs are deemed to be e-procurement adopters if they take advantage of one of the variety of e-procurement functionalities listed in Table 1 above.

The independent variables of this study consist of the technological, organizational, and environmental contexts. Measurement of these variables is based on a comprehensive review of the existing IS/IT literature. For the technological context, relative advantage is based on the measures used in Teo et al. (2009). Measures of compatibility and complexity are taken from Grandon and Pearson (2004). In relation to the organizational context, top management support uses measures from Teo and Ranganathan (2004). Employees' IS knowledge is developed by adapting measures from Looi (2005). For the environmental context, measures of competition intensity, partner readiness, and external pressures are adapted from To and Ngai (2006), Chwelos et al. (2001), and Grandon and Pearson (2004), respectively.

Instrument Development Process

This study will use a quantitative research methodology using a cross-sectional survey approach. The questionnaires are sent to the respondents via mail, e-mail, and web-survey. In designing a questionnaire, it is, however, necessary to initially identify the steps involved in developing the items for each construct that appears in the research model. There are five steps involved in developing measures of this study.

The first step is to generate the items. The items of each construct are gathered from various sources, namely, the literature, the software functionalities, and the website (e.g. <http://home.eperolehan.gov.my/>).

The second step involves checking the content validity of the measures with the experts. Experts include e-procurement practitioners (e.g. e-procurement officers) and academicians/researchers of e-procurement. This process is crucial to ensure that the items are relevant to measuring of the construct. Based on the expert feedback, the questionnaire will be refined before the next stage follows.

The third step is the collecting of data. Data collection will go through the three stages of data collection, that is, pre-test, pilot test, and actual survey. Pre-testing and a pilot survey will be carried out to further refine the questionnaire and obtain empirical feedback from the sample regarding the appropriateness of the instrument. The pre-testing process will be carried out using postgraduate students and academicians who are knowledgeable about the IS under study. All constructive comment from the respondents will be taken into account and the questionnaire will then be refined before the pilot study stage commences. At the pilot study phase, the questionnaire will be administered to company CEOs, randomly chosen from the database. Appropriate adjustments will be made before the actual distribution takes place.

The fourth step is to perform the confirmatory factor analysis with information gathering and negotiation, making orders, and receiving goods (Table 1). The confirmatory factor analysis is conducted to provide an appropriate means of measuring the efficacy of measurement among scale items. The final step is to fit the data to the cause-effect model with constructs that are confirmed (or emerge) in factor analysis to test nomothetic validity.

Instrument Validation

This study uses constructs that have already been validated from previous studies whenever appropriate. The use of a validated instrument is vital to ensuring that it yields stable results. For instrument validation purposes, the issues of content validity, construct validity, and reliability are addressed.

Content validity refers to the degree to which the items of the instrument are relevant to measuring of the construct. It is largely based on the opinions of various users (Nunnally and Bernstein 1994) who are knowledgeable about the constructs under study. For this reason, the instrument is sent to e-procurement experts like e-procurement officers and academicians/researchers in order to get feedback and comments from them. The respondents are required to rate the importance of each item using a four-point likert scale of 1-not relevant to 4—highly relevant. Each item on the instrument is empirically screened and the content validity ratio (CVR) is then computed. Based on the results of the CVR, items which are found not to be statistically significant to the construct will be removed from the instrument, while any significant items will remain.

Construct validity examines the correlations among various measures (Nunnally and Bernstein 1994). Each measure must validly measure the constructs. Construct validity is determined by both convergent and discriminant validities. Convergent validity accesses the consistency across multiple operationalizations (Zhu et al. 2006). Discriminant validity, on the other hand, measures the extent to which different constructs diverge from one another (Zhu and Kraemer 2005). In this study, construct validity among various measures within the technological, organizational, and environmental contexts will be examined using factor analysis. Factor loadings of greater than 0.50, as suggested by Nunnally (1978), will be considered appropriate.

Reliability refers to the extent to which an experiment, test, or any measuring procedure yields the same results on repeated measurements of the same phenomenon (Nunnally and Bernstein 1994). The more consistent the results given by the repeated measurements, the higher will be the reliability of the measuring procedure. In this study, the reliability test will be conducted on the technological, organizational, and environmental factors. The reliability of each construct will be assessed by calculating the Cronbach's alpha coefficients where a Cronbach's alpha value of more than 0.70 is deemed sufficient (Nunnally 1978).

