



# An investigation into the factors influencing the adoption of B2B trading exchanges in small businesses

Mohammed Quaddus<sup>1</sup> and  
Glenn Hofmeyer<sup>1</sup>

<sup>1</sup>Graduate School of Business, Curtin University  
of Technology, 78 Murray Street, Perth, WA,  
Australia

**Correspondence:**

Mohammed Quaddus, Graduate School of  
Business, Curtin University of Technology, 78  
Murray Street, Perth, WA 6000, Australia.

Tel: +61 8 9266 2862;

Fax: +61 8 9266 3368;

E-mail: quaddusm@gsb.curtin.edu.au

**Abstract**

Small businesses, in general, play dominant roles in terms of employment generation and share in total business activities. However, studies have shown that small businesses are also slow in their uptake of modern technologies including electronic commerce. This paper presents the result of an empirical study that investigates the adoption behaviour of small businesses in relation to business-to-business (B2B) trading exchanges in the context of Western Australia. Following extensive literature review on innovation adoption–diffusion theories and qualitative field study, a research model was developed which treated six sets of antecedents of small business's attitude towards B2B trading exchanges. The findings revealed that external influences raise the small business's awareness of an innovation. This awareness leads to the evaluation of the perceived direct and indirect benefits and a positive evaluation leads to a positive attitude towards the innovation. The results confirmed that a positive attitude towards B2B trading exchanges leads to the intention to adopt B2B trading exchanges in small businesses. The findings also confirm that external, belief, contextual and control factors drive the attitude towards B2B trading exchanges. Implications of the results are highlighted.

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**Introduction**

Small businesses contribute significantly to economic activities in Australia, employing over 47% of the private sector workforce and contributing over 40% to Australia's goods exports (ABS, 2003, <http://www.sbd.com.au/publications/publications.asp>, accessed on 12 February 2007). In Western Australia (WA), small businesses account for 96.7% of total business numbers (ABS, 2003) thus making it a significant industry in terms of employment generation and other economic activities. However, studies have shown that small businesses are slow to apply technology to improve their competitiveness as they are affected by their sheer small size and limited resources. Poon & Swatman (1999) found that small businesses in Australia have been slow in their uptake of electronic commerce even though electronic commerce and its associated technologies could provide unique opportunities to small businesses to overcome issues with geographical remoteness and time differences. These are relevant issues for WA small businesses given that location and time constraints isolate them from the major markets in the world.

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Business-to-business electronic commerce (B2B) is an electronic commerce framework that facilitates business relationships and transactions between firms (Turban *et al.*, 2002) at relatively low cost (Kaplan & Sawhney, 2000). This low cost adds to its appeal to small to medium businesses (Kaplan & Sawhney, 2000). It is envisaged that B2B trading exchange can address the issues of isolation and remoteness of WA small businesses by bringing buyers and sellers together in a virtual marketplace. This study, therefore, explores the adoption behaviour of WA small businesses of B2B trading exchanges.

The motivation of this research was also influenced by the challenge of modelling the adoption process of B2B trading exchanges, which is executed at the organisational level. Most of the technology adoption studies are aimed at individual level using a number of prominent theories such as the theory of reasoned action (TRA) (Ajzen & Fishbein, 1975), Theory of Planned Behaviour (TPB) (Ajzen, 1991) and Technology Acceptance Model (TAM) (Davis, 1989). Organisational level adoption has been studied by a number of researchers (Frambach & Schillewaert, 2002; van Everdingen & Wierenga, 2002; Zhu *et al.*, 2003; Bruque-Camara *et al.*, 2004; MacKay *et al.*, 2004; Mustonen-Ollila & Lyytinen, 2004; Gengatharen & Standing, 2005; Waarts & van Everdingen, 2005). In this research, we take an integrative approach by combining the individual level adoption variables of 'awareness', 'attitude' and 'intention to adopt' B2B trading exchanges by small businesses with the organisational level adoption determinants of external factors, external control factors, internal control factors, contextual factors and cognitive and normative beliefs.

The paper is organised as follows. The next section presents the background literature followed by the research model, which has been developed based on an extensive literature review, which was then enhanced through a qualitative field study. The hypotheses are then presented. The sample, measures and the data analysis method, based on partial least square, are presented in research method section. The findings are presented next. Finally, the paper concludes with the discussion and implications of the results.

## Background

A B2B trading exchange is a trading portal or trading hub, which aligns buyers and sellers in a virtual marketplace for the online exchange of goods and services (Rayport & Sviokla, 1994). The intent of B2B trading exchanges is to create a market for all market participants without allowing any one of the participants' interests to dominate the exchange. There is a criteria set for participating in trading in the exchange and any buyer or seller can gain trading status on the exchange providing they meet the criteria set. There are no physical exchanges of goods of services in the exchange; instead, the exchange only facilitates the matching of buyers and sellers (Turban *et al.*, 2002).

## External and external control factors

As the name implies, external factors are the factors outside of the control of an organisation. These factors influence the awareness of a technology (in our case B2B trading exchange) among the adopting organisations. Igbaria *et al.* (1997) confirmed small business dependency on external factors for technology adoption. Kwon & Zmud (1987) argued that the external environment of the organisation is an important factor in the adoption of new technologies.

External factors have been operationally defined in various ways such as consumer readiness, competitive pressure, trading partner readiness, vendor of the innovation, Government (Sultan *et al.*, 1990; Frambach *et al.*, 1998; Teo *et al.*, 1998; Zhu *et al.*, 2003; MacKay *et al.*, 2004). In this study, we propose to use the external factors as vendors, competition, government and trading partners.

The perception of control was the key addition to the TRA to formulate TPB model (Ajzen, 1991). External control factors are external to the organisations. However, organisation can have indirect control in shaping these factors. A number of studies on ICT have highlighted the importance of a critical mass of users in the adoption of an innovation (Rogers, 1991; Bouchard, 1993; Kraut *et al.*, 1998). The availability of 'vendor support' has also been found to be a key factor in technology adoption (Fichman, 1992; Zinatelli *et al.*, 1996).

Thus, in this study, we have used the external control factors of 'critical mass' and 'vendor support' influencing the small businesses' attitude towards B2B trading exchange adoption.

## Internal control and contextual factors

An internal control is an organisation's confidence in its ability to perform or undertake a particular behaviour. Ajzen's (1991) conceptualisation of internal control refers to internal situational enablers or constraining factors. In the context of this research, internal controls are those factors that are in direct control of the organisation and are based on the perception of the level of readiness of the organisation (Iacovou *et al.*, 1995).

Thong (1999) studied the adoption of technology at the organisational level and found organisational contextual factors to be significant. Previous studies in IT adoption also identified a number of organisational factors that influence the adoption of IT (Tornatzky & Fleischer, 1990). Therefore, this study adopted a more micro perspective of the organisational environment and proposed that B2B trading exchange adoption can be hindered or enabled by the organisation in which it is being implemented. This will include attributes and experience of owner/managers (Thong & Yap, 1995) and other organisational level variables of size, industry, level of computer use (Delone, 1988; Jackson *et al.*, 1997; Agarwal & Prasad, 2000).

**Cognitive and normative response/beliefs**

The concept of cognitive belief has been studied by a number of prominent theories, for example, TRA (Ajzen & Fishbein, 1975), TPB (Ajzen, 1991) and Hierarchy of Effects model (Lavidge & Steiner, 1961). Belief is primarily composed of ‘awareness’ about the technology to be adopted which is affected by various external influences, for example vendor, competition, government etc. Literature suggest that attitude towards a given behaviour (e.g. adoption of B2B trading exchange) is a function of the belief that a certain behaviour would lead to specific outcomes and then to the evaluation of these outcomes (Ajzen & Fishbein, 1980). To facilitate evaluation we include perceived direct and indirect benefit of B2B trading exchange as factors under cognitive belief (Arunachalam, 1995; Iacovou *et al.*, 1995).

