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# An Investigation Into The Factors Influencing The Adoption of B2B Trading Exchanges In Small Businesses In Western Australia

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## Abstract

*Small business plays an important role in Western Australian economy. Given the remoteness of Western Australia, electronic commerce technology, such as B2B Trading exchanges, presents unique opportunities to small businesses in Western Australia. This study thus explores the adoption behaviour of these small businesses in relation to B2B Trading exchanges. Drawing on established theories, relating to the innovation adoption diffusion, and empirical work in IT, EDI and Electronic Commerce adoption this study develops a research model. The research instrument developed for this study was administered to a random sample of 1,500 small businesses within Western Australia. The data was analysed using Partial Least Square (PLS) approach. The findings of this study revealed that external influences raise the 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. In turn this leads to the intention to adopt. 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 also highlighted.*

**Keywords:** B2B Trading exchanges, Small business, Adoption/Diffusion, Partial Least Square (PLS)

## 1. Introduction

In the modern business environment companies are constantly trying to seek to differentiate themselves from competitors by reducing costs through lower overheads or by using technology to further reduce costs and increase market reach (Greiger 2003). The decreasing cost of technology has made the adoption of technology more attractive and affordable for businesses. The growing importance of technology to modern businesses is increasing and challenges the ability of small business leaders to make "rational" choices regarding the adoption of innovative technologies. Electronic commerce is one of the fastest growing areas of technology that holds promise for businesses. Business-to-Business electronic commerce (B2B) is at the apex of the electronic commerce framework and facilitates business relationships and transactions between firms (Turban et al 2002). B2B electronic commerce has lead companies to establish more affordable connections with their suppliers and customers (Turban et al 2002). B2B Trading exchanges developed for similar reasons and bring together buyers and sellers in real-time trading communities at relatively low cost (Kaplan and Sawhney 1999). This adds to its appeal to small to medium businesses in contrast to EDI (Kaplan and Sawhney 1999). Gartner (2001) estimated that B2B Trading exchange would reach \$8.5 trillion in 2005. In Western Australia there are 139,500 small businesses and account for 96.7% of total business numbers (ABS 2003). 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 Australian small businesses given that location and time constraints isolate them from the major markets in the world. Western Australian small businesses

endure higher levels of isolation, as they are also isolated from national markets in terms of time and location.

Therefore, given perceived importance of electronic commerce technology, such as B2B Trading exchange technology, and the significant contribution that small businesses make to the Western Australian economy, this study explores the adoption behaviour within the realm of the Electronic Commerce, in particular B2B trading exchanges. The paper is organized as follows. The next section presents a background literature that identifies the lack of adoption research into B2B Trading exchanges in small businesses. The research model is then presented which has been developed based on extensive literature review and enhanced through a qualitative field study. The hypotheses are also presented in this section. The sample, measures and the data analysis method, based on partial least square, are presented in research method section. The findings are next presented. Finally, the paper concludes with the discussion and implications of the results.

## **2. Background**

In the context of this research, 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 and 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 or services in the exchange, instead the exchange only facilitate the matching of buyers and sellers (Turban et al 2002). In this way, the exchange is similar to the concept of a Sunday or flea market where buyers and sellers meet to exchange goods and services. The rules that apply are also similar to the flea market rules where no participant can dominate the structure and the participation is guided by a liberal set of criteria.

Small businesses are slow to innovate or apply technology to improve competitiveness as unique, size-related issues affect them. Poon and Swatman (1997) established that small firms could have greater benefits from using the Internet than larger organisations. However, Poon and Swatman (1999) found that despite the fact that electronic commerce presents an opportunity to compete with larger businesses, small businesses in Australia have been slow in their uptake of electronic commerce. Even though, the literature detailed below is not comprehensive, there was no evidence of any study that investigated the factors that influence the intention to adopt B2B Trading exchanges in small businesses. This study reviewed the literature to understand the B2B Trading exchange adoption process and to provide the theoretical basis that guided the investigation into the factors that influence the adoption of B2B Trading exchanges in small businesses in Western Australia. Rogers (1995) defines an innovation as an idea or practice that is perceived as new by the adopting organisation and the adoption of the innovation must result in a significant change in the adopter's existing behaviour. Thus the adoption of a B2B Trading exchange by small business can be considered as an innovation.