Sample of Study

The sample of this study is the SME businesses, looking specifically from the manufacturing industry perspective. SMEs play a significant role in the global economy and in supply chains (Gunasekaran et al. 2009). In New Zealand, SMEs represent a large percentage of businesses. In 2008, for instance, SMEs comprised 97.1% of enterprises in New Zealand. Further, SMEs accounted for 40.7% of the economy's total output in 2007 and contributed to a significant portion of New Zealand's GDP (Gross Domestic Product). SMEs in New Zealand

make up three categories: micro enterprise, i.e. businesses having fewer than 5 full-time employees (FTEs), small firm (6 to 49 FTEs), and medium firm (50 to 99 FTEs) (<http://sme-centre.massey.ac.nz/>). This definition is used in this study. Hence, larger companies of more than 100 FTEs are, therefore, excluded.

The literature revealed that manufacturing firms are heavy users of e-procurement technology (Gunasekaran and Ngai 2008). These firms that depend on both direct and indirect production goods generally benefit more from e-procurement than other industries because the number of purchase orders is larger, and the purchase portfolio is larger and more diverse (Batenburg 2007). The unit of analysis of this study is the CEOs of the SMEs. SMEs are more likely to adopt e-procurement technology when their CEOs possess greater IT knowledge and have a positive attitude towards the technology adoption. All respondents' details such as the companies' names, CEOs' names, companies' addresses, and numbers of employees are taken from Kompas.com directory. The sampling is a stratified random sample by size, with companies selected randomly within the group for each of the sizes.

Data Analysis

Data of this study will be analysed using Partial Least Square (PLS) technique. This technique is particularly useful because of its ability to model latent constructs under conditions of nonnormality and with small and medium sample sizes (Chin et al. 2003). However, a minimum sample size of 150 (with 4 indicators) or 100 (with 6 indicators) appears best to balance the trade-offs for detection and accurate estimation (Chin et al. 2003). Hence, for the data to be analysed using PLS technique, this study should receive, as a minimum, 150 responses.

PROGRESS OF STUDY

This study is currently at the content validity stage. Twenty eight surveys have been issued to each group of experts covering the academicians/researchers and practitioners of e-procurement worldwide.

CONCLUSION

This study is conducted to develop a measure of the extent of e-procurement adoption and to examine the key factors that influence the extent of e-procurement adoption in New Zealand SMEs. The significance of the study can be seen from two perspectives, namely, theory and practice. This study contributes to the literature on e-procurement technology by: (1) introducing a measure of e-procurement adoption that other researchers will be able to use; (2) providing a better understanding of the problem of the extent of adoption in general; and (3) granting a better understanding of the key factors that influence the extent of e-procurement adoption. In relation to a practice, findings of the study may give SME managers a useful insight into the extent of e-procurement adoption in New Zealand SMEs and assist them in making decisions around adopting e-procurement.

This study, however, has two limitations. First, the present study focuses on SME companies only. Hence, the findings will be generalized to SMEs only and will not illustrate any significant differences in e-procurement adoption between small and large enterprises in the country. Second, this study is cross-sectional in nature. The results will, therefore, posit the relationship between the contextual factors (i.e. technology, organization, and environment) and extent of e-procurement adoption, rather than shed light on their causality.

REFERENCES

- Barua, A., Konana, P., Whinston, A.B., and Yin, F. 2004. "An Empirical Investigation of Net-Enabled Business Value," *MIS Quarterly* (28:4), pp 585-620.
- Batenburg, R. 2007. "E-Procurement Adoption by European Firms: A Quantitative Analysis," *Journal of Purchasing & Supply Management* (13), pp 182-192.
- Bhatt, G.D., and Emdad, A.F. 2001. "An Analysis of the Virtual Value Chain in Electronic Commerce," *Logistics Information Management* (14:1/2), pp 78-85.
- Bland, V. 2003. "The Internet in Action: The Ballooning of E-Business Opportunities," *New Zealand Management*, pp 51-54.
- Beatty, R.C., Shim, J.P., and Jones, M.C. 2001. "Factors Influencing Corporate Web Site Adoption: A Time-Based Assessment," *Information & Management* (38), pp 337-354.
- Carr, A.S., Leong, G.K., and Sheu, C. 2000. "A Study of Purchasing Practices in Taiwan," *International Journal of Operations & Production Management* (20:12), pp 1427-1445.
- Chin, W.W., Marcolin, B.L., and Newsted, P.R. 2003. "A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study," *Information Systems Research* (14:2), pp 189-217.

- Cho, I., and Kim, Y. 2002. "Critical Factors for Assimilation of Object-Oriented Programming Languages," *Journal of Management Information Systems* (18:3), pp 125-156.
- Chwelos, P., Benbasat, I., and Dexter, A.S. 2001. "Research Report: Empirical Test of an EDI Adoption Model," *Information Systems Research* (12:3), pp 304-321.
- ePerolehan. Retrieved 15 February, 2010, from <http://home.eperolehan.gov.my/>.
- Gebauer, J., and Segev, A. 1998. "Assessing Internet-Based Procurement to Support the Virtual Enterprise," *Electronic Journal of Organizational Virtualness* (2:3), pp 30-43.
- Gebauer, J., and Shaw, M.J. 2004. "Success Factors and Impacts of Mobile Business Applications: Results from a Mobile E-Procurement Study," *International Journal of Electronic Commerce* (8:3), pp 19-41.
- Gottschalk, P., and Abrahamsen, A.F. 2002. "Plans to Utilize Electronic Marketplaces: The Case of B2B Procurement Markets in Norway," *Industrial Management & Data Systems* (102:6), pp 325-331.
- Grandon, E.E., and Pearson, J.M. 2004. "Electronic Commerce Adoption: An Empirical Study of Small and Medium US Businesses," *Information & Management* (42:1), pp 197-216.
- Grover, V. 1993. "An Empirically Derived Model for the Adoption of Customer-Based Interorganizational Systems," *Decision Sciences* (24:3), pp 603-640.
- Gunasekaran, A., and Ngai, E.W.T. 2008. "Adoption of E-Procurement in Hong Kong: An Empirical Research," *International Journal of Production Economics* (113), pp 159-175.
- Gunasekaran, A., McGaughey, R.E., Ngai, E.W.T., and Rai, B.K. 2009. "E-Procurement Adoption in the Southcoast SMEs," *International Journal of Production Economics* (122), pp 161-175.
- Harrigan, P.O., Boyd, M.M., Ramsey, E., and Ibbotson, P. 2008. "The Development of E-Procurement within the ICT Manufacturing Industry in Ireland," *Management Decision* (46:3), pp 481-500.
- Hawking, P., and Stein, A. 2004. "E-Procurement: Is the Ugly Duckling Actually a Swan Down Under?" *Asia Pacific Journal of Marketing and Logistics* (16:1), pp 3-26.
- 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), pp 465-485.
- Joo, Y., and Kim, Y. 2004. "Determinants of Corporate Adoption of E-Marketplace: An Innovation Theory Perspective," *Journal of Purchasing & Supply Management* (10), pp 89-101.
- Lancioni, R., Schau, H.J., and Smith, M.F. 2003. "Internet Impacts on Supply Chain Management," *Industrial Marketing Management* (32:3), pp 173-175.
- 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), pp 60-81.
- MacManus, S.A. 2002. "Understanding the Incremental Nature of E-Procurement Implementation at the State and Local Levels," *Journal of Public Procurement* (2:1), pp 5-28.
- Min, H., and Galle, W.P. 2003. "E-Purchasing: Profiles of Adopters and Nonadopters," *Industrial Marketing Management* (32), pp 227-233.
- Murtaza, M.B., Gupta, V., and Carroll, R.C. 2004. "E-Marketplaces and the Future of Supply Chain Management: Opportunities and Challenges," *Business Process Management Journal* (10:3), pp 325-335.
- New Zealand Centre for SME Research. Retrieved 10 May, 2010, from <http://sme-centre.massey.ac.nz/>.
- Nunnally, J.C. 1978. *Psychometric Theory*. McGraw-Hill Series in Psychology, McGraw-Hill, Inc.
- Nunnally, J.C., and Bernstein, I.H. 1994. *Psychometric Theory*. McGraw-Hill Series in Psychology, McGraw-Hill, Inc.
- Pearcy, D.H., and Giunipero, L.C. 2008. "Using E-Procurement Applications to Achieve Integration: What Role Does Firm Size Play?" *Supply Chain Management: An International Journal* (13:1), pp 26-34.
- Pearson, J.N., and Gritzmacher, K.J. 1990. "Integrating Purchasing into Strategic Management," *Long Range Planning* (23:3), pp 91-99.
- Premkumar, G. 2003. "A Meta-Analysis of Research on Information Technology Implementation in Small Business," *Journal of Organizational Computing and Electronic Commerce* (13:2), pp 91-121.

- Rajkumar, T.M. 2001. "E-Procurement Business and Technical Issues," *Information Systems Management* (18:4), pp 52-60.
- Reunis, M.R.B., Van Raaij, E.M., and Santema, S.C. 2004. "Actor-to-Actor Dissemination of Electronic Procurement (EP) Adoption: An Exploration of Influencing Factors," *Journal of Purchasing & Supply Management* (10), pp 201-210.
- Rogers, E.M. 1995. *Diffusion of Innovations*. The Free Press, New York.
- Schoenherr, T., and Tummala, W.M.R. 2007. "Electronic Procurement: A Structured Literature Review and Directions for Future Research," *International Journal of Procurement Management* (1), pp 8-37.
- Soares-Aguiar, A., and Palma-dos-Reis, A. 2008. "Why Do Firms Adopt E-Procurement Systems? Using Logistic Regression to Empirically Test a Conceptual Model," *IEEE Transactions on Engineering Management* (55:1), pp 120-133.
- Statistics New Zealand. Retrieved 1 February, 2010, from <http://search.stats.govt.nz/search?w=business&af=ctype%3Astatistics>.
- Stefan, D. 2008. "Business-to-Business (B2B) Electronic Commerce." Retrieved 10 May, 2010, from <http://www.articlesbase.com/corporate-articles/business-to-business-b2b-electronic-commerce-569433.html>.
- Stockdale, R., and Standing, C. 2004. "Benefits and Barriers of Electronic Marketplace Participation: An SME Perspective," *The Journal of Enterprise Information Management* (17:4), pp 301-311.
- Swanson, E.B. 1994. "Information Systems Innovation among Organizations," *Management Science* (40:9), pp 1069-1092.
- Teo, T.S.H., Tan, M., and Buk, W.K. 1998. "A Contingency Model of Internet Adoption in Singapore," *International Journal of Electronic Commerce* (2:2), pp 95-118.
- Teo, T.S., and Pian, Y. 2003. "A Contingency Perspective on Internet Adoption and Competitive Advantage," *European Journal of Information Systems* (12), pp 78-92.
- Teo, T.S.H., and Ranganathan, C. 2004. "Adopters and Non-Adopters of Business-to-Business Electronic Commerce in Singapore," *Information & Management* (42), pp 89-102.
- Teo, T.S.H., Lin, S., and Lai, K. 2009. "Adopters and Non-Adopters of E-Procurement in Singapore: An Empirical Study," *The International Journal of Management Science* (37:5), pp 972-987.
- To, M.L., and Ngai, E.W.T. 2006. "Predicting the Organisational Adoption of B2C E-Commerce: An Empirical Study," *Industrial Management & Data Systems* (106:8), pp 1133-1147.
- Tornatzky, L.G., and Klein, K.J. 1982. "Innovation Characteristics and Innovation Adoption-Implementation: A Meta-Analysis of Findings," *IEEE Transactions on Engineering Management* (29:1), pp 28-43.
- U.S. Census Bureau E-Stats. Retrieved 10 May, 2010, from <http://www.census.gov/econ/estats>.
- Wu, F., Zsidisin, G.A., and Ross, A.D. 2007. "Antecedents and Outcomes of E-Procurement Adoption: An Integrative Model," *IEEE Transactions on Engineering Management* (54:3), pp 576-587.
- Zhu, K., and Kraemer, K.L. 2005. "Post-Adoption Variations in Usage and Value of E-Business by Organizations: Cross-Country Evidence from the Retail industry," *Information Systems Research* (16:1), pp 61-84.
- Zhu, K., Dong, S., Xu, S.X., and Kraemer, K.L. 2006. "Innovation Diffusion in Global Contexts: Determinants of Post-Adoption Digital Transformation of European Companies," *European Journal of Information Systems* (15), pp 601-616.

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