

**SYMPOSIUM ON E-PROCUREMENT IN PUBLIC SECTOR:  
PART II**

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## FACTORS INFLUENCING E- PROCUREMENT USAGE

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**ABSTRACT.** Research indicates that e-procurement is being implemented slowly in many organizations, especially government organizations. This article investigates positive factors influencing e-procurement intentions within semi-government organizations. A web-based survey was carried out on Australian government purchasing professional's perspectives of e-procurement. Findings from a multiple regression analysis indicate that suppliers' participation, internal managerial support and the perceived benefits gained through implementation all influence e-procurement intentions.

### INTRODUCTION

E-procurement is the use of online technology to assist with the procurement function. It is considered an operational imperative in today's competitive environment, a growth area and one of the key issues purchasing and supply executives need to face now and in the near future (Davila, Gupta & Palmer, 2003; Carter, Carter, Monczka, Slaight, & Swan, 2000). Although forecasts on the use of e-procurement have been downgraded with the burst of the Internet bubble in 2001 (Davila et al., 2003), experts are still predicting growth (Halal, 2003) with statistics showing an increased growth in the use of e-procurement for 2004. For example a recent survey indicated that e-procurement of direct goods is

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now exceeding that of indirect goods (Bartels, Hudson, & Pohlmann, 2003). On the other hand results are also less than expected by some. Such confusion may be causing some type of inertia within the adoption process even though significant benefits can be obtained (Anon, 2002).

Significant operational benefits, such as the following, can be gained: lower transaction costs, lower staffing requirements, shorter procurement cycles, reduced inventory levels, higher degree of transparency and increased communication and collaboration between supplier and buyer organizations (Davila et al., 2003; Turban, King, Lee, Warkentin & Chung, 2002; Osmonbekov, Bello & Gilliland, 2002; Carter et al., 2000; Rajkumar, 2001; Min & Galle, 2003). Yet, for all the benefits outlined there are many organizations that are taking a “wait and see” approach to the implementation of e-procurement technologies (Gottschalk & Abrahamsen 2002, Davila et al., 2003). As Bartels, Hudson and Pohlmann (2003, p. 6) point out: “While the data provides evidence that progress is being made in terms of online adoption and usage, those averages disguise a more complex picture in which certain segments of companies vary vastly in results. Large service sector firms are making the most progress and seeing the best results, while other segments – small manufacturers in particular – are lagging in online purchasing and tool usage.” With such differing adoption practices between different industries, research conducted within specialized industry segments helps develop an understanding for that particular segment.

Debate exists as to whether such a wait and see approach is necessarily bad for an organisation (MacManus, 2002). Research into government organizations has highlighted a number of factors that may influence this approach: inflexibility of organizational structures; lack of financial investment; lack of skills and training; and not suited to traditional government practices (MacManus, 2002). Yet, there is still a desire by government organizations to adopt e-commerce technologies. Understanding the factors that positively influence adoption of e-procurement technologies will help organizations develop strategies that assist implementation. This research investigates some of the factors that positively influence Australian semi-government organizations adoption of e-procurement.

There is also a debate as to what e-procurement entails (Vaidya, Sajeev & Callender, 2004). Confusion concerning the differences between e-purchasing and e-procurement has lead to suggestions that the

two terms are used interchangeably (MacManus, 2002). The approach taken in this research was to use an all encompassing definition, and to define e-procurement to include all forms of use of electronic infrastructure that connects two organizations in the purchasing process (de Boer, Harink, & Heijboer, 2002; Min & Galle, 2003). A broad perspective has also been taken in other research and ensures that respondents are not confused over intricate and minor differences in definitions when responding to self administered questionnaires. Therefore, the definition of e-procurement provided to the respondents is as follows: “Electronic tendering, or auctioning and procurement of goods and services over the Internet. This may be via portals, extranets, e-auctions, private platforms, marketplaces, and/or electronic data interchange (EDI).” Such a broad definition is similar to that used by the World Bank and covers a wide range of information and communication technologies used by organizations to conduct relationships with suppliers when acquiring goods and services.

Therefore, the research focus is the following research question: What factors positively influence the buyers’ intentions to implement e-procurement?

In particular, the research is focused on Australian semi-government organizations where there is an emphasis in adopting newer technologies. The semi-government organizations surveyed in this research included Australian State Government Departments that have become autonomous financial entities. Examples include railway infrastructure and transport, electricity supply; building services; airport corporations, department of primary industry service providers and specialized health care providers.

### **Government and Semi-government Usage of E-procurement**

There is particular concern that government and semi-government organizations have not progressed to use e-procurement at anywhere near the levels forecast. The UK government publications are typical of the hype surrounding the use of e-commerce where it is seen as an important aspect in making government efficient (Foley, 2000). For example the 1998 Competitiveness White Paper outlines “building sound foundations for e-commerce, improving understanding, increasing access, enhancing trust, promoting government as an exemplar, developing monitoring of e-commerce, and co-ordinating activities for e-commerce within government” (Foley, 2000, p. 1).

Similarly the forecasts were upbeat in terms of the benefits government could obtain. E-commerce technologies provide effective and efficient ways in which corporate buyers can gather information rapidly about available products and services, evaluate and negotiate with suppliers, implement order fulfilment over communications links, and access post-sales services (Foley, 2000). Such benefits are similar to those outlined for private organizations although some researchers have highlighted that the requirements of government procurement differ from those of private enterprises (MacManus, 2002). She highlights that public sector procurement practices require departments to use a large number of suppliers to encourage competition and include minority business owners that may not have electronic access. Such requirements will change how they develop relationships with their suppliers and consequently how they develop strategies for electronic integration.

Given the variety of different e-procurement modes that organizations use, the most common task currently undertaken is that of purchasing through online catalogues (MacManus, 2002). Data gathered in this research project also substantiates such findings with 57% of respondents using online catalogues. Yet online auctions and e-tendering is a low 12.6 and 23% respectively. Therefore, different models and uses of e-procurement are being used across differing government departments, thus indicating that e-procurement is still in an early adoption stage with differing models being used to suit varied circumstances.

### **Factors Influencing Usage of E-procurement**

Exploratory studies have indicated that many organizations are pursuing electronic means to conduct business, that there are a number of factors influencing the adoption of electronic commerce, and that these may be summarized as e-procurement, e-sourcing and e-collaboration (see for example Bartezzaghi & Ronchi, 2003). However, because the growth in the usage of e-procurement has not met expectations, most recent research has been investigating the barriers to e-procurement usage (More & McGrath, 2002; Kheng & Al Hawamdeh, 2002) rather than factors which positively influence adoption (Min & Galle, 2003).

As an example, although EDI has existed for a number of years, the number of organizations using EDI has been limited, due to the high cost of implementing an EDI system. The use of EDI is generally restricted to

large manufacturing organizations and their major suppliers within a close geographical distance (Turban et al., 2002; Osmonbekov et al., 2002). The Internet effectively removed these restrictions allowing organizations to be networked together at a low cost, and it offers greater flexibility as the requirement for private networks are eliminated (Attaran, 2001). With the opening up of connectivity, however, a lowering in the security of data also occurred, and concern over security is a factor limiting the implementation of e-commerce systems (Carter et al., 2000; Croom, 2000). Nonetheless, more recent evidence indicates security concerns are becoming less of an issue (at least for the more aggressive adopters) and hence concerns about security are not restricting the use of B2B e-commerce systems (Davila et al., 2003).

Another factor limiting usage is the readiness of supplier firms to participate (Bartels, Hudson & Pohlmann, 2003). Buyers have indicated that they are willing to use e-procurement, but they perceive that their suppliers are not able to participate. Buyers then have the choice of either limiting the extent of their e-procurement processes (reducing the benefits obtained) or finding new suppliers who are willing to conduct transactions electronically.

### **Positive Factors influencing e-procurement**

This research focused on investigating factors which positively influence the purchasing organization to become involved in the use of e-procurement rather than considering factors which inhibit the organizational adoption. A considerable number of studies have been conducted to determine what influences a firm to become involved in e-procurement (see Kennedy & Deeter-Schmelz, 2001; Ellram & Zsidisin, 2002; Min & Galle, 2003; Croom, 2001; Croom & Brandon-Jones, 2004; Davila et al., 2003; Joo & Kim, 2004). From this research a list of positive influencing factors was developed; the factors are discussed in more detail below.

### **Supplier Participation and Intentions**

Some suppliers apply pressure on their customers to become involved in the use e-commerce to reduce costs, improve communications and gain operational efficiencies (Kennedy & Deeter-Schmelz, 2001). Many buyers have indicated that they are not pleased with the online capabilities of their suppliers. An ISM/Forrester survey

found that 36.6% of manufacturers rated their suppliers online capabilities as very bad or poor (Olsztynski, 2003). Yet for the procurement process to occur electronically both the supplier and the buyer need to be connected (often via the Internet). Some suppliers provide encouragements that can be either financial or non-financial. Examples of financial encouragements are lower prices or increased discounts for products ordered electronically and/or the option to reduce inventories. Non-financial incentives include training sessions, customized web fronts, and better service (Croom, 2001; Deeter-Schmelz, Bizzari, Graham & Howdyshell, 2001). Overall, previous research has highlighted that supplier support has a positive influence on the adoption of e-commerce (Deeter-Schmelz et al., 2001). Supplier strategies and willingness to take on new technologies such as e-procurement have been shown to have a positive effect on the utilization of the new technologies by the buying partner. Therefore, H1 is

Supplier participation and intentions have a positive relationship with Electronic Procurement Intentions (EPI).

### **External Organizational Pressures**

Suppliers can also exert pressure on their customers to use their systems and vice versa (Joo & Kim, 2004; Min & William. 1999). The use of power in such cases occurs when there is a relative power imbalance within the dyad. To fully gain from the benefits of e-procurement, suppliers need to have as many of their customers as possible using their electronic ordering systems. Powerful suppliers may indicate to their buyers that they must use their system or they will cease supplying them. Of course the reverse can also occur where powerful buyers insist that their suppliers conduct transactions electronically or they will cease buying from that particular supplier. Supplier pressure to use new technology may have a positive effect on purchase intentions if the customer relies/depends on the supplier. Alternatively, it may have a negative effect if the buyer resists this pressure and purchases similar products from elsewhere. Due to the coercive nature of supplier pressure the researchers consider it still wise to postulate that such pressure will have an effect on the buyer's intention to use e-procurement. Therefore overall, H2 is

Supplier pressure to use new technologies has a positive relationship with EPI.

### **Internal Organizational Support**

The continuous drive towards organizational efficiency and lowering the cost to conduct business is also driving the adoption of e-procurement (Lancioni, Schau & Smith, 2003). Organizations are applying internal forces to boost adoption hoping to gain from the benefits e-procurement is purported to give (Croom & Brandon-Jones, 2004). Therefore, internal organizational support for adoption of such systems is vital if they are going to be implemented successfully. Previous research has highlighted a number of internal factors influencing adoption: staffing levels, training in new technologies; encouragement from management and other departments (in particular information systems) (Osmonbekov et al., 2002); sufficient financial and resource backing (Joo & Kim, 2004); and adequate budget allocations to ensure all requirements are met. It is proposed that internal organizational support will have a positive influence on e-procurement intention (EPI). Therefore H3 is

Internal organizational support has a positive relationship with EPI.

### **Network Connectivity/Integration**

Suppliers' systems also need to be integrated and compatible with their buyers' systems if the transaction process is to be automatic thus gaining the full benefits available (Rajkumar, 2001; Croom & Brandon-Jones, 2004). Integration of electronic networks that are reliable and have sufficient capacity allows easy transfer of information. Research has shown that network connectivity has an impact on the performance of an e-procurement system (Croom & Brandon-Jones, 2004). Therefore, it can be expected that reliable and secure connectivity would increase an organization's intentions to use e-procurement. The extent of integration with major supplier's electronic networks will influence buyer organization adoption. It is proposed that electronic networks that are highly integrated between buyers and their major suppliers will positively influence the buyer organization's intention to use electronic purchasing technologies. Therefore, H4 is

Extent of electronic integration has a positive relationship with EPI.



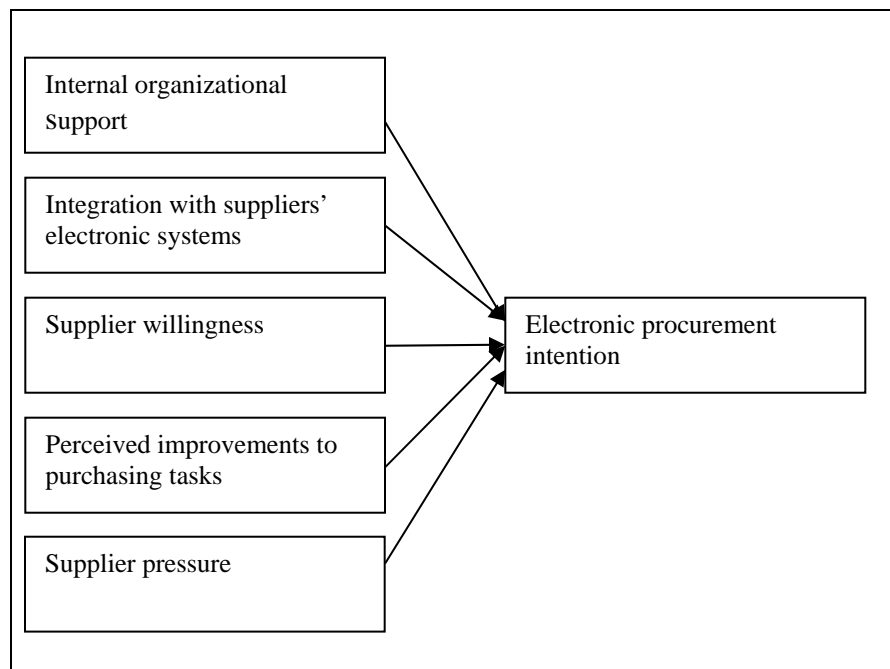
### Task Improvements/Convenience

E-procurement has been shown in many cases to improve the task of the purchasing professional (Olsen & Boyer, 2003; Rajkumar, 2001). In particular, the amount of time spent on administrative tasks is reduced allowing supply personnel to concentrate on more strategic issues (Rajkumar, 2001). If individual purchasing professionals perceive that using such technologies will make their tasks easier, then their intention to purchase electronically will be increased. Therefore H5 is

Perceived improvements to purchasing tasks undertaken have a positive relationship with EPI.

Based on the above hypotheses a conceptual model was developed to illustrate how the main constructs are to be tested. This model is depicted in Figure 1.

**FIGURE 1**  
**Model of Electronic Procurement Intention**



## METHODS

The hypotheses were tested, using survey data gathered from purchasing professionals, through the multivariate technique of multiple regression analysis. This section outlines the research method undertaken to test the hypotheses.

### Sample

Purchasing professionals within Australian semi-government departments were the targeted respondents. To reach these respondents members of the Australian Institute of Purchasing and Materials Management (AIPMM) and all purchasing professionals within the Queensland State Government (Queensland Purchasing emailing list) were sent an email inviting them to complete the survey at a specified web site. Members of AIPMM are purchasing professionals representing government, semi-government and private organizations, however only the government and semi-government responses were used for this research. Purchasing professionals from the Queensland Purchasing list are all government employees. Due to privacy considerations Queensland Purchasing and APIMM did not directly release their emailing lists to the researchers and the exact number of participants on the emailing lists is unknown. Estimates of the numbers who were sent the email inviting responses would be 2500 for the AIPMM, a significant proportion (say 50%) of whom would be government and semi-government, and 450 for the Queensland Government all of whom would be government or semi-government. A reminder email was sent three weeks after the first email, requesting those who had not completed the survey to do so. Web based surveys have the advantage of targeting respondents who are used to using electronic tools, particularly the Internet, in their normal working environment. Research has also shown that Internet respondents are less likely to complete questionnaires using other distribution methods (Swobada, Muehlberger, Weitkumat & Schneeweiss, 1997). From the emails sent, 211 surveys were completed, of which 199 were usable.

### Questionnaire development and variables

A questionnaire was developed after a review of the literature related to e-purchasing and e-procurement and discussions with academics and the head of Queensland Purchasing. Items were anchored using a 7 point Likert scale (1 - very strongly disagree to 7 - very strongly agree). Item

statements used to measure the independent variables are found in Table 1.

There were two items measuring the dependent variable, intentions, both asked statements relating to the respondent's intentions to increase their use of the Internet in more of their purchasing activities within (a) less than 12 months and (b) greater than 12 months. The items were summed to form the dependent variable: intentions to use e-procurement. The mean for the dependent item was 3.96, standard deviation 0.95 and had a Cronbach Alpha of 0.875, indicating acceptable reliability.

Content validity was addressed by using prior items wherever possible and by carrying out reviews on the instrument. Before the questionnaire was finalized it was pre-tested on a sample of ten respondents who gave feedback on the interpretation of the questions and provided feedback on items that were unclear. Exploratory factor analysis allowed the researchers to determine construct validity of the independent variables (Hair, Anderson, Tathom & Black, 1998). Calculations of Cronbach Alpha confirmed the reliability of all variables as they were 0.7 or greater (Hair et al., 1998).

## RESULTS

This section outlines the data analysis undertaken and the results. All respondents had used the internet in some form for purchasing activities although not necessarily for transaction purposes. Details of Internet usage was elicited using a number of specific questions on past experience such as how long they have been using the Internet / EDI and e-procurement within their work environment. Even though the respondents were in semi-government organizations, the majority classified their operations as manufacturing type operations (49.7%), followed by service industry (39.1%) and primary industry (11.1%). Manufacturing type of industries would include construction of railroad vehicles, construction of new government facilities, and primary industry departments supplying product such as seed to farmers.

Respondent's purchasing experience ranged from less than one year to greater than 30 with an average of 16.4 years. Of those who responded, 65% indicated that they had transacted online with the average time of usage being three years. This indicates that 35% did not consider that their organization was using e-procurement as defined. Also the usage of e-procurement was less than one year for 17.8% of respondents, one to

two years for 32.5% and two to four years for 34%. Only 10% have been using e-procurement for more than four years. With respect to size of organization, 40% of respondents indicated that their organization had a budget over \$30 million, while 50% had a budget of between \$10 million and \$30 million.

### Factor Analysis

Factor analysis was carried out on the independent variables using principal component analysis with varimax rotation. All variables consisted of multi-item measures and the results of the factor analysis are given in Table 1. Two items were removed from the analysis due to large cross loadings on more than one factor, improving the unidimensionality of the factors. All factors have eigenvalues greater than one and items have factor loadings of 0.55 or greater.

**TABLE 1**  
**Results of the Exploratory Factor Analysis**

Variable	Item	Factor Loadings	Cronbach's Alpha
Internal organizational support Eigenvalue = 3.74 % variance = 17.8	Sufficient staffing levels	0.84	0.87
	IS/ IT department +ve influences behaviour	0.81	
	Sufficient budget allocation	0.79	
	Sufficient staff training	0.77	
	Management Pressure to use systems	0.69	
	IS/ IT determines choice of systems	0.55	
Electronic integration with suppliers Eigenvalue = 1.98 % variance = 9.4	Suppliers access our site for information	0.74	0.7
	We access suppliers sites for information	0.69	
	Electronically integrated with suppliers	0.67	
Suppliers Willingness Eigenvalue = 2.26 % variance = 10.7	Suppliers plan to use e-procurement 1 to 5 years	0.88	0.82
	Suppliers plan to use e-procurement next 12 months	0.86	
	Suppliers willing to participate	0.59	

**TABLE 1 (Continued)**

<b>Variable</b>	<b>Item</b>	<b>Factor Loadings</b>	<b>Cronbach's Alpha</b>
Perceived improvements to purchasing tasks Eigenvalue = 3.74 % variance = 16.7	Make job easier	0.85	0.85
	Online catalogues makes job easier	0.82	
	Reduced time spent with sales people	0.79	
	Questions answered more effectively	0.70	
	More information on products & services available	0.66	
	Comfortable using electronic tools	0.59	
Supplier pressure Eigenvalue = 2.37 % variance = 11.3	Major suppliers exerted pressure on infrastructure development	0.89	0.85
	Major suppliers exerted pressure to initiate e-procurement practices	0.87	
	Major suppliers exerted pressure on behaviour	0.80	

Overall the factor analysis explained 65.9% of the variance and reliability coefficients range from 0.7 to 0.87 and are considered acceptable (Hair et al., 1998). The independent variables aligned with those hypothesized from the literature and allowed the researchers to test all hypotheses generated.

### **Model Analysis**

Overall model evaluation and testing of the proposed hypotheses was conducted using stepwise linear multiple regression analysis. Results are given in Table 2 with the overall model significant.

As indicated in Table 2, the relationship between supplier pressure and intention to use e-procurement was not significant and was not included in the model analysis. The final model, excluding supplier pressure, was highly significant with an  $R^2$  of 0.462,  $p < 0.001$  and F-test of 43.5. Given the sample size and specified significance level the  $R^2$  was great enough to ensure acceptable power level (Hair et al., 1998). Variance Inflation Factors are all above 1 indicating that multicollinearity is not a problem (Hair et al., 1998).

**TABLE 2**  
**Results of the Multiple Regression Analysis**

<b>Variable</b>	<b>R<sup>2</sup> change</b>	<b>Beta</b>	<b>F change</b>
Supplier willingness	0.203	0.423	50.07*
Perceived improvements to purchasing tasks	0.124	0.356	36.15*
Internal organizational support	0.101	0.304	34.25*
Electronic integration with suppliers	0.045	0.213	16.66*
Supplier pressure	Not significant hence not included in the model	-0.02	

Note: \*  $p < 0.001$

The results partially support the proposed model in that four of the five independent variables significantly influence the buyer organization's intentions to use e-procurement practices. Hypotheses H1, H3, H4 and H5 are all supported, while hypothesis H2 is not supported. Hypothesis H2 may not have been supported as coercive pressure can also be a disincentive as indicated earlier.

Major supplier willingness and future participation had the strongest influence on intentions to use e-procurement, with an  $R^2$  of .203. Such a result should not be unexpected in that e-procurement practices need to be used by both buyers and suppliers if the benefits of using electronic systems are to be achieved. Internal organizational support and perceived improvements and convenience in purchasing activities also had an influence on intentions.

## DISCUSSION

The research indicates that major suppliers' willingness and future intentions to transact online are a driving force that influences the buyers' intentions to use e-procurement. This result has also been found in research conducted within the US that found supplier support directly affected Internet purchase intentions (Deeter-Schmelz et al., 2001). The extent of supplier support varied, with the influence in this research being much stronger (0.423) and explaining a greater extent of the variance than the previous Deeter-Schmelz et al., (2001) study (0.16). The implication of this result is that either supplier's intentions have a

greater effect in Australia, or as time and experience have grown so has the realization that supplier intentions and willingness are critical to the adoption of e-procurement. Therefore, if suppliers wish to encourage their buyers to initiate e-procurement practices, they should indicate to their buyers the extent of their future intentions in this area. Therefore, e-procurement is not an issue that can be addressed through internal processes only, but one that has consequences to the dyad or supplier-buyer relationship.

Internal organizational support also has an important effect on intentions to use the Internet for purchasing transactions. The organization must supply the purchasing or supply department with adequate resources if they are going to undergo the change processes required to implement e-procurement systems. Adequate resources in training, staffing levels and systems support will be necessary if the intentions to further use the Internet for transactions are to be realized. Note however that one implication of the results obtained here is that although organizational support is important, it is not as important as suppliers' intentions. Therefore, managers that wish their purchasing / supply departments to use this technology for efficiency and cost benefits must also approach their major suppliers and determine their intentions, preferring those suppliers who are expressing intentions to implement e-procurement.

Perceived improvements to purchasing tasks also has a positive effect on future e-procurement intentions, although this research indicated that it does not have as strong an effect as previous research has indicated. Research by Deeter-Schmelz et al., (2001) showed that this variable had by far the strongest influence on Internet purchase intentions (0.55) unlike research that indicated it had a lesser effect (0.356). Such a difference could be due to the time difference of the data collection. Late 2000 and early 2001 saw the decline in optimism on what the Internet and its utilization could actually achieve. The data for this research was collected in late 2003, when the shake up of Internet companies and consequent solutions had lowered the level of optimism throughout the business community.

Electronic integration with suppliers, although significant, did not have a large effect (0.21) and explained only 4.5% of the variance. Such a low result could be due to the level of knowledge and technical ability of the respondents. The low result could also be due to the fact that

newer technologies, such as web services, are perceived to overcome these issues.

Overall, the model highlights that online transaction intention is an issue that needs to be addressed by both sides of the purchasing process: buyers and suppliers. As with the development of purchasing relationships in general, unless e-procurement is seen as a tool to assist in the development of relationships by ensuring that both sides of the relationship have the willingness and future intentions to go down the path of electronic transactions - it won't work.

### **CONCLUSION**

Major factors influencing the use of e-procurement in the semi-government organizations were elicited in this study. The existence of these factors may be used by supplier organizations or by buyer organizations to facilitate the uptake of e-procurement.

It needs to be stressed that the respondents to this survey were purchasing professionals in semi-government organizations, and applying generalizations to private industry organizations may be difficult. Future research needs to extend this study to other types of organizations in order to allow generalization of these results to the wider business community.

These results reinforce the view that there has been a change in attitude towards the use of electronic systems in the procurement process, and it is suggested that this is due to the overall drop in business expectations after the burst of the Internet bubble. Such changes in attitude and expectations are to be expected given the turbulent market place created by the rapid developments occurring in the information industry. To keep track of changes in attitudes to electronic commerce initiatives, future research needs to be conducted regularly to evaluate the extent and direction of those changes.

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