Zaltman et al. (1973) studied organisational innovation adoption and found that adoption occurs in two stages, namely the initiation stage followed by the implementation stage. Since this study was concerned with the factors that influence the intention to adopt it was bounded to initialisation phase of innovation adoption and diffusion theory. To understand the factors that influence the adoption behaviour of small businesses towards B2B Trading exchanges we investigated several theoretical perspectives from the literature. The review of the marketing literature identified models that are similar to the classical adoption models in that they also attempt to understand the motivation to adopt and the decision-making involved. One of these models, the Hierarchy of Effect, has similar stages to the classical innovation adoption diffusion models and argues that consumers passes through a series of steps in sequential order of cognitive, affective and behavioural stages. In the Hierarchy of Effects model, the cognitive stage relates to the consumer developing an awareness of the product (Lavidge and Steiner 1961). This study infers that using this model as the basis, an organisation is influenced to

consider the technology during the affective stage. The awareness of the technology leads to the organisation assessing the potential of the technology based on their perception of the benefits.

The model has predominately been used to examine the effect of sponsorship on brand (McDaniel 1999) and the influence of Olympic sponsorship on a product (Crimmins and Horn 1996). There was no evidence in the literature on the application of the Hierarchy of Effect model into the factors that influence B2B Trading exchanges in small business. Intentions were found to be the single best predictor of any planned behaviour, including the intention to adopt B2B Trading exchanges (Ajzen and Fishbein 1980). Understanding the background to these intentions increases our understanding of the intended behaviour. There are a core set of theories that seek to explain the target adopter attitudes and their behaviour towards an innovation. These theories are Diffusion of Innovations (Rogers 1995), Theory of Reasoned Action (Ajzen and Fishbein, 1975), Technology Acceptance Model (Davis 1989) and Theory of Planned Behavior (Ajzen 1991). These models have all been validated for technology-based innovations.

The Theory of Reasoned Action has been used to understand human behavior based on the assumption that human make rational decisions (Fishbein and Ajzen 1975). The model proposes that there are causal relationships linking beliefs, attitudes, intentions and that attitudes and subjective norms determine behavioral intentions (Ajzen and Fishbein 1980). The TRA model has been extensively validated and has been successfully applied to explain behaviour across a wide variety of domains such as education (Fredricks and Dossett, 1983) and Internet Banking (Tan and Teo 2000). Sheppard et al. (1988) concluded that the power of the TRA to explain behaviour across a number of contexts was strong. However, there was no evidence in the literature that demonstrated the use of the TRA to explain the adoption of B2B trading exchanges. B2B Trading exchange adoption is executed in an inter-organisational context. Therefore, the application of the TRA, without adaptation to account for the external, facilitating contextual or control influences associated with an inter-organisational innovation such as B2B Trading exchanges, has limited value in this study. Azjen (1991) developed the Theory of Planned Behavior (TPB) to overcome some the limitations of the TRA through the important addition of the perceived behavioral control constructs. This construct relates to the perception of the presence or absence of the required resources or opportunities needed to perform the intended behaviour.

The Theory of Planned Behaviour (TPB) has been successfully applied to explain the behaviour in areas such as marketing/consumer behaviour (Berger 1993) and leisure behaviour (Ajzen and Driver 1992). Taylor and Todd (1995) have also applied TPB to study the adoption of new technologies, however there is no evidence in the literature that demonstrates the use of the TPB to explain the adoption of B2B Trading exchanges in small businesses. The Technology Acceptance Model (TAM) (Davis 1989) is a specific adaptation of the TRA model and has been extensively used in understanding usage and acceptance in Information Technology (IT). The model has been tested and extended by a number of studies that included voice-mail (Adams et al. 1992) and spreadsheets (Mathieson 1991). Even though the model was tailored to the acceptance of computer-based technologies, its robust structure allows applications in other technology adoption situations after appropriate adjustments (Davis et al. 1989). However, there is no evidence in the literature that demonstrate the use of the TAM to explain the adoption of B2B Trading exchanges. The adoption of B2B Trading exchanges at an organisational level requires the sourcing of computer hardware, support and interaction with trading partners. In this sense, the adoption of B2B Trading exchanges is similar to IT, EDI and Electronic Commerce as innovation types. Previous studies identified a number of internal factors, in the form of organisational factors that influences the adoption of IT (Kwon and Zmud 1987). Igbaria et al (1997) confirmed small business dependency on external support by concluding that external support was a significant factor that hindered IT adoption. Since small businesses are not in position to employ experts within the organisation to guide the innovation process, the owner/manager plays a key role in the adoption of technology. In this regard, Thong and Yap (1995) concluded that small businesses with a CEO that is more knowledgeable about IT, has a