The concept of normative response/belief has been theorised by the TRA (Ajzen & Fishbein, 1975). A form of norm, which has been studied in inter-organisational research, is the concept of coercion. Iacovou *et al.* (1995) found that subsidies and other influencing tactics used by trading partners could increase the rate of adoption. Small businesses are vulnerable to more powerful trading partners; hence, we propose to use coercion as a form of normative belief in this research.

**Attitude and intention to adopt**

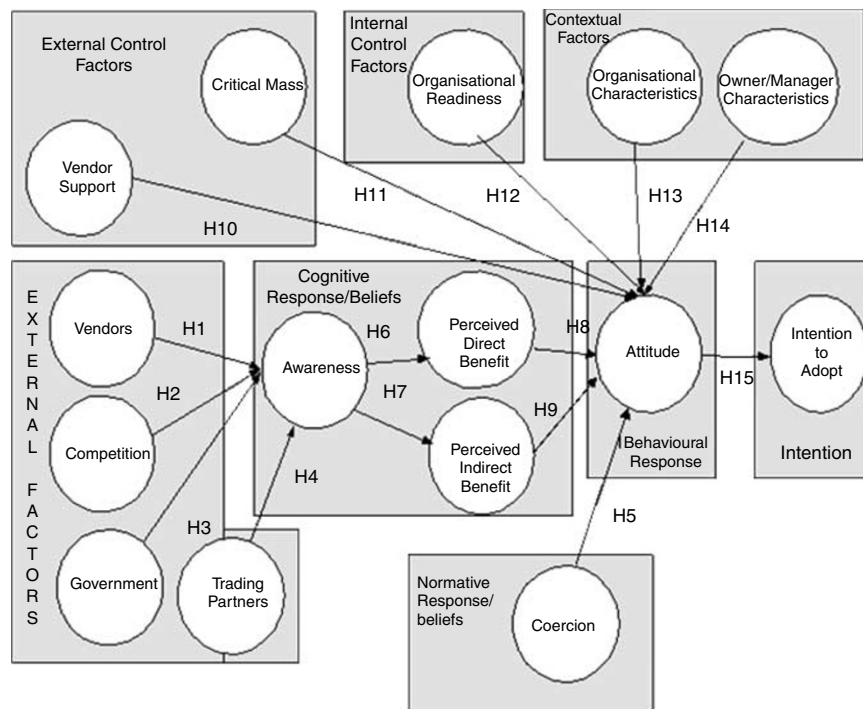
As mentioned earlier, this research proposes to study the influencing determinants of attitude and intention to adopt B2B trading exchange. Attitude is a behavioural

response, which has been widely studied by TRA, TPB and related past studies. The attitude and intention to adopt concepts have been applied in a number of TRA-related studies, such as education (Fredricks & Dossett, 1983), beer (Ajzen & Fishbein, 1980), and Internet banking (Tan & Teo, 2000), among many others.

**B2B trading exchange adoption model for small business**

The research model primarily draws from the literature on Hierarchy of Effect model (Lavidge & Steiner, 1961), the traditional Diffusion of Innovation theory (Rogers, 1995), the TRA (Ajzen & Fishbein, 1975), the TPB (Ajzen, 1991), TAM (Davis *et al.*, 1989) and various factors identified in studies on IT, EDI and Electronic Commerce adoption. The initial research model was developed first from an extensive literature review. This initial model was further enriched through a qualitative field study that was concerned with further exploring and confirming the factors and variables identified during the literature review. The final research model is shown in Figure 1.

As mentioned in the background section, the research model studies the impact of ‘external factors’ on ‘awareness’ about B2B trading exchange. This awareness then leads the small business to seek information about B2B trading exchange in terms its ‘benefits’. These perceived benefits then influence small business to form an ‘attitude’ that eventually leads to an ‘adoption’ decision. The research model also shows that ‘external control factors’, ‘internal control factors’ and ‘contextual factors’



**Figure 1** Research model for B2B trading exchange adoption in small business.

of small business influence the 'attitude'. The literature review section justified the theoretical basis of the research model.

### Hypothesis

Using the research model as a basis, the links among the factors in Figure 1 represent the hypotheses. The hypotheses are developed formally below. It is noted that much of the supporting literature for hypotheses are also provided in the Background section.

#### Hypotheses related to external factors

Frambach *et al.* (1998) argued that the persuasive activities of the vendor could influence the likelihood that an innovation will be adopted by increasing the awareness. Hultink *et al.* (1997) also contested that the marketing tactics employed by vendors increase awareness.

Therefore, the following hypothesis is proposed:

**Hypothesis 1 (H1):** *The activities pursued by the vendor will positively influence the awareness of a B2B trading exchange in small business.*

Studies conducted by Mansfield *et al.* (1977) found empirical evidence that supported the theory that intense competition stimulates the rapid spread of an innovation. Di Maggio & Powell (1983) argued that the existence of similar innovations in a particular industry would influence the organisation's adoption of an innovation via increased awareness. A number of studies have shown that competitive pressure influences an organisation's awareness of IT/electronic commerce and ultimately its adoption (Robertson & Gatignon, 1986; Iacovou *et al.*, 1995; Premkumar *et al.*, 1996).

Therefore, the following hypothesis is proposed

**Hypothesis 2 (H2):** *Competitors using B2B trading exchange are likely to influence the awareness of B2B trading exchanges.*

According to Roessner (1988), the more intense the government involvement, the greater is the likelihood of any potential adopter embracing the innovation. Government could facilitate or inhibit the adoption of an IT-based solution by implementing policies that assist in its adoption (Roessner, 1988). Goldsmith (1990) found that government promotes the adoption of an innovation through the provision of an effective low-cost infrastructure, incentives or direct subsidies.

Therefore, the following hypothesis is proposed:

**Hypothesis 3 (H3):** *Government involvement will influence the awareness of B2B trading exchanges in small business.*

Though small businesses may have an aversion to adopting a B2B trading exchange, they might be

influenced by trading partners to adopt. A number of studies have identified the role in terms of awareness that business partners play in the adoption of innovations by small businesses (Swatman & Swatman, 1991; Hart & Saunders, 1994; Beatty, 1998).

Therefore, the following hypothesis is proposed:

**Hypothesis (H4):** *Trading partners using B2B trading exchanges will positively influence the awareness of B2B trading exchanges in small business.*

#### Hypothesis related to normative response/beliefs

The TRA recognises the importance of social norms in influencing individual behaviour (Ajzen & Fishbein, 1980). In the case of B2B trading exchanges, the powerful buyer can use their power coercively to cease doing business with a less powerful supplier unless the supplier adopts a B2B trading exchange (Hart & Saunders, 1997). In WA, a small business that wants to do business with the WA government must trade electronically using Government Electronic Marketplace (GEM).

Therefore, the following hypothesis is proposed:

**Hypothesis 5 (H5):** *Coercion by important trading partners, major suppliers or government will have a positive influence on the attitude towards the adoption of B2B trading exchanges.*

#### Hypotheses related to cognitive response/beliefs

Awareness is mainly concerned with the reception of information about B2B trading exchanges. This study contests that whereas awareness is a precondition to forming the belief, it is the perception of benefits or beliefs that drives an adoption decision. Agarwal & Prasad (1998) considered awareness to be a crucial prerequisite to the development of a specific perception that in turn leads to innovation adoption. Zaltman *et al.* (1973) also support this contention.

