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## Extent of E-Procurement Usage: An Empirical Study of Small and Medium Sized New Zealand Manufacturing Businesses

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### Abstract

*This paper describes a project which aims to investigate the extent of e-procurement usage at the organizational level and to examine the key factors that influence the extent of e-procurement usage in New Zealand (NZ) small and medium enterprises (SMEs). An integrated model is developed based on the Technology-Organization-Environment (TOE) framework and Diffusion of Innovation (DOI) theory. It is hypothesized that the extent of e-procurement usage is influenced by the technological (i.e. relative advantage, compatibility, and complexity), organizational (i.e. top management support and employees' knowledge), and environmental (i.e. external pressure) contexts. This study employs a quantitative research methodology using a cross-sectional survey approach and a qualitative analysis of respondents' free comments incorporated at the end of each construct of the survey. The model is tested using data from 120 senior managers. Our results demonstrate that relative advantage, employees' knowledge, and external pressure have a significant influence on the extent of e-procurement usage.*

### Keywords

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

### INTRODUCTION

The Internet has greatly facilitated the globalization of the competitive business arena especially in the era of business-to-business (B2B) e-commerce. B2B e-commerce forms a greater portion of the total business activity as compared to other electronic business models like business-to-consumer (B2C). In United States (U.S.), for instance, a total sales value of \$3,082 billion was reported for B2B e-commerce in 2007 as compared to the B2C sales value which was worth only \$251 billion (U.S. Census Bureau 2010). The total value of e-B2B activity was estimated by the Gartner Group to exceed \$7 trillion by 2009, compared to \$430 billion in 2000 (Stefan 2008). These data show that e-commerce has a greater impact on B2B transactions than B2C. One element of B2B e-commerce is *electronic procurement* (e-procurement), which is the focus of this study.

E-procurement is a B2B purchasing practice that utilizes e-commerce to identify potential sources of supply, purchase goods and services, transfer payment, and interact with suppliers (Harrigan et al. 2008). E-procurement has provided a unique opportunity for managers to boost the competitiveness and profitability of the businesses by expediting purchase order processes, simplifying purchase payment, expanding supplier bases, reducing paperworks, and eliminating order errors (Min and Galle 2003). The use of e-procurement in most countries is still limited, especially for SMEs (Bland 2003). This is due largely to resource constraints, as SMEs are often characterized as firms with low levels of IT sophistication, weak market position, and underutilization and lack of information technology (IT) integration (Chau and Hui 2001). Regardless of all the limitations, however, SMEs have now started to implement e-procurement in their organizations, mainly because of the increasing emphasis on supply chain management in domestic and international operations (Gunasekaran et al. 2009).

This paper describes a project which aims to investigate the extent of e-procurement usage and to examine the key factors that influence the extent of e-procurement usage in NZ SMEs. A study on e-procurement is particularly interesting for two main reasons. Firstly, purchasing forms a major part of the organization's expenditure. Secondly, the purchased inputs are significant to both primary and support activities of the value chain of the organization. SMEs are a main concern of this study because they represent a large percentage of businesses in NZ and contribute to a significant portion of NZ's Gross Domestic Product. By studying the factors that influence or inhibit the extent of e-procurement usage, we hope to be able to identify ways to increase its use by SME businesses in NZ.

This paper is organized as follows. First, a literature review of prior studies on e-procurement is presented. Second, the research methodology of the study is discussed by presenting the theoretical framework, research

model and hypotheses, measures, sample and procedures, and validity and reliability assessment. The paper follows with a discussion of the study's findings and concludes with the study's limitations in the final section.

## LITERATURE REVIEW

Many researchers and practitioners are struggling to determine what factors facilitate or inhibit organizations' attempts to implement e-procurement. Some studies have highlighted the benefits (e.g. Wu et al. 2007b) and barriers (e.g. Gunasekaran et al. 2009) associated with the implementation of e-procurement. Several studies found that the implementation of e-procurement encounters various uncertainties from both internal and external business environments that could lead to failures. These failures might be due to the technological backwardness, organizational obstacles, environmental constraints, or other factors (Hsu et al. 2006). Based on prior literature, this study intends to fill several gaps.

Firstly, the existing literature on e-procurement has paid much attention to e-procurement adoption (e.g. Gunasekaran and Ngai 2008), the first step in innovation diffusion, rather than on innovation use, the stage after adoption. Most commonly, a comparison of the adopters and non-adopters was made using a dichotomous variable such as "yes or no," or "adopt or not adopt" decisions. Although this is helpful to understand adoption decisions, it does not completely capture the reach and richness of the use of IT innovations (Tornatzky and Klein 1982). Research on innovation should focus on both adoption and use as dependent variables and not simply dichotomous yes or no adoption decisions (Tornatzky and Klein 1982). The present research focuses on the extent of e-procurement usage (i.e. post-adoption stages) and, thus, fills this gap.

Secondly, prior literature reported the use of e-procurement in different countries or regions like U.S. (e.g. Gunasekaran et al. 2009), Europe (e.g. Harrigan et al. 2008), and Asia-Pacific (e.g. Gunasekaran and Ngai 2008; Susan and Catherine 2007; Teo et al. 2009). However, research in the Asia-Pacific context, especially in NZ, is very limited. The present study fills this gap by studying the extent of e-procurement usage in NZ, and in NZ SME companies in particular. The results will give some useful insights into whether findings which are germane to the Western countries are also relevant to the Asia-Pacific region countries like NZ.

Finally, several researchers have studied the use of e-procurement in the context of a large corporate setting (e.g. Teo et al. 2009), giving less attention to SME businesses (Gunasekaran et al. 2009). In general, firms vary considerably in their use of technologies. Even within the same industry, firms use technologies like e-business differently (Hsu et al. 2006). Hence, it is argued that findings that are applicable to a large corporate setting may not be applied to the SME environment. This study addresses this gap.

To sum up, this study attempts to fill in the above gaps. Specifically, two research questions are the focus of this study: (1) to what extent do NZ SMEs use e-procurement? and (2) what are the key factors that influence the extent of e-procurement usage in NZ SMEs?

## RESEARCH METHODOLOGY

### Theoretical Framework

This study integrates the TOE framework (Tornatzky and Fleisher 1990) and DOI theory (Rogers 1995) to examine the key factors that influence the extent of e-procurement usage in NZ SMEs. An integrated model of the TOE framework and DOI theory has been used in prior studies such as Zhu et al. (2006). These frameworks are used rather than the Technology Acceptance Model/TAM (e.g. Wu et al. 2007a) or the Unified Theory of Acceptance and Use of Technology/UTAUT (e.g. Marchewka et al., 2007) because the present study focuses on the extent of e-procurement usage at the organizational level (i.e. SMEs), rather than on the acceptance of technology by the individual users which is modelled by TAM and UTAUT.

The TOE framework identifies three contextual factors, namely, technological (T), organizational (O), and environmental (E), that may influence management's decision to use an innovation. DOI theory refers to the perceived critical characteristics of innovations with respect to the contextual factors mentioned earlier. It is argued that innovation diffusion can be better understood by including both innovation characteristics and the contextual factors (Zhu et al. 2006) to provide a more holistic model. Hence, an integrated model of the TOE framework and DOI theory is deemed as an appropriate theoretical foundation for this study. Five main components of innovation characteristics are relative advantage, compatibility, complexity, observability, and trialability. However, only relative advantage, compatibility, and complexity were found to be consistently related to the technology usage (Tornatzky and Klein 1982; Wu et al. 2007a) and, consequently, were included in this study.

### Research Model and Hypotheses

This study uses rich measures to appraise the system usage as suggested by Burton-Jones and Straub (2006) as opposed to lean measures. Lean measures capture the entire content of the activity in an omnibus measure such as use or non-use, duration of use, or extent of use. In contrast, rich measures incorporate the nature of the usage activity. DeLone and McLean (2003) argued that more use of the system will yield more benefits, but without considering the nature of this use, examining use alone is clearly insufficient. They proposed that the nature of system use could be addressed by determining whether the full functionality of a system is being used for the intended purposes. Following this, this study conceptualised the extent of e-procurement usage as “the extent to which an organization takes advantage of the variety of e-procurement functionalities available.” These functionalities include information search and exchange (ISE), simple e-procurement transactions (SPT), complex e-procurement transactions (CPT), and electronic collaboration (EC). Information search and exchange is a stage where buyer identifies their needs, evaluates potential sources of supply, gathers information about market conditions, goods and services, and suppliers, and exchanges information within and between firms (Lefebvre et al. 2005; Teo et al. 2009; Wu et al. 2007b). Simple e-procurement transactions is a stage where buyers rely on electronic means to conduct simple e-transactions related to procurement such as purchasing goods and services using electronic catalogues, creating and approving purchase requisitions electronically, and placing and tracking orders electronically (Lefebvre et al. 2005; Teo et al. 2009). In complex e-procurement transactions, buyers undertake more complex e-procurement functionalities by purchasing goods and services using e-auctions, e-reverse auctions, or by issuing electronic calls for tenders, making payments, and negotiating contracts with suppliers electronically (Lefebvre et al. 2005; Teo et al. 2009). Electronic collaboration offers buyers a wider range of e-procurement capabilities that support e-collaboration with their suppliers (Teo et al. 2009). The functionalities covered in this study are, however, limited to the functionalities within the purchasing functions only. Other procurement activities such as storing, transportation, warehousing, inbound receiving, inspection, and quality control and assurance are not covered.

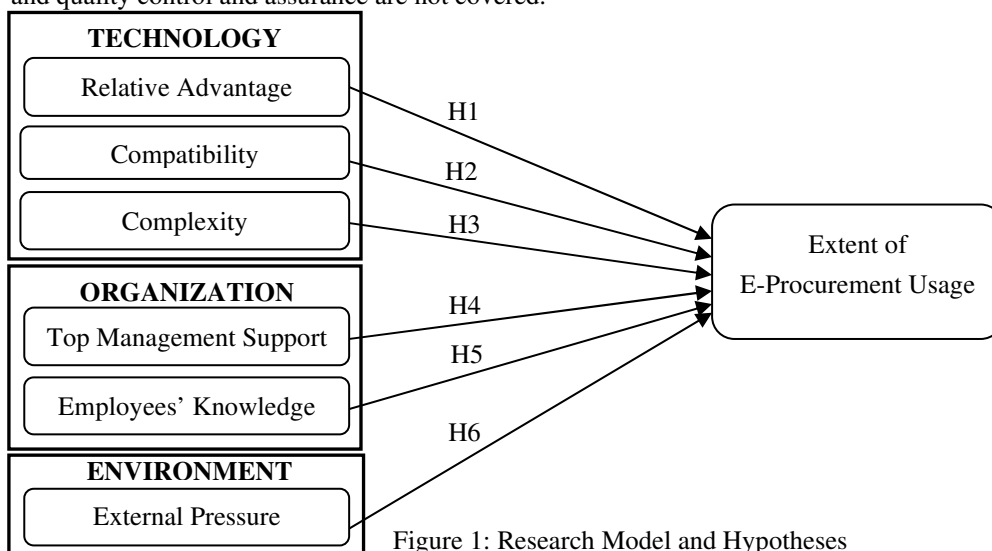


Figure 1: Research Model and Hypotheses

The research model and the hypotheses of the study are presented in Figure 1. Three major factors that influence the extent of e-procurement usage are viewed from the technological, organizational, and environmental contexts. *Technological context* refers to the existing technologies in use and new technologies relevant to the organization. Three factors covered under the technological context are relative advantage, compatibility, and complexity. Relative advantage is the degree to which the use of e-procurement is perceived by the organization to offer advantages over a competing or preceding idea. Compatibility is the degree to which e-procurement is perceived by the organization as being consistent with the organization's preferred work style, existing work practices, prior experience, and values. Complexity refers to the degree to which e-procurement is perceived by the organization as relatively difficult to understand and use. It is hypothesized that relative advantage will positively influence the extent of e-procurement usage (H1); compatibility will positively influence the extent of e-procurement usage (H2); and complexity will negatively influence the extent of e-procurement usage (H3).

*Organizational context* refers to descriptive measures of the organization such as its scope, size, and the amount of resources available internally. Two factors specified within the organizational context are top management support and employees' knowledge. Top management support refers to the extent of commitment and resource support given by the top management of the organization to use e-procurement. Employees' knowledge is the extent of employees' knowledge about e-procurement. It is hypothesized that top management support will positively influence the extent of e-procurement usage (H4); and employees' knowledge will positively influence the extent of e-procurement usage (H5). *Environmental context*, on the other hand, is the arena in which an

organization conducts its business. The only factor that sits within the environmental context is external pressure. External pressure refers to the degree to which the actions of the organization in using e-procurement are influenced by the trading partners and other organizations in the market. It is hypothesized that external pressure will positively influence the extent of e-procurement usage (H6).

### Measures

The measurement of variables for this study is based on existing scales identified by a comprehensive review of the existing information systems (IS)/IT literature (see Table 1). The factors associated with the technological, organizational, and environmental contexts are based on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

The extent of use of each of the various e-procurement functionalities is measured on a seven-point Likert scale from 1 (not used at all) to 7 (used very extensively). The organization is deemed to use a particular functionality if they respond the range of 4 to 7 (Forman 2005). The final measure of e-procurement usage for a particular organization is the total number of the functionalities that they use, in a range of 0 to 11 (ISE), 0 to 7 (SPT), 0 to 9 (CPT), or 0 to 6 (EC). All constructs are modelled as reflective.

Table 1. Measurement Items

Construct	Source	Type
Extent of e-procurement usage(USAGE)	Lefebvre et al. (2005); Teo et al. (2009); Wu et al. (2007b)	Reflective
Relative advantage (RA)	Teo et al. (2009)	Reflective
Compatibility (CMP)	Teo and Pian (2003)	Reflective
Complexity (CPX)	Grandon and Pearson (2004)	Reflective
Top management support (TMS)	Soliman and Janz (2004); Teo and Pian (2003)	Reflective
Employees' knowledge (EK)	Looi (2005)	Reflective
External pressure (EP)	Premkumar and Ramamurthy (1995)	Reflective

Data of this study is analysed using the Partial Least Square (PLS) technique. PLS is chosen because of its ability to model latent constructs under conditions of non-normality and with small and medium sample sizes (Teo et al. 2009). PLS is recommended for small sample sizes as it has the ability to use bootstrapping methods. In addition, PLS has also been commonly used in similar prior studies such as Teo et al. (2009) and Zhu et al. (2006).

### Sample and Procedures

This study uses a quantitative research methodology using a cross-sectional survey approach, involving both online and mail surveys. In addition, a qualitative analysis of respondents' free comments is also incorporated at the end of each construct of the survey. The qualitative data is used to explain and elaborate the quantitative findings.

The unit of analysis of this study is the SME manufacturers in NZ. SMEs are categorised into three main groups, namely, micro companies (i.e. businesses having fewer than 5 full-time employees or FTEs), small companies (6 to 49 FTEs), and medium companies (50 to 99 FTEs) (NZ Centre for SME Research 2010). Micro companies are, however, excluded from this study because they are too small and studying them would not clarify the impact of their capacity for innovation. The list of the manufacturers was obtained from the Kompass database. As at August 2010, the Kompass database recorded 5,296 manufacturers in NZ, of which 2,929 and 389 were from the small and medium businesses, respectively. Out of this, a sample of 1,000 companies (small = 860; medium = 140) was randomly taken from the population in order to avoid bias.

To reduce the costs, the senior managers of the SMEs were personally called and invited to participate in the survey using Skype. Overall, 377 respondents were personally talked to and 144 of them agreed to participate in the survey, while 233 expressed an inability to participate. However, 612 SMEs could not be reached for various reasons such as busy or out of country, and for these organizations, 343 e-mail addresses were obtained from the operators (i.e. for e-mail invitation purposes) while the remaining were reached via hard copies. 26 companies were excluded from the samples because they claimed that the companies were either not a manufacturing organization, not an SME, the contact person was no longer in the organization, or the organization was closed. The total valid respondents was, therefore, 974 companies (i.e. 1,000 – 26). To boost response rate, reminder letters were sent to the respondents in two stages. The first reminder letter was sent two weeks after the original distribution. The second reminder letter with the questionnaire was sent approximately two weeks later. Data collection was performed between the periods of October 2010 till February 2011. 147 responses were received for the survey. 27 responses were discarded because of incomplete data. Hence, only 120 usable responses were

analysed giving a response rate of 12% (i.e. 120/974). This low response rate may be attributable to the limitations of the senior managers' time in answering the questionnaire as they are busy people with many demands on their time. From the responses obtained, a non-response bias test (using the Mann-Whitney test) was conducted to ensure that the responses represented the population as a whole. The non-response bias was tested by comparing early respondents (n = 74) and late respondents (n = 46). Following prior literature (e.g. Teo et al. 2009), three demographic items were used to assess the non-response bias in this study, namely, number of FTEs, sales turnover, and manufacturing sector. The p-value of the number of FTEs (p = 0.529), sales turnover (p = 0.911), and manufacturing sector (p = 0.730) suggested that there were no differences in responses across the two groups. Thus, non-response bias did not pose a major problem to this study.

### Validity and Reliability Assessment

The questionnaire was refined via several runs of experts' reviews and pre-testings before the actual distribution took place. For content validity purposes, an extensive review of the literature was undertaken to gain an understanding of each construct and its items, and to ensure that no important dimensions were neglected. 10 e-procurement practitioners and 10 academicians/researchers participated in this process. Each item on the questionnaire was reviewed for its content, scope, and purpose. Their feedback resulted in several modifications to the items. Two rounds of pre-testings were carried out to ensure that the instrument was well designed and contained items that really measure the constructs. The first round involved a professor in IS, a deputy director of the NZ Centre for SME Research, and 16 doctoral students. One senior IS lecturer and 6 doctoral students participated in the second round.

Table 2. Convergent and Discriminant Validity

	AVE	Cronbach Alpha	USAGE	CMP	CPX	EK	EP	RA	TMS
USAGE	0.62	0.79	<b>0.79</b>						
CMP	0.84	0.96	0.59	<b>0.92</b>					
CPX	0.72	0.92	0.39	0.52	<b>0.85</b>				
EK	0.80	0.88	0.44	0.60	0.51	<b>0.90</b>			
EP	0.76	0.89	0.63	0.67	0.37	0.41	<b>0.87</b>		
RA	0.67	0.92	0.60	0.74	0.62	0.45	0.67	<b>0.82</b>	
TMS	0.86	0.97	0.52	0.82	0.55	0.58	0.65	0.73	<b>0.93</b>

**Note:** Numbers in bold denote the square root of the average variance extracted (AVE)

For validation purposes, construct reliability, convergent validity, and discriminant validity were examined for all constructs. Construct reliability was assessed by the Cronbach alphas. In this study, the Cronbach alphas for all measures ranged from 0.79 to 0.97, which exceeded the recommended minimum value of 0.70. Convergent validity was examined by the AVE value where a value of more than 0.50 was evidence for convergent validity. A square root of AVE was used to evaluate the discriminant validity where all inter-construct correlations were compared. Results shown in Table 2 demonstrate adequate convergent and discriminant validities for this study. In addition, items with loadings of less than 60 percent were dropped from further analysis (Teo et al. 2009). Statistical significance was assessed using a bootstrap procedure, with 500 resamples.

## FINDINGS AND DISCUSSION

### Extent of E-Procurement Usage

The findings of the extent of e-procurement usage are shown in Table 3. Results revealed that the manufacturers were still new to the experience of exploiting the related e-procurement functionalities. Most of them used the information search and exchange functionalities highly for searching for suppliers of goods (68.3%) and services (65.5%) electronically, and exchanging purchasing information with external parties electronically (55.6%). This result suggests the Internet as a useful channel for businesses to find the suppliers and to deal with their business partners electronically. Supporting this, the respondents pointed that "*e-procurement is a useful first up tool to find suppliers and services*" and "*most useful is searching for suppliers of obsolete electronic components.*" Another respondent asserted that "*we use our Enterprise Resource Planning (ERP) for raising orders and inventory management. We use Internet to search potential suppliers or service providers.*"

Table 3. Extent of Use of E-Procurement Functionalities by Organizations

Functionalities	No. of	% of
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		Organizations	Organizations
ISE	Search for suppliers of goods electronically	82	68.3
	Search for suppliers of services electronically	78	65.5
	Check availability of goods electronically	58	49.2
	Check availability of services electronically	50	42.4
	Check prices of goods electronically	65	55.1
	Check prices of services electronically	45	37.8
	Exchange purchasing information with external parties electronically	65	55.6
	Exchange purchasing information with internal parties electronically	63	53.8
	Provide online specific information about product specifications that suppliers must meet	48	41.4
	Send suppliers regular updates about new developments in our organization electronically	32	27.1
	Share inventory planning information with suppliers electronically	21	17.8
SPT	Purchase goods using electronic catalogues	53	44.2
	Purchase services using electronic catalogues	27	22.7
	Create purchase requisitions electronically	63	52.9
	Approve purchase requisitions electronically	51	43.2
	Place orders with suppliers of goods electronically	78	65.5
	Place orders with suppliers of services electronically	45	37.5
	Track orders electronically	64	53.3
CPT	Purchase goods at electronic auctions	17	14.4
	Purchase services at electronic auctions	3	2.5
	Purchase goods via electronic reverse auctions	3	2.5
	Purchase services via electronic reverse auctions	1	0.9
	Purchase goods by issuing electronic calls for tenders	10	8.8
	Purchase services by issuing electronic calls for tenders	4	3.4
	Make payments to suppliers of goods electronically	99	83.9
	Make payments to suppliers of services electronically	96	80.7
EC	Negotiate contracts (price, volume, etc.) with suppliers electronically	85	71.4
	Electronic communications with suppliers via e-mail	108	90.8
	Electronic comms with suppliers using technologies other than e-mail	20	16.7
	Internal electronic comms on issues related to procurement via e-mail	77	64.7
	Internal electronic comms on issues related to procurement using technologies other than e-mail	19	16.0
	Technology integration of e-procurement with other internal systems	40	34.5
	Permitting the suppliers to directly access our internal systems	7	5.9

**Note:** The extent of use of functionality is measured on a seven-point Likert scale, ranging from 1 (not used at all) to 7 (used very extensively). Usage is defined as responding in the ranges of 4 to 7.

In the simple e-procurement transactions, e-procurement was widely used for placing orders with the suppliers of goods (65.5%) and tracking orders (53.3%), electronically. This result is consistent with Susan and Catherine (2007) who reported online ordering as the most common e-procurement activities in Australia, followed by purchase approvals and order tracking. A plausible explanation is that e-procurement applications allow firms to

locate goods at a reasonable cost and streamline the ordering process to obtain significant efficiencies. However, the use of e-procurement with regards to complex e-procurement transactions was rather low, especially in regards to purchasing of goods and services via e-auctions, e-reverse auctions, and electronic calls for tenders. The most common use of complex e-procurement transactions were making payments to suppliers of goods (83.9%) and services (80.7%) electronically and negotiating contracts with suppliers electronically (71.4%). This may be explained by the lack of electronic integration which is often required for the organizations to move to more complex electronic transactions (Lefebvre et al. 2005). Another possible explanation is that conducting transactions via e-procurement applications like e-reverse auctions can have impacts on buyer-supplier relationships as it could potentially harm the buyer's long-term performance by generating distrust among its suppliers (Kwak 2002). With regards to electronic collaboration, the findings revealed that most of the electronic communications (90.8%) and internal electronic communications on issues related to procurement (64.7%) came from e-mail rather than other technologies such as instant messaging, discussion groups, and video conferencing. Higher levels of electronic collaboration such as technology integration of the e-procurement system with other internal systems and permitting the suppliers to directly access the organization's internal systems (e.g. via ERP) was still uncommon. A plausible explanation is that e-mail helps organizations to communicate faster with their business partners and at lower cost. A similar finding was found in Teo et al. (2009) who reported that e-mail is the most common e-procurement tool used in communication. According to the respondents, "e-mail plays a large part in complex negotiations" and "communication on a daily basis with suppliers is done via e-mail wherever possible (some smaller suppliers don't have e-mail)." Others, however, preferred to have direct communication with their business partners where this can only be built and maintained by phones or visits. Other respondents had similar views by stating that "direct communication is easy and it is clear what business partner wants," and "one of our strengths is that we do foster personal relationships with our customers. There is real potential this could be lost with e-procurement."

#### Factors Associated with the Extent of E-Procurement Usage

In relation to the key factors that influence the extent of e-procurement usage in NZ SMEs, the results of path loadings revealed that relative advantage, employees' knowledge, and external pressure were significant at  $p < 0.05$  and above (see Figure 2). H1, H5, and H6 were, therefore, supported. These constructs explained approximately 48% of the variance in the extent of e-procurement usage ( $R^2 = 0.48$ ).

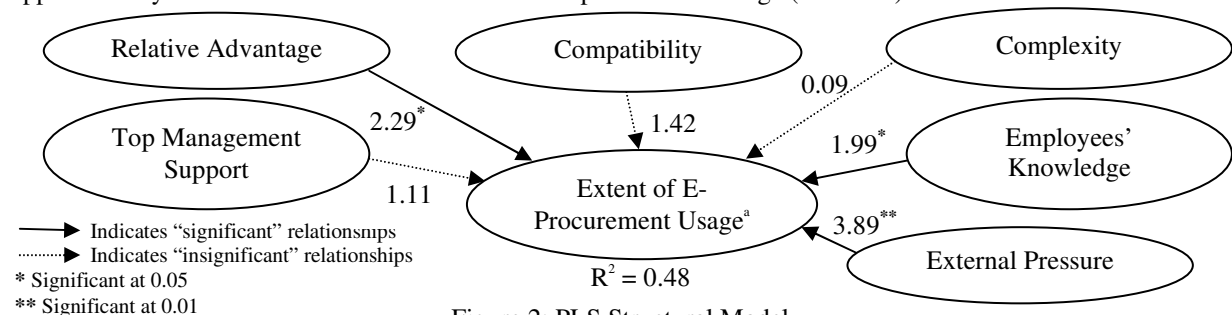


Figure 2: PLS Structural Model

Note: <sup>a</sup>Extent of e-procurement usage is measured by the total number of the functionalities used by the organization.

Among the innovation characteristics, relative advantage showed a significant and positive relationship with the extent of e-procurement usage ( $\beta = 2.29, p < 0.05$ ), thereby supporting H1. This demonstrates that Internet-based technologies have been widely accepted as helping organizations to improve purchasing process, facilitate better management of purchasing activities, improve relationships with business partners, reduce the price of procured goods or services, reduce operational costs, and improve competitive advantage (Teo et al. 2009). Several advantages given by the respondents include: "we feel e-procurement is very useful for buying many line items (usually of low or medium unit cost)," and "e-procurement provides good information when purchasing and has a useful history on past purchases." Similarly, another respondent pointed out that "e-procurement is flexible when purchasing officer is away. Employees can look at the screen to see the status of part." However, the organizations that do not perceive the benefits of e-procurement to be significant would consider the implementation of the system to be unnecessary. For instance, the respondents noted that "there is no advantage of using e-procurement," and "we are not sure how e-procurement would be better than any other sort of procurement." Likewise, another respondent added that "Yes, I can see the advantages, but on the flip side, if our 'customers' adopted it, our margins will be eroded and 'a do everything for nothing' culture would arise with our competitors. Only the customer wins and small business would lose out to those corporate with scale." In addition, e-procurement had also been considered as "costly to install and to maintain." Educating these companies about the potential benefits of e-procurement might, however, encourage the applications of e-procurement in future (Gunasekaran and Ngai 2008).

Other innovation characteristics like compatibility ( $\beta = 1.42, p > 0.05$ ) and complexity ( $\beta = 0.09, p > 0.05$ ) were found not to be statistically significant to the extent of e-procurement usage. H2 and H3 were, therefore, not



supported. This is inconsistent with prior literature (e.g. Grandon and Pearson 2004) where compatibility and complexity were discovered as the strongest driver in technology innovation compared to the other innovation characteristics. In this study, the respondents argued that *“even in an electronic business environment, people are still needed,”* and *“the effect on supplier relationships is usually to distance the supplier from the customer if there is no human interaction.”* Another respondent raised the issue of compatibility which is *“often depending on the supplier systems and it is not always compatible with internal systems and can mean double entry.”* These incompatibilities have consequently contributed to the difficulty of integrating e-procurement into their businesses as e-procurement does not only require the system itself but also the need to integrate with existing information infrastructures or systems like accounting, human resources, and inventory management. Failure to integrate these systems results in duplication of work and puts the reliability of the organizational information in danger. Accordingly, the respondents asserted that *“the use of the systems can be very complex,”* *“time consuming,”* and *“never friendly and no flexibility for a small business.”* Surprisingly, some of them were *“not aware of e-procurement systems”* and the use of the systems was, therefore, irrelevant.

For the organizational context, top management support ( $\beta = 1.11, p > 0.05$ ) did not seem to be a significant factor on the extent of e-procurement usage, thereby rejecting H4. In general, top management's belief about the positive impact of e-procurement on the organization's performance will influence their decision regarding the use and the amount of resources committed to the technology usage. The result of this study is, however, inconsistent with the results of other e-procurement studies like Teo et al. (2009). This demonstrates that top management support does not play a crucial role in facilitating the extent of e-procurement usage. This might be because of the organization has limited budget, top management support is less important in driving e-procurement applications, and they may feel obligated to keep abreast with the trend in e-procurement applications (Wu et al. 2007b). Another reason might be related to the low volume of their business transactions where respondents pointed that *“our business is low volume niche industrial business. Unit value of our finished products is in few thousand dollars. We have not yet explored the usage of e-procurement within our organization,”* and *“currently, we can manage our work-load using our current ERP system and excel spreadsheets. But, if our business activity doubles or triples, then it may be more cost effective to consider e-procurement.”* For these reasons, the use of e-procurement was considered to be unnecessary. Another respondent argued against the necessity of *“investing time and money for e-procurement unless the benefits of using it are obvious.”* Others had similar views by noting that *“there are enough risks in business without adding to them”* and *“I doubt risk is an acceptable trade off.”*

Confirming Looi (2005), this study found a significant association between employees' knowledge and the extent of e-procurement usage ( $\beta = 1.99, p < 0.05$ ). Hence, H5 was supported. According to Teo et al. (2009), knowledge about e-procurement is generally crucial before determining the use of e-procurement. Businesses with employees who are more knowledgeable about e-procurement are more likely to use e-procurement. A possible explanation is that greater knowledge in e-procurement results in less degree of uncertainty and less risk in using the applications. According to the respondent, *“the people who do the ordering have the skills and understanding.”* However, one of the respondents argued that *“it is the way of the future, so management will have to adopt these methods, but some aging employees struggle with modern electronic methods.”*

Soliman and Janz (2004) argued that the organizations that invest in IS/IT due to pressures from the trading partners or competitors may gain competitive advantage compared to others that fail to do so. Firms that encounter pressure from their trading partners will generally use the technology more frequently than those that do not. Hence, when more competitors become e-procurement-capable, SMEs are more inclined to use e-procurement in order to maintain their competitive position. Supporting this, the findings of this study demonstrated external pressure ( $\beta = 0.36, p < 0.01$ ) as the strongest determinant of the extent of e-procurement usage, more than relative advantage and employees' knowledge. H6 was, therefore, supported. One of the respondents asserted that *“we don't have a choice. Our parent company makes us use e-procurement.”* However, some of the respondents expressed their concerns as follows: *“our main suppliers are not pushing e-procurement at all,”* and *“it is the way of the future, but do not feel we would be compromised with any of our suppliers if we did not adopt e-procurement across the board.”*

## PROGRESS OF STUDY

This study has two dimensions of dependent variables, namely, breadth (i.e. the extent to which an organization takes advantage of the variety of e-procurement functionalities) and depth (i.e. the percentage of goods and services purchased online). However, this paper covers the breadth only, while the depth of e-procurement usage is not discussed. Currently, the latest part of this study has just completed data collection and data analysis stages.

## CONCLUSION

This study focuses on the post-adoption stages, making it different from the other e-procurement studies that commonly used “adoption vs. non-adoption” as a measure. Results revealed that the manufacturing SMEs in NZ

were still new to the experience of exploiting the related e-procurement functionalities. Most of them participated in the most basic information search and exchange, simple e-procurement transactions, complex e-procurement transactions, and electronic collaboration. The use of complex e-procurement transactions was rather low, especially in the context of purchasing goods and services using several advanced channels like e-auctions, e-reverse auctions, and electronic calls for tenders. Furthermore, most of the organizations used e-mail to negotiate, communicate, and perform transactions with their business partners. Other technologies such as instant messaging, discussion groups, and video conferencing were rarely used. Higher levels of electronic collaboration such as technology integration of the e-procurement system with the other internal systems were still uncommon. In relation to the influential factors, results demonstrated the significant impacts of relative advantage, employees' knowledge, and external pressure on the extent of e-procurement usage, leaving other factors to be insignificant. This indicates that the SMEs used e-procurement functionalities because of the benefits offered by e-procurement, capabilities by the employees, and pressures exerted by the competitive environments. However, no firm evidence was found to support the influence of compatibility, complexity, and top management support on the extent of e-procurement usage.

This study contributes to the literature of e-procurement by introducing a measure of the extent of e-procurement usage that other researchers will be able to use and gaining a better understanding of the key factors that influence the extent of e-procurement usage in NZ SMEs. The mixed methods provide several benefits such as helping researchers to triangulate some of the quantitative findings, thereby improving the accuracy of the researchers' judgments and contributing to a greater confidence in the results. Practically, the findings of the study may give the SME managers a useful insight into the extent of e-procurement usage and assist them in making decisions around using e-procurement. Additionally, the findings would enable other related departments in the organizations such as finance, accounting, IT, inventory control, and purchasing to better prepare and plan for e-procurement technologies in their organizations in future.

This study, however, has two limitations. Firstly, the study was restricted to the SMEs in NZ only. The results will, therefore, not illustrate any significant differences on the extent of e-procurement usage between small and large enterprises in the country. Secondly, this study is cross-sectional in nature. The results will, therefore, posit the relationship between the contextual factors (i.e. technological, organizational, and environmental) and the extent of e-procurement usage, rather than shed light on their causality.

## REFERENCES

- Bland, V. 2003. "The Internet in Action: The Ballooning of E-Business Opportunities," *New Zealand Management*, July, pp 51-54.
- Burton-Jones, A. and Straub, D.W.S. 2006. "Reconceptualizing System Usage: An Approach and Empirical Test," *Information Systems Research* (17:3), pp 228-246.
- Chau, P.Y.K. and Hui, K.L. 2001. "Determinants of Small Business EDI Adoption: An Empirical Investigation," *Journal of Organizational Computing and Electronic Commerce* (11:4), pp 229-252.
- DeLone, W.H. and McLean, E.R. 2003. "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update," *Journal of Management Information Systems* (19:4), pp 9-30.
- Forman, C. 2005. "The Corporate Digital Divide: Determinants of Internet Adoption," *Management Science* (51:4), pp 641-654.
- Grandon, E.E. and Pearson, J.M. 2004. "Electronic Commerce Adoption: An Empirical Study of Small and Medium US Businesses," *Information & Management* (42:2004), pp 197-216.
- Gunasekaran, A. and Ngai, E.W.T. 2008. "Adoption of E-Procurement in Hong Kong: An Empirical Research," *International Journal of Production Economics* (113:2008), 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* (122:2009), 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.
- Hsu, P., Kraemer, K.L., and Dunkle, D. 2006. "Determinants of E-Business Use in U.S. Firms," *International Journal of Electronic Commerce* (10:4), pp 9-45.
- Kwak, M. 2002. "Potential Pitfalls of E-Auctions," *MIT Sloan Management Review*, Winter 2002, p 18.
- Lefebvre, L., Lefebvre, E., Elia, E., and Boeck, H. 2005. "Exploring B-to-B E-Commerce Adoption Trajectories in Manufacturing SMEs," *Technovation* (25:2005), pp 1443-1456.

- 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.
- Marchewka, J.T., Liu, C., & Kostiwka, K. (2007). An application of the UTAUT model for understanding student perceptions using course management Software. *Communications of the IIMA*, 7(2), 93-104.
- Min, H. and Galle, W.P. 2003. "E-Purchasing: Profiles of Adopters and Nonadopters," *Industrial Marketing Management* (32), pp 227-233.
- New Zealand Centre for SME Research 2010. "About SMEs." Retrieved 10 May, 2010, from <http://sme-centre.massey.ac.nz/>.
- Premkumar, G. and Ramamurthy, K. 1995. "The Role of Interorganizational and Organizational Factors on the Decision Mode for Adoption of Interorganizational Systems," *Decision Sciences* (26:3), pp 303-336.
- Rogers, E.M. 1995. *Diffusion of Innovations*. Fourth ed. New York: The Free Press.
- Soliman, K.S. and Janz, B.D. 2004. "An Exploratory Study to Identify the Critical Factors Affecting the Decision to Establish Internet-Based Interorganizational Information Systems," *Information & Management* (41:2004), pp 697-706.
- 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>.
- Susan, W. and Catherine, H. 2007. "E-Procurement: Current Issues & Future Challenges," *Proceeding of the European Conference on Information Systems (ECIS 2007)* (133), pp 131-142.
- 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), pp 972-987.
- Teo, T.S. and Pian, Y. 2003. "A Contingency Perspective on Internet Adoption and Competitive Advantage," *European Journal of Information Systems* (12:2003), pp 78-92.
- 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.
- Tornatzky, L.G. and Fleischer, M. 1990. *The Process of Technology Innovation*. Lexington Books, Lexington, MA.
- U.S. Census Bureau 2010. "U.S. Census Bureau E-Stats." Retrieved 10 May, 2010, from <http://www.census.gov/econ/estats>.
- Wu, J., Wang, S., and Lin, L. 2007a. "Mobile Computing Acceptance Factors in the Healthcare Industry: A Structural Equation Model," *International Journal of Medical Informatics* (76:2007), pp 66-77.
- Wu, F., Zsidsin, G.A., and Ross, A.D. 2007b. "Antecedents and Outcomes of E-Procurement Adoption: An Integrative Model," *IEEE Transactions on Engineering Management* (54:3), pp 576-587.
- 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* (15:2006), pp 601-616.

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