greater likelihood of adopting IT. Kwon and Zmud (1987) argued that the external environment of the organisation is an important influence in the adoption of new technologies.

The growth in inter-organisational systems (IOS) has further reinforced the role of external environmental factors. The potential adopter could also derive some value from the fact that business partners or interrelated business within their business environment or network have adopted the innovation. This concept has been theorised in the literature as network externalities or critical mass (Katz and Shapiro 1994). Kraut et al. (1998) highlighted the importance of a critical mass of users in the adoption of an innovation. The literature on innovation adoption theory has primarily neglected the extent to which the role of the vendor influences the adoption process (Gatignon and Robertson 1989). Sultan et al. (1990) and Frambach et al. (1998) supported the argument by claiming that the vendor of the innovation could have a significant influence on the adoption behaviour. Whilst there are no studies identified that specifically addressed the adoption of B2B Trading exchanges in small businesses, the literature on IT adoption provided this study an insight into how extending the traditional innovation adoption and diffusion models to incorporate factors organisational contextual, external environmental, critical mass and control factors can assist in explaining the adoption behaviour of information technology based innovations.

The literature on EDI adoption also provides an insight as the practice of EDI is similar to B2B Trading exchanges as innovation types, as they are both enabled by inter or extra organisational systems and requires computer interaction. The underlying approach for studies into EDI adoption research was to incorporate, either explicitly or implicitly, traditional innovation diffusion theory as the foundation (Chewlos et al. 2001). Arunachalam (1995) identified barriers to EDI adoption as the adopter's lack of awareness of the benefits of EDI. Iacovou et al. (1995) also argued that small businesses that perceived the benefits of EDI to be positive would be more inclined to adopt EDI. In their study, Iacovou et al. (1995) split the perceived benefit construct into perceived direct and indirect benefits of EDI. There also exist a number of studies in the literature that have been undertaken into the factors affecting adoption and barriers to the adoption of electronic commerce (Ramsey et al. 2003, Poon and Swatman 1999). However little is known on the adoption of Internet related technologies as the focus of most of the studies were exploratory and focussed on usage, advantages and inhibitors relating to electronic commerce or the Internet. Therefore, the review of the literature on electronic commerce and its associated technologies adoption identified no specific studies that addressed the organisational adoption of B2B Trading exchanges in small business. Researchers have argued that it may not be possible to develop a unifying theory of adoption due to fundamental differences between the innovation types. Therefore this study developed a research model that draws on the traditional innovation diffusion theories and incorporates factors from previous innovation adoption diffusion studies that extended the traditional models for different contexts and innovations types. The research model developed is presented next.

### **3. B2B Trading Exchange Adoption Model for Small Business**

The research model draws from the literature on Hierarchy of Effect model (Lavidge and Steiner 1961), the traditional DOI theory (Rodgers 1995), the TRA (Ajzen and 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 literature review provided the theoretical basis for the investigation into the factors that influence the adoption of B2B Trading exchanges in small businesses in Western Australia. The research model was developed through a process where an initial research model was developed from an extensive literature review. This initial model was further enriched through a qualitative field study that was concerned with further exploring the factors and variables identified during the literature review with the aim of validating the initial research model and to identify any other relevant factors and variables. The field study process is described in more detail in the Sample and Procedure section. The final research model was developed through a process of identifying similarities and differences in the factors between an initial research model and those factors identified in a qualitative field study. The final research model extended a sequential research

model with external influences and certain environmental conditions that make it more likely for the adoption of B2B Trading exchanges in small businesses to occur.