Therefore, the following two hypotheses are proposed:

**Hypothesis 6 (H6):** *Awareness of a B2B trading exchange will lead to a positive evaluation of its perceived direct benefits.*

**Hypothesis 7 (H7):** *Awareness of a B2B trading exchange will lead to a positive evaluation of its perceived indirect benefits.*

Tornatzky & Klein (1982) found that perceived benefits in terms of relative advantage, compatibility and complexity constantly relate to adoption. Premkumar & Ramamurthy (1995) concluded that relative advantage, technical compatibility and cost influence the decision to adopt EDI. Iacovou *et al.* (1995) argued that small businesses that perceived the benefits of EDI to be

positive would be more inclined to adopt EDI. They also found that perceived benefits can both be direct or indirect in nature.

Therefore, the following two hypotheses are proposed:

**Hypothesis 8 (H8):** *Small businesses that have a greater perception of the direct benefits of B2B exchanges will positively influence the attitude towards the intention to adopt a B2B trading exchange.*

**Hypothesis 9 (H9):** *Small businesses that have a greater perception of the indirect benefits of B2B exchanges will positively influence the attitude towards the intention to adopt a B2B trading exchange.*

#### Hypotheses related to external control factors

Vendor support refers to the level of technical support offered by the vendor for implementing and using a technology-based solution. Fichman (1992) argued that access to external support could lower knowledge barriers for organisations. Cragg & King (1993), suggest small businesses have limited internal IT expertise and are reliant on the advice and support from vendors. A number of other studies found that the availability of technical external support positively influenced the decision to adopt (Delone, 1988; Gatignon & Robertson, 1989; Zinatelli *et al.*, 1996).

Therefore, the following hypothesis is proposed:

**Hypothesis 10 (H10):** *The availability of vendor technical support will positively influence the attitude towards the intention to adopt a B2B trading exchange by small business.*

According to Rogers (1991), organisations may adopt an innovation based on the number of other interrelated organisations in their business environment that have adopted the innovation. In the literature these are referred to as network externalities or critical mass (Markus, 1990; Rogers, 1991; Katz & Shapiro, 1994). In the case of inter-organisational adoption, a positive perception of the innovation exists and increases when an organisation's suppliers, customers or competitors also use the innovation (Markus, 1990). For inter-organisational innovations such as B2B trading exchanges, adopters can only gain full benefit through the widespread adoption of the technology.

Therefore, the following hypothesis is proposed:

**Hypothesis 11 (H11):** *A critical mass of small businesses adopting B2B trading exchanges will positively influence the attitude of other small businesses towards adopting a B2B trading exchange.*

#### Hypothesis related to internal control factor

The relatively low levels of technology use in the operations of small firms makes the integration of sophisticated technology, such as B2B trading exchanges, difficult as it necessitates significant expenditures on technology and people (Saunders & Clark, 1992; Bouchard, 1993). Since small business generally lacks these types of resources, it is considered that the levels of financial and technological resources are key dimensions in measuring organisational readiness. Premkumar *et al.* (1994) concluded that factors of organisation readiness were major influences on the intention to use EDI applications. Cragg & King (1993) also identified the factors of organisational readiness as one of the most important areas that hinders IT growth in small businesses.

Therefore, the following hypothesis is proposed:

**Hypothesis 12 (H12):** *Organisational readiness will positively influence the attitude towards the adoption of a B2B trading exchange.*

#### Hypotheses related to contextual factors

Damanpour (1991) argued that research into organisational adoption should consider the type of organisation. Fichman (1992) proposed incorporating the factors of the characteristics of adopters in adoption studies. A number of other studies expanded the TAM and TRA models with individual and organisation characteristics (Igbaria *et al.*, 1997; Jackson *et al.*, 1997; Agarwal & Prasad, 2000; Mathieson *et al.*, 2001). Other studies have investigated the effects of organisation characteristics (e.g. business type, product type, etc.) on attitude and innovation adoption and diffusion (Aiken & Hage, 1971; Meyer & Goes, 1988; Damanpour, 1991).

Therefore, the following hypothesis is proposed:

**Hypothesis 13 (H13):** *Organisation characteristics will influence the attitude towards the adoption of a B2B trading exchange.*

In small businesses the owner/manager is the key person, and therefore the attributes and experience of owner/managers underpin small business. Niedleman (1979) found that in small businesses, failure to utilise technology could be attributed to the CEO's lack of basic knowledge and awareness of IT. Thong & Yap (1995) concluded that a small business with a CEO that is more innovative would have a more positive attitude toward IT adoption. They also found that the more knowledgeable the CEO is about IT, the greater the likelihood of them adopting IT (Thong & Yap 1995).

Therefore, the following hypothesis is proposed:

**Hypothesis 14 (H14):** *The characteristics of the owner/managers will influence the attitude towards the adoption of a B2B trading exchange.*

#### **Hypothesis related to behavioural response**

The TRA (Ajzen & Fishbein, 1975) recognises the importance of attitude as the mediating effect of most factors that influence the intention to adopt an innovation. Therefore, a positive or negative attitude towards the target behaviour will influence the intention to adopt a B2B trading exchange. It is expected that those adopters with a positive attitude are more likely to develop specific intentions to adopt a B2B trading exchange.

Therefore, the following hypothesis is proposed:

**Hypothesis 15 (H15):** *A positive attitude towards B2B trading exchanges will positively influence the intention to adopt B2B trading exchanges in small business.*

### **Research method**

#### **Sample and procedure**

The research process was divided into a number of phases to enrich the findings of this study. The first phase was the extensive literature review that was followed by a qualitative field study, which further enhanced the initial research model developed in the literature phase. The final phase was the quantitative survey to test the hypotheses.

For the qualitative field study phase, seven owners/managers of small businesses were selected and interviewed from a list of companies that subscribed to the WA GEM initiative. The data for this phase were collected through interviews using semi-structured interview technique. The collected data were analysed using the content analysis technique of coding and categorisation as outlined by Holsti (1969). A further review of the data and literature led to the development of a final research model that was tested in the quantitative phase of the study. For details of the qualitative field study, see Quaddus & Hofmeyer (2006).

The final phase of the data collection in this study involved a quantitative survey. The data collected were used to measure and test the hypotheses developed. Prior to administering the survey, a pre-test of the survey was conducted involving a convenient sample of eight small businesses. At the completion of the survey, the respondents were interviewed to identify any problems with the survey. The findings of the pre-test of the survey instrument ensured that the survey instrument was effective and the constructs were clearly understood by the participants of the wider survey. For the survey phase, a random sample of 1000 small businesses in WA, satisfying the small business criteria, were selected to participate in the

study. The questionnaire was distributed to the owner/managers' of the small business (Wave 1).

This data collection exercise produced a response rate that was perceived to be low. To increase the response rate, further mining of the original 1000 sample was undertaken. A random sample of a further 500 small businesses of those that did not respond to the original survey request, taken from the original 1000 sample, were distributed (Wave 2). This time a prize was offered as an incentive to respond. Despite the incentive, the returned sample was still considered to be relatively low, as the response rate only marginally increased to 15%.

To further improve the response rate, an additional data collection exercise was undertaken involving a further 500 small businesses, associated with a local Business Enterprise Centre that provided a range of business services to small business within their region (Wave 3). This sample contained a large proportion of small businesses that are at the smaller end of the small business scale (1–5 employees) and as such the response rate was also low.

Overall, 211 returned surveys were useable out of the 1500 sample. This translated to an effective response rate of approximately 14%. It is noted that low response rates is not uncommon for small businesses in Australia (Houghton & Creeda, 1999; Dawson *et al.*, 2002).

The data gathered from the survey phase were analysed by partial least squares (PLS) based structural equation modelling (Barclay *et al.*, 1995). This study used the standard PLS analysis of the individual item reliability, composite reliability and discriminant validity, to assess the adequacy of the measurement model (Barclay *et al.*, 1995; Hulland, 1999).

#### **Data examination**

Since this research represented three different waves of data collection, the study performed a non-response bias analysis, using the Mann–Whitney *U* test to test for significant differences between key demographic and attitude towards B2B trading exchanges-related variables. The analysis showed that there was negligible non-response bias between Wave 1 and Wave 2 sample. This meant that the response for Wave 1 and Wave 2 samples could be combined for data analysis.

The same non-response bias analysis identified that Wave 3 sample is distinct from the combined Wave 1 and Wave 2 samples. Therefore, the Wave 3 sample was separated from the Wave 1/Wave 2 data set for PLS analysis. The returned Wave 1/Wave 2 samples comprised of 147 valid responses in the data set. This satisfied the minimum requirement of 10 times the number of items in the most complex formative construct or the largest number of antecedent constructs leading to an endogenous construct in the research model, as argued by Barclay *et al.* (1995).

#### **Measures**

The 15 factors described earlier (see Figure 1) have been measured with great care. The factors were operationa-

lised first from the literature as given below. They were further enhanced through the field study (Quaddus & Hofmeyer, 2006). Seven-point Likert scale ranging from 'strongly disagree' to 'strongly agree' has been used to measure all the items. The complete list of measures is shown in Table A1 in Appendix A.

## Results

### Assessment of measurement properties

The initial research model consisted of 67 observed variables. As per the PLS procedure (Barclay *et al.*, 1995; Hulland, 1999), this model was tested for item reliability, internal consistency and discriminant validity to assess the measurement adequacy of the model. Following the recommendation of Hair *et al.* (1998) 11 items were discarded (loadings below 0.5). The item loadings are detailed in Table 1 with the low loading items marked as 'a'. There was no persuasive argument found in the literature to support the use of these low loading items in measuring the construct.

The revised model with 56 observed variables were again tested using PLS and all item reliabilities exceeded the 0.5 reliability criteria. Table 1 shows the final item loadings. The Fornell & Larcker's (1981) method was used to evaluate the model for internal consistency (see Table 2). The results show that internal consistencies of all constructs are very high.

This study used the square root of the AVE and cross-loading matrix to assess the discriminant validity as suggested by Igarria *et al.* (1995b) and Barclay *et al.* (1995). According to Barclay *et al.* (1995), the model is assessed to have acceptable discriminant validity if the square-root of the AVE of a construct is larger than its correlation with other constructs. The results are detailed in Table B1 in Appendix B with the square roots of the AVEs shown in the main diagonal of Table B1. The off-diagonal elements represent the correlations among the latent variables. Table B1 indicates that the discriminant validity of the latent variables was met, which means that all the latent variables are different from each other.

The second discriminant validity criterion states that no item should load higher on another construct than the construct it is supposed to measure (Barclay *et al.*, 1995). Results of the cross-loading analysis showed that all items loaded higher on the construct that they were measuring than they did on other constructs in the model. To save space, the cross-loading matrix is not presented in this paper.

### The structural model and tests of hypotheses

The structural model deals with testing the hypothesised relationships. We have used bootstrap method to test the hypotheses.

The results detailing the path coefficients and *t*-statistics are summarised in Table 3. It is observed that among the primary hypotheses H1, H6, H7, H8, H9, H11, H13 and H15 were supported (significant *t*-values), while

hypotheses H2, H3, H4, H5, H10, H12 and H14 are not supported (insignificant *t*-values). The nomological validity or explanatory power of the proposed model can be assessed by observing the  $R^2$  values of the endogenous constructs (Santosa *et al.*, 2005). The model explains 56% of the variance ( $R^2$ ) of the Intention to adopt (see Figure 1 and Table 3). All  $R^2$  values exceeded the minimum required value of 0.10 as suggested by Falk & Miller (1992; see Table 3 and Figure 1).

## Discussion

From Table 3 and Figure 1, it is observed that the single most significant predictor of 'awareness' of B2B trading exchange is 'vendors'. This 'awareness' significantly influences the small business to evaluate B2B trading exchange in terms of its perceived 'direct' and 'indirect benefit'. These benefits then significantly influence the small business' 'attitude' towards B2B trading exchange. 'Attitude' is also significantly influenced by 'critical mass' of small business and 'organisational characteristics'. It is also observed that 'attitude' do indeed significantly influences small business' 'intention to adopt' B2B trading exchange. The results of the data analysis in relation to the 15 hypotheses proposed show that overall the results provide partial support that the research model explains the intention to adopt B2B trading exchanges in small business. We now discuss the results in detail.

### External factors (Hypotheses H1–H4)

The findings of this study showed that there is significant statistical evidence to support a positive relationship between the influence of the vendors of B2B trading exchanges and the awareness of the innovation (Hypothesis H1). This finding is consistent with previous studies by Hultink *et al.* (1997), Frambach *et al.* (1998) and Easingwood & Beard (1996). The finding has implications for vendors of B2B trading exchanges. This will enable them to better target their promotional activities, and to raise the awareness of the benefits of B2B trading exchanges.

The findings of this study did not support the statistical significance of the other external factors – Competition (H2), Government (H3) and Trading Partners (H4). These findings disagreed with previous findings (Robertson & Gatignon, 1986; Kwon & Zmud, 1987; Roessner, 1988; Swatman & Swatman, 1991; Iacovou *et al.*, 1995). Even though the direct influence of competitors was not found to be significant, there may be circumstances in which competitors may exercise an indirect influence on the adoption, through various marketing strategies.

The findings of this study did not support the external factor of Government to be statistically significant although WA government had been pushing for GEM. This finding was surprising. A possible explanation is that small businesses believe that the government would benefit more in this scheme than small businesses. This was a consistent theme that emerged from the interviews.

Table 1 Item loadings

Construct	Item (Observed variables)	Loading	Construct	Item (Observed variables)	Loading	
Vendors	Reducing adoption risk	0.834	Owner manager characteristics	Innovativeness	0.608	
	Awareness of business	0.773		Risk attitude	0.617	
	Endorsement of industry leaders	0.865		Attitude towards electronic trading	0.841	
	Publishing names of important users	0.872		Age	0.278 <sup>a</sup>	
	Promotion using trade magazines	0.888		Perceived direct benefit	Reduce cost	0.903
	Promotion using seminars	0.903			Reduce staff	0.858
	Promotion using trade fairs	0.884			Reduce paperwork	0.877
	Direct mailing	0.792			Reduce clerical error	0.847
	Sales people	0.845			Increase turnover	0.798
					Cost of training	0.01 <sup>a</sup>
Competition	Competitors using B2B trading exchanges	0.532		High costs of the solution	-0.265 <sup>a</sup>	
	Driven by competitors	0.945		Security risk	-0.004 <sup>a</sup>	
	Competitive industry	0.842		Easy to use	-0.192 <sup>a</sup>	
Government	Government leadership	0.873	Perceived indirect benefit	Compatible with business	-0.127 <sup>a</sup>	
	Government as user	0.886		Complex to implement	-0.178 <sup>a</sup>	
	Government direct subsidy	0.885		Integrated with other systems	-0.135 <sup>a</sup>	
	Government provides low cost infrastructure	0.921		Increases ability to compete	0.929	
Trading partners	Influence from important business partners	0.893	Attitude	Increase working relationship	0.927	
	Influence from important major supplier	0.855		Status symbol	0.393 <sup>a</sup>	
	Influence from important customer	0.88		I intend to use within the next 12 months	0.949	
Awareness	An important innovation	0.859	Intention to adopt	Replace current methods	0.968	
	Familiar with benefits	0.682		Recommend the use	0.954	
	More competitive	0.912		I intend to use within the next 12 months	0.949	
Vendor support	Access to someone to make it work	0.871	Coercion	Replace current methods	0.968	
	Customer hotlines	0.947		Recommend the use	0.954	
	External training	0.912		Mandatory measures by government	0.631	
Critical mass	Number of users	0.724	Organisation readiness	Demanded by major supplier	0.868	
	Number of business partners trading	0.949		Demanded by important customer	0.836	
	Number of suppliers trading	0.939		Level of financial resources	0.566	
Organisation characteristics	Nature of business	0.922		Computer proficient	0.806	
	Nature of product	0.868		No computer awareness	0.617	
	Computer usage	0.707		Computer awareness	0.717	
	Partner usage	0.516		Computer Professional	0.663	
	Size	-0.218 <sup>a</sup>		Computer literate	0.316 <sup>a</sup>	

<sup>a</sup>Low loading items discarded.

This study also did not statistically support the significance of the influence of trading partners. Similar to the reasons for the findings on government influence, the lack of support could be attributed to the belief that trading partners were more likely to benefit from the adoption of B2B trading exchanges.

#### Normative response/beliefs (Hypothesis H5)

The findings of this study did not support the statistical significance of the coercive power of a more powerful trading partner, major supplier or government which is contrary to some previous findings (Pfeffer & Salancik, 1978). The result is also surprising since WA government



Table 2 Internal consistencies

<i>Latent variables</i>	<i>Internal consistencies</i>	<i>Latent variables</i>	<i>Internal consistencies</i>
Vendor	0.96	Organisation characteristics	0.85
Competition	0.83	Owner/manager characteristics	0.85
Government	0.94	Perceived benefits	0.93
Trading partners	0.91	Perceived indirect benefits	0.93
Vendor support	0.94	Attitude	0.95
critical mass	0.91	Intention to adopt	0.97
Organisation readiness	0.81	Coercion	0.83
Awareness	0.86		

Table 3 Tests of Hypotheses

<i>Hypotheses</i>	<i>Path coefficients</i>	<i>t-value</i>
H1: Vendors → awareness	0.614	7.937*
H2: Competition → awareness	0.032	0.358
H3: Government → awareness	-0.061	0.834
H4: Trading partners → awareness	0.157	1.584
H5: Coercion → attitude	0.111	1.156
H6: Awareness → perceived direct benefit	0.692	16.279*
H7: Awareness → perceived indirect benefit	0.541	6.575*
H8: Perceived direct benefit → attitude	0.25	2.483*
H9: Perceived indirect benefit → attitude	0.272	3.905*
H10: Vendor support → attitude	-0.023	0.343
H11: Critical mass → attitude	0.143	1.708*
H12: Organisation readiness → attitude	0.035	0.502
H13: Organisation characteristics → attitude	0.201	2.308*
H14: Owner manager characteristics → attitude	0.094	1.290
H15: Attitude → intention to adopt	0.751	20.788*

\* $P < 0.05$ .

$R^2$  for Intention to Adopt = 0.56;  $R^2$  for Attitude = 0.62;

$R^2$  for Perceived Direct Benefit = 0.48;

$R^2$  for Perceived Indirect Direct Benefit = 0.29;

$R^2$  for Awareness = 0.52.

is eliminating the traditional process of procurement via GEM. It is interesting to note that the results of the analysis of the combined Wave 1/Wave 2/Wave 3 sample showed that coercion was a significant factor. As Wave 3 sample contains small businesses having 1–5 employees, it can be said that more powerful trading partners have significant levels of coercive power over small businesses at the lower end of the small business scale.

#### Cognitive response/beliefs (Hypotheses H6–H9)

The findings of this study revealed that there is significant positive relationship between the awareness of a B2B trading exchange and its perceived direct and indirect benefits (H6 and H7). This supports the major assumption underpinning the research model. This finding has implications for vendors and governments, in that the innovation is likely to occur within small businesses based on the potential adopter's perception of the innovation adoption attributes or benefits.

The findings of this study supported the significant relationships of perceived direct and indirect benefits with the attitude towards B2B trading exchanges (Hypotheses H8 and H9). This has significant implications of the stakeholders of B2B trading exchange, especially vendors and promoters of B2B trading exchange. The benefits (direct and indirect) of B2B trading exchange need to be made known to the prospective adopters via various marketing and promotional activities to form a positive attitude about B2B trading exchange.

#### External control factors (Hypotheses H10 and H11)

The findings of this study did not statistically support the significance of the availability of vendor support on small businesses' attitude towards B2B trading exchanges (H10). The literature has also shown mixed results. The lack of significance of vendor support could be attributed to the fact that the respondents did not have an appreciation of the complexity of computer interaction

involved in a B2B trading exchange or to the belief that their existing support arrangements are adequate.

The findings of this study supported the Critical Mass construct as a statistically significant factor affecting the attitude (H11). The interviews in the qualitative phase of the study also highlighted the need for critical mass, where the respondents indicated that it was their preference not to adopt a B2B trading exchange in isolation, as it was potentially too risky.

#### **Internal control factors (Hypothesis H12)**

The findings of this study did not statistically support the significance of Organisational Readiness. These findings contradict the earlier studies by Iacovou *et al.* (1995) and Kuan & Chau (2001). The lack of statistical support for Organisation Readiness was surprising, given the support for this factor in the field study interviews. However, this could be due to the fact that there was a lack of specialised IT skills in the small business sample surveyed. The respondents might have believed that they are not yet ready to implement B2B trading exchange as far as readiness of IT skills are concerned.

#### **Contextual factors (Hypothesis H13 and H14)**

This study found that the organisational characteristics of the small business are likely to influence the attitude towards adopting a B2B trading exchange (H13). This supports the findings of Thong (1999) and Kimberley & Evanisko (1981). The findings are also consistent with the interview results, which showed that certain industries and products are more suited to an electronic trading environment (for example, finance and insurance, communication services, IT & computing, Consulting).

The findings of this study did not statistically support the relationship between owner/manager Characteristics and their attitude towards B2B trading exchanges. These findings are contrary to the studies by McGregor & Gomes (1999) and Thong & Yap (1995). It is interesting to note that the results of the analysis of the combined Wave 1/Wave 2/Wave 3 sample showed that owner/manager characteristics were a significant factor. As Wave 3 sample contains small businesses having 1–5 employees, it can be inferred that this factor is more significant in small business at the lower end of the small business scale.

#### **Behavioural response and intention to adopt (Hypothesis H15)**

The findings of this study support the statistical significance of the influence of a positive attitude on small businesses' intention to adopt B2B trading exchanges. Even though we identified a number of different antecedents to adoption behaviour, it was found that attitude most strongly drives the intention of small businesses to adopt B2B trading exchanges. The findings support the principles of TRA. The results show that there are a number of new factors and items that are specific to the innovation type and context, which influence small businesses' attitude towards B2B trading exchanges.

#### **Conclusion**

This study used a research model that extended the TRA and TPB models, and incorporated relevant factors sourced from studies on IT, EDI and electronic commerce adoption in order to identify the significant factors that influence the intention of small business to adopt B2B trading exchanges. The constructs and variables of the initial research model, developed from the comprehensive literature review, were validated and enhanced by a field study.

The major theoretical contribution of this study, apart from extending the traditional innovation diffusion theories for the innovation type, B2B trading exchanges in the context of small businesses, is awareness. This study confirmed awareness as a significant perception or belief factor. Specifically, the study concluded that an awareness of an innovation is influenced by the external factor of the Vendors of an innovation. The study also found that Awareness drives the perception of both direct and indirect benefits that in turn leads to the forming of an Attitude towards the Intention to adopt the innovation. The findings of this study did not support the factor of Coercion as a belief factor.

The implication of the findings for government and vendors is that mass media knowledge of B2B trading exchanges is not in itself sufficient to lead to adoption within the context of small businesses. This study found that this general knowledge does not in itself translate into a positive perception of the innovation adoption attributes or benefits. The challenge for government is to provide a range of initiatives and focused promotional work to increase small businesses' awareness of the benefits of B2B trading exchanges with the aim of accelerating the adoption rate. Vendors would also need to undertake more detailed and focussed promotional work in marketing their products to raise the awareness of the benefits of B2B trading exchanges as a means to increase the adoption rate.

The most important research limitation of this study is the relatively small sample size returned. This prevented the study from splitting the sample into two data sets for PLS analysis, which limited the opportunity to cross-examine the model using different samples. Analysis of the survey data also excluded the views of B2B trading exchange adopters.

However, the core of this research model has applicability to inter-organisational systems in small businesses. Beyond the scope of B2B trading exchanges, the model could therefore be applied to the adoption of inter-organisational systems, such as other electronic commerce-based solutions. However, the model may require some extension and re-operationalisation of constructs for the different innovation types and contexts.

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## About the authors

**Mohammed Quaddus** received his Ph.D. from the University of Pittsburgh, M.S. from University of Pittsburgh and Asian Institute of Technology. His research interests are in Information Management, Decision Support Systems, Group Decision and Negotiation Support Systems, Multiple Criteria Decision Making, Systems Dynamics, Business Research Methods and in the theories and applications of Innovation Diffusion process. He has published in a number of journals and contributed in several books/monographs. In 1996 and 2005 he received 'researcher of the year' award at Curtin Business School, Curtin University of Technology, Australia. Currently, he is a Professor of Information & Decision Systems with the Graduate School of Business, Curtin University of Technology, Australia. Prior to joining Curtin, he was with the University of Technology-Sydney and with the

National University of Singapore. He also spent a year at the Information Management Research Centre, Nanyang Technological University, Singapore, and six months with the Asian Institute of Technology, Bangkok, Thailand.

**Glenn Hofmeyer** received his D.B.A and M.B.A from the Curtin University of Technology. His research interests are in electronic commerce, the theories and applications of Innovation Diffusion process to technology and information management. He has contributed to the proceeding for several conferences. He has also worked as a consultant in providing ICT consulting for large corporations, government departments, public utilities and small to medium enterprises in Australia. Currently he is a sessional lecturer with the Graduate School of Business, Curtin University of Technology.

## References

- ABS (2003) Characteristics of small business. Australian Bureau of Statistics, Cat. No. 8127.0, Canberra.
- ABELL W and LIM L (1996) Business use of the internet in New Zealand: an exploratory study. <http://www.scu.edu/ausweb96/business/abell/paper.htm> June 2004.
- AGARWAL R and PRASAD J (1998) The antecedents and consequences of user perceptions in information technology adoption. *Decision Support Systems* **22**(1), 15–29.
- AGARWAL R and PRASAD J (2000) A field study of the adoption of software process innovations by information systems professionals. *IEEE Transaction on Engineering Management* **74**(3), 295–308.
- AIKEN M and HAGE J (1971) The organic organization and innovation. *Sociology* **5**, 63–82.
- AJZEN I (1991) The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes* **50**, 179–211.
- AJZEN I and FISHBEIN M (1975) *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Addison-Wesley, Reading, MA.
- AJZEN I. and FISHBEIN M. (1980) *Understanding Attitudes and Predicting Social Behavior*. Prentice Hall, Englewood Cliffs, NJ.
- ARUNACHALAM V (1995) EDI: an analysis of adoption, users, benefits and barriers. *Journal of Systems Management* **46**(2), 60–64.
- BARCLAY D, HIGGINS C and THOMPSON R (1995) The partial least squares (PLS) approach to causal modeling: personal computer adoption and use as an illustration. *Technology Studies* **2**(2), 285–309.
- BEATTY R (1998) *An empirical investigation into the salient factors used by organisations in the adoption of Web site technology*. Doctoral Thesis, Mississippi State University.
- BERGERON E and RAYMOND L (1997) Managing EDI for corporate advantage: a longitudinal study. *Information and Management* **31**(6), 319–333.
- BOUCHARD L (1993) Decision criteria in the adoption of EDI. In *Proceedings of the Thirteenth International Conference on Information Systems* pp 365–376, Orlando, Florida.
- BRUQUE-CAMARA S, VARGAS-SANCHEZ A and HERNANDEZ-ORTIZ MJ (2004) Organizational determinants of IT adoption in the pharmaceutical distribution sector. *European Journal of Information Systems*, **13**, 133–146.
- CRAGG P and KING M. (1993) Small-form computing: motivators and inhibitors. *MIS Quarterly* **17**(1), 47–60.
- DAMANPOUR F (1991) Organisational innovation: a meta-analysis of effects of determinants and moderators. *Academic Management Journal* **34**(3), 555–590.
- DAVIS FD (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* **13**(3), 319–340.
- DAVIS FD, BAGOZZI RP and WARSHAW PR (1989) User acceptance of computer technology: a comparison of two theoretical models. *Management Science* **35**(8), 982–1002.
- DAWSON S, BREEN J and SATYEN L (2002) The ethical outlook of Micro business operators. *Journal of Small Business Management* **40**(4), 302–313.
- DELONE W (1988) Determinants of success for computer usage in small business. *MIS Quarterly* **12**(1), 51–61.
- DI MAGGIO P and POWELL W (1983) The iron cage revisited: industrial isomorphism and collective rationality in organisational fields. *American Sociological Review* **63**(4), 149–160.
- EASINGWOOD C and BEARD C (1996) New product launch: marketing action and launch tactics for high technology products. *Industrial Marketing Management* **25**, 87–103.
- FALK RF and MILLER NB (1992) *A Primer for Soft Modelling*. University of Akron Press, Akron.
- FICHMAN RG (1992) Information technology diffusion: a review of empirical research. In *Proceedings 13th International Conference on Information Systems 1992*, pp 195–206, Dallas, Texas.
- FORNELL C and LARCKER D (1981) Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research* **18**, 39–50.
- FRAMBACH RT, BARKEMA HG, NOOTEBOOM B and WEDEL M (1998) Adoption of a service innovation in the business market: the influence of supplier variables. *Journal of Business Research* **41**(2), 161–174.
- FRAMBACH RT and SCHILLEWAERT N (2002) Organizational innovation adoption: a multi-level framework of determinants and opportunities for future research. *Journal of Business Research* **55**, 163–176.
- FREDRICKS AJ and DOSSETT DL (1983) Attitude-behaviour relations: a comparison of the Fishbein-Ajzen and the Bentler-Speckart Models. *Journal of Personality and Social Psychology* **45**, 501–512.
- GATIGNON H and ROBERTSON TS (1989) Technology diffusion: an empirical test of competitive effects. *Journal of Marketing* **53**(1), 35–49.
- GENGATHAREN DE and STANDING C (2005) A Framework to assess the factors affecting success or failure of the implementation of government-supported regional e-marketplaces for SMEs. *European Journal of Information Systems* **14**, 417–433.
- GOLDSMITH RE (1990) The validity of scale to measure global innovativeness. *Journal of Applied Business Research* **7**(2), 89–97.
- HAIR JF, ANDERSON RE, TATHAM RL and BLACK WC (1998) *Multivariate Data Analysis*. Prentice-Hall, Upper Saddle River, NJ.
- HART P and SAUNDERS C (1994) Power and trust: critical factors in the adoption and use of electronic data interchange. Working Paper, College of Business, Atlantic University, Boca Raton Florida.
- HART P and SAUNDERS C (1997) Power and trust: critical factors in the adoption and use of electronic data interchange. *Organization Science* **8**(1), 23–42.
- HOLSTI O (1969) *Content Analysis for the Social Sciences*. Addison-Wesley, Philippines.

- HOUGHTON K and CREEDA (1999) Home Based business in two Australian Regions: backyarders and front-runners. Report prepared for the Department of Employment, Workplace Relations and small business, The A.C.T. Government, the Sunshine Coast Area Consultative Committee, the Noosa, Coundra and Maroochy City Councils.
- HULLAND J (1999) Use of partial least square (PLS) in strategic management research: a review of four recent studies. *Strategic Management Journal* **20**(2), 195–204.
- HULTINK EJ, GRIFFIN A, HART S and ROBBEN HSJ (1997) Industrial new product launch strategies and product development performance. *Journal of Product Innovation Management* **14**(4), 243–257.
- IACOVOU CL, BENBASAT I and DEXTER AS (1995) Electronic data interchange and small organisations: adoption and impact of technology. *MIS Quarterly* **19**(4), 465–485.
- IGBARIA M, GUIMARAES T and DAVIS GB (1995b) Testing the determinants of microcomputer usage via a structural equation model. *Journal of Management Information Systems* **11**(4), 87–114.
- IGBARIA M, ZINATELLI N, CRAGG P and CAVAYE ALM (1997) Personal computing acceptance factors in small firms: a structural equation model. *MIS Quarterly* **4**, 279–302.
- JACKSON CM, CHOW S and LEITCH R (1997) Toward an understanding of the behavioral intention to use an information system. *Decision Sciences* **28**(2), 357–389.
- KAPLAN S and SAWHNEY M (2000) B2B E-commerce hubs: towards a taxonomy of business models. *Harvard Business Review* **3**, 97–103.
- KATZ M and SHAPIRO C (1994) Systems competition and network effects. *Journal of Economic Perspectives* **8**(2), 93–115.
- KIMBERLEY J.R. and EVANISKO M.J. (1981) Organisational innovation: the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal* **24**(4), 689–713.
- KRAUT R, RICE R, COOL C and FISH R (1998) Varieties of social influence: the role of utility and norms in the success of a new communication medium. *Organization Science* **9**(4), 437–453.
- KUAN K and CHAU P (2001) A perception-based model of EDI adoption in small businesses using technology–organisation–environment framework. *Information and Management* **38**, 507–521.
- KWON TH and ZMUD RW (1987) Unifying the fragmented models of information systems implementation. In *Critical Issues in Information Systems Research* (BORLAND RJ and HIRSCHHIEIM RA, Eds), pp 252–257, Wiley, New York.
- LAVIDGE RJ and STEINER GA (1961) A model of predictive measurements of advertising effectiveness. *Journal of Marketing* **25**(6), 59–62.
- LYTLE R (1988) Will you be proactive or reactive on EDI? *Systems 3X and AS World* **16**(11), 68–74.
- MACKAY N, PARENT M and GEMINO A (2004) A model of electronic commerce adoption by small voluntary organizations. *European Journal of Information Systems* **13**, 147–159.
- MANSFIELD E, RAPPORT J, ROMEO A, VILLANI E, WAGNER S and HUSIC F (1977) *The production and application of New Industrial Technology*. Norton, New York.
- MATHIESON K, PEACOCK E and CHIN W (2001) Extending the technology acceptance model: the influence of perceived user resources. *The Database for Advances in Information Systems* **32**(3), 86–112.
- MARKUS M (1990) Toward a critical mass theory of interactive media. In *Organisation and Communication Technology* (FULK J and STEINFELD CW, Eds), pp 194–218, Sage, Newbury Park, CA.
- MCCUSKER T (1993) How to get from 80% to 100% in EDI. *Datamation* **39**(3), 45.
- MCGREGOR J. and GOMES C. (1999) Technology uptake in small and medium-sized enterprises: some evidence from New Zealand. *Journal of Small Business Management* **37**(3), 94–102.
- MEYER AD and GOES JB (1988) Organisational assimilation of innovations: a multilevel contextual analysis. *Academy of Management Journal* **31**(4), 897–923.
- MUSTONEN-OLLILA E and LYYTINEN K (2004) How organizations adopt information system process innovations: a longitudinal analysis. *European Journal of Information Systems* **13**, 35–51.
- NIEDLEMAN LD (1979) Computer usage by small and medium sized European firms: an empirical study. *Information Management* **2**(2), 67–77.
- NILAKANTA S and SCAMELL RW (1990) The effects of information sources and communication channels on the diffusion of innovation on a database development environment. *Management Science* **36**(1), 24–40.
- PFEFFER J and SALANCIK GR (1978) *The External Control of Organisations: A Resource Dependence Perspective*. Harper and Row, New York.
- POON S and SWATMAN P (1999) An exploratory study of small business internet commerce issues. *Information and Management* **35**(1), 9–18.
- PREMKUMAR G and RAMAMURTHY K (1995) The role of interorganisational and organisational factors on the decision mode for adoption of interorganisational systems. *Decision Sciences* **26**(3), 303–336.
- PREMKUMAR G, RAMAMURTHY K and CRUM M. (1996) An assessment of motor carrier adoption, use, and satisfaction with EDI. *Transportation Journal* **35**(4), 303–336.
- PREMKUMAR G, RAMAMURTHY K and NILAKANTA S (1994) Implementation of electronic data interchange: an innovation diffusion perspective. *Journal of Management Information Systems* **11**(2), 57–186.
- PREMKUMAR G and ROBERTS M (1999) Adoption of new information technologies in rural small businesses. *Omega International Journal of Management Science* **27**(1), 467–484.
- PURAO S and CAMPBELL B (1998) Critical concerns for small business electronic commerce: some reflections based on interviews of small business owners. In *Proceedings of the Association for Information Systems Americas Conference*, pp 325–327, Baltimore, MD.
- QUADDUS MA and HOFMEYER G (2006) Factors influencing the adoption of B2B trading exchanges in small businesses in western Australia: a field study approach. In *Proceedings Pacific Asia Conference on Information Systems (PACIS 2006)*, pp. 385–400, Kuala Lumpur.
- RAYPORT J and SVIOKLA J (1994) Managing the Market space. *Harvard Business Review* **72**(6), 141–151.
- RIZZONI A (1991) Technological innovation and small firms: a taxonomy. *International Small Business* **9**(3), 31–42.
- ROBERTSON TS and GATIGNON H. (1986) Competitive effects on technology diffusion. *Journal of Marketing*. **50**, 1–12.
- ROESSNER JD (1988) *Innovation Policy in the United States: An Overview of the Issues*. Government Innovation Policy: Design, Implementation, Evaluation, St. Martin's, New York.
- ROGERS EM (1991) *The Critical Mass in the Diffusion of Interactive Technologies in Organizations*. Harvard Business Research Colloquium Publishing Division, Harvard Business School, Boston.
- ROGERS EM (1995) *Diffusion of Innovation*. The Free Press, New York, USA.
- SANTOSA PI, WEI KK and CHAN HC (2005) User involvement and user satisfaction with information-seeking activity. *European Journal of Information Systems* **14**, 361–370.
- SAUNDERS C and CLARK S (1992) EDI adoption and implementation: a focus on Interorganizational linkages. *Information Resources Management Journal* **5**(1), 9–19.
- SULTAN F, JOHN UF and DONALD RL (1990) A meta-analysis of application of p diffusion models. *Journal of Marketing Research* **27**, 70–77.
- SWATMAN PMC and SWATMAN PA (1991) Electronic data interchange: organisational opportunity, not technical problem. In *Databases in the 1990s* (SRINIVASAN B and ZELEZNIKOW J, Eds), pp 354–374, World Scientific Press, Singapore.
- TEO TSH, LIM VKG and WAI SH (1998) An empirical study of attitudes towards teleworking among information technology personnel. *International Journal of Information Management* **8**(5), 329–343.
- TEO TSH, TAN M and BUK WK (1997) A contingency model of internet adoption in Singapore. *International Journal of Electronic Commerce* **2**(2), 95–118.
- TAN M and TEO TSH. (2000) Factors influencing the adoption of internet banking. *Journal of the Association for Information Systems* **1**(5), 1–42.
- THONG JYL. (1999) An integrated model of information systems adoption in small business. *Journal of Management Information Systems* **15**(4), 187–214.
- THONG JYL and YAP CS (1995) CEO characteristics, organisation characteristics, and I.T. adoption in small business. *Omega International Journal of Management Science* **23**(4), 429–442.
- TORNATZKY LG and FLEISCHER M (1990) *The Process of Technological Innovation*. Lexington Books, Lexington, MA.
- TORNATZKY LG and KLEIN KJ (1982) Innovation characteristics and innovation adoption and implementation: a meta analysis

- of findings. *IEEE Transactions on Engineering Management* **29(11)**, 28–45.
- TURBAN E, LEE J, KING D and CHUNG HM (2002) *Electronic Commerce: A Managerial Perspective*. Prentice-Hall Inc., New Jersey.
- VAN EVERDINGEN Y and WIERENGA B (2002) Intra-firms adoption decisions: role of inter-firm and intra-firm variables. *European Management Journal* **20(6)**, 649–663.
- WAARTS E and VAN EVERDINGEN Y (2005) The influence of national culture on the adoption status of innovations: an empirical study of firms across Europe. *European Management Journal* **23(6)**, 601–610.
- YAP CS, SOH CPP and RAMAN KS (1992) Information system success factors in small businesses. *Omega* **20(5/6)**, 597–609.
- ZALTMAN G, DUNCAN R and HOLBECK J (1973) *Innovations and Organisations*. Wiley, New York.
- ZHU K, KRAEMER K and XU S (2003) Electronic business adoption by European firms: A cross-country assessment of the facilitators and inhibitors. *European Journal of Information Systems* **12**, 251–268.
- ZINATELLI N, CRAGG P and CAVAYE A (1996) End user computing sophistication and success in small firms. *European Journal of Information Systems* **5(3)**, 172–181.
- ZMUD RW (1983) The effectiveness of external information channels in facilitating innovation within software development groups. *MIS Quarterly* **7(2)**, 43–58.

## Appendix A

Table A1 List of measures and relevant references

Measures	References
'Critical mass' has been measured by three items	Bouchard (1993), McCusker (1993) and Lyttle (1988)
'Vendor support' has been measured by three items	Yap <i>et al.</i> (1992) and Premkumar & Roberts (1999)
'Vendors' were measured by nine items	Easingwood & Beard (1996), Premkumar & Roberts (1999), Frambach <i>et al.</i> (1998), Zmud (1983) and Nilakanta & Scamell (1990).
'Competition' was measured by three items	Thong & Yap (1995), Kuan & Chau (2001), and Thong (1999).
'Government' was measured by four items	Teo <i>et al.</i> (1997), Goldsmith (1990) and Premkumar & Roberts (1999)
'Trading partners' were measured by three items	Swatman & Swatman (1991), Kuan & Chau (2001) and Bergeron & Raymond (1997)
'Coercion' was measured by three items	Agarwal & Prasad (2000) and Pfeffer & Salancik (1978)
'Awareness' was measured by three items	Zaltman <i>et al.</i> (1973) and Agarwal & Prasad (2000)
'Perceived direct benefits' and 'Perceived indirect benefits' were measured by 12 and three items, respectively	Abell & Lim (1996), Tornatzky & Klein (1982), Premkumar & Roberts (1999), Kuan & Chau (2001) Puroo & Campbell (1998) and Poon & Swatman (1999)
'Organisational readiness' was measured by six items	Saunders & Clark (1992) and Iacovou <i>et al.</i> (1995)
'Organisational characteristics' were measured by five items	Thong & Yap (1995), Premkumar & Roberts (1999), Poon & Swatman (1999) and Iacovou <i>et al.</i> (1995)
'Owner/manager characteristics' were measured by four items	Rizzoni (1991), Thong & Yap (1995) and Agarwal & Prasad (1998)
'Organisational attitude' was measured by three items	Thong & Yap (1995)
'Intention' was measured by three items	Thong & Yap (1995) and Agarwal & Prasad (1998)

## Appendix B

**Table B1 Correlation of latent variables & square roots of AVE**

	<i>Vendors</i>	<i>Competition</i>	<i>Government</i>	<i>Trading partners</i>	<i>Awareness</i>	<i>Vendor support</i>	<i>Critical mass</i>	<i>Organisation readiness</i>	<i>Organisation characteristics</i>	<i>Owner manager characteristics</i>	<i>Perceived direct benefit</i>	<i>Perceived indirect benefit</i>	<i>Attitude to adopt</i>	<i>Intention to adopt</i>	<i>Coercion</i>	
Vendors	<b>0.836</b>															
Competition	0.523	<b>0.774</b>														
Government	0.468	0.621	<b>0.894</b>													
Trading partners	0.681	0.639	0.465	<b>0.894</b>												
Awareness	0.709	0.415	0.319	0.566	<b>0.837</b>											
Vendor support	0.323	0.405	0.617	0.404	0.251	<b>0.894</b>										
Critical mass	0.499	0.539	0.446	0.493	0.566	0.451	<b>0.894</b>									
Organisation readiness	-0.094	-0.098	-0.061	-0.12	-0.188	0.015	-0.12	<b>0.71</b>								
Organisation character	0.518	0.443	0.325	0.435	0.59	0.26	0.607	-0.182	<b>0.774</b>							
Owner manager characteristics	0.382	0.205	0.189	0.346	0.519	0.22	0.382	-0.131	0.489	<b>0.774</b>						
Perceived benefits	0.63	0.201	0.148	0.412	0.692	0.061	0.371	-0.303	0.514	0.434	<b>0.837</b>					
Perceived indirect benefits	0.508	0.328	0.325	0.429	0.541	0.189	0.457	-0.11	0.463	0.327	0.598	<b>0.95</b>				
Attitude	0.584	0.31	0.368	0.408	0.723	0.223	0.542	-0.155	0.628	0.469	0.639	0.636	<b>0.95</b>			
Intention to adopt	0.43	0.198	0.157	0.341	0.557	0.026	0.382	-0.188	0.531	0.447	0.591	0.536	0.751	<b>0.95</b>		
Coercion	0.468	0.446	0.439	0.579	0.446	0.377	0.359	-0.163	0.481	0.315	0.375	0.304	0.45	0.405	<b>0.774</b>	

The shaded and bold elements in the main diagonal are the square roots of AVE.