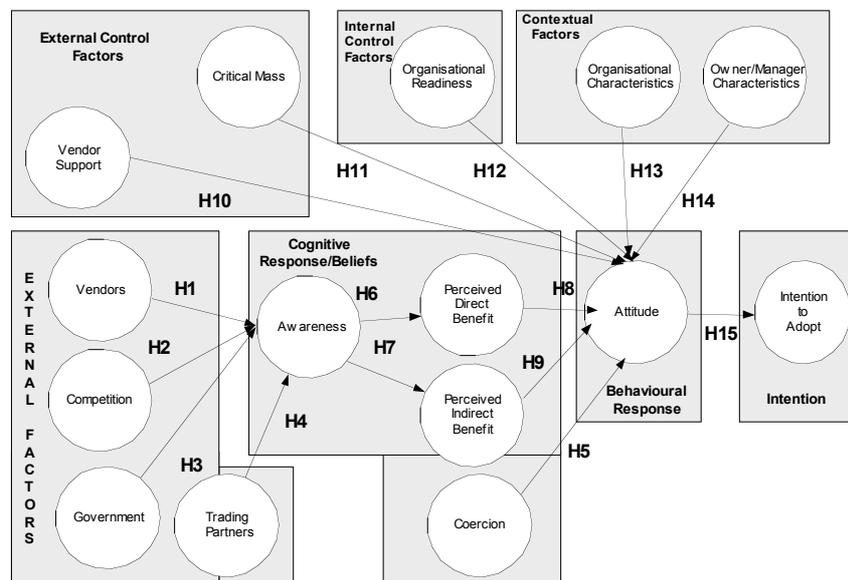
The research model extended the TRA and TPB models and identified contextual factors, control factors and external factors as the independent variables that influence the organisation adoption of B2B trading exchanges. The behavioral intention to adopt was modeled as the dependent variable and it relates to the strength of the prospective adopter's intention to commit resources to implement the innovation. The attitude towards adoption in the research model was concerned with the prospective adopter's positive or negative feeling about adopting the innovation. The Hierarchy of Effect model incorporates an awareness concept where the adopter is made aware of the innovation or product, by an external influence. This awareness leads to the adopter seeking information about the product and the evaluation of this information leads to adopter forming an opinion or attitude that eventually leads an adoption decision. Similarly, using the Hierarchy of Effect model as the basis, the research model proposed that small businesses would need to be made aware of an innovation by an external influence. The awareness of the existence of an innovation may result in the organisation making judgements on the benefits to the organisation. Consequently, a positive evaluation of the benefits leads to a positive attitude towards the innovation that may lead to its eventual adoption. Therefore, this study extended the traditional TRA frameworks to include an awareness factor. The inclusion of this awareness factor is recognition that many innovations may simultaneously exist in the small business environment and the adopter's recognition that one or more of these hold promise (Zaltman et al. 1973). All of the innovation diffusion theories share a common view that the adopter's decision to adopt is based on their perceived beliefs towards the innovation and these beliefs explain the adopter's attitude towards an innovation (Fishbein and Ajzen 1975; Davis et al. 1989; Rogers 1995). This study also considered the negative benefits such as high cost of the solution and security as part of the perceived benefits construct (Kendal et al. 2001). Similar to the Iacovou et al. (1995) model, this study also distinguished between perceived direct and indirect benefits.

The literature review identified the concept of coercion as a relevant factor in inter-organisational theory and was considered to be significant in this study, as B2B Trading exchanges are enabled by inter or extra organisational electronic interaction. In the small business context, an important trading partner may coerce small businesses, as the weaker partner in the trading relationship, into adopting the innovation. Therefore, the research model for this study included the coercion construct. The TRA model proposed that external factors would affect behaviour through their effects on beliefs or perceptions. Ajzen and Fishbein (1980) argued that beliefs or perceptions are either formed from direct experience, from outside information, inferred or self-generated. Therefore, this study infers that external factors are considered to significantly influence the intention to adopt B2B Trading exchanges. Based on the relative importance of external factors, the external factors of Competition (Thong 1999), Government (Teo et al. 1998), and Trading partner (Iacovou et al. 1995) were included in the research model for this study. According to Sultan et al. (1990) and Frambach et al. (1998), the vendor of the innovation could have a significant influence on the adoption behaviour. Therefore, this research model explicitly accounted for the influence by the vendor of the innovation. The research model explored the influence of these external factors in driving the awareness of the innovation.

Previous studies in IT adoption identified a number of organisational factors that influences the adoption of IT (Tornatzky and 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. Small businesses generally lack expertise relating to technology within the organisation and rely on the owner/manager in the adoption of technology. Therefore, the attributes and experience of owner/managers is an important guide to the innovative attitude that prevails in small business and therefore the owner manager characteristics were included as contextual factors (Thong and Yap 1995). The perception of control was the key addition to the Theory of Reasoned Action (TRA) to formulate the Theory of Planned Behaviour (TPB). In the context of this research, internal control relates to those factors that are not in the direct control of the

organisation and relates to those factors that are controllable by the organisation and is based on the perception of the level of readiness of the organisation (Ivacovou et al. 1995).

External control in the context of this research relates to presence of a critical mass of participants (Bouchard 1988) and the availability of vendor support (Fichman 1992). B2B Trading exchanges, as an inter-organisational system, requires the involvement of at least two organisations and the value that can be derived from the innovation increases as the number of interrelated businesses adopts the innovation (Chewlos et al 2001). Similar to EDI, a critical mass is deemed to be fundamental to the success of a B2B Trading exchange, since a lack of buyers or sellers could cause the collapse of the trading exchange. Small business may need to rely on either third party or vendor support since lack of specialised technical skill and a level of technical competency for complex technological innovations. They also lack good internal IT support, as they often do not support an internal formalised IT function. Therefore, the availability of vendor support was considered to be important factor in the context of this study and included in the research model. The research model developed for this study extended the traditional innovation adoption and diffusion theories, by taking into account external factors, contextual and control factors. This leads to a comprehensive model that was considered to better explain the factors that influence the intention to adopt B2B Trading exchanges in small businesses. The research model developed is shown below in Figure 1.



**Figure 1: Research Model for B2B Trading Exchange Adoption in Small Business**

#### 4. Hypotheses

Using the research model as a basis, the links among the factors in Figure 1 represent various hypotheses. The primary hypotheses of this research, which have been developed based on an extensive literature review, are as follows:

H1: The activities, pursued by the vendor, will positively influence the awareness of a B2B trading exchange in small businesses

H2: Competitors using B2B trading exchange are likely to lead to a greater awareness of B2B trading exchanges

H3: The greater the degree of government involvement the greater the awareness of B2B trading exchanges in small business

H9: Small businesses that have a greater perception of the indirect benefits of B2B exchanges will more likely have a positive attitude towards the intention to adopt a B2B trading exchange

H10: The availability of vendor technical support is more likely to have a positive attitude towards the intention to adopt a B2B trading exchange in small business

H11: Small business that perceive a critical mass of trading partners, suppliers and customers are adopting B2B trading exchanges are more likely to

H4: Trading Partners using B2B Trading exchanges, will positively influence the awareness of B2B Trading Exchanges in small business

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

H6: Awareness of a B2B Trading will lead to a positive evaluation of the perceived direct benefits of adopting B2B Trading exchanges

H7: Awareness of a B2B Trading will lead to a positive evaluation of the perceived indirect benefits of adopting B2B Trading exchanges

H8: Small businesses that have a greater perception of the direct benefits of B2B exchanges will more likely have a positive attitude towards the intention to adopt a B2B trading exchange

have a positive attitude towards adopting a B2B trading exchange

H12: Small businesses with a higher levels of Organisation readiness are more likely to have a positive attitude towards the adoption a B2B trading exchange

H13: Organisation characteristics are more likely to influence the attitude towards the adoption of a B2B Trading exchange

H14: The characteristics of the Owner/Managers are more likely to influence the attitude towards the adoption a B2B Trading exchange

H15: A positive attitude towards B2B trading exchanges will have a positive influence on the intention to adopt B2B trading exchanges in small business

## **5. Research Method**

### ***5.1 Measures***

The fifteen factors described earlier (see Figure 1) have been measured with great care. Most of the items have been adapted from the existing literature and further enhanced through a field study. Seven point likert scale ranging from 'strongly disagree' to 'strongly agree' has been used to measure all the items. The reliability and validity have been assessed based on the standard procedure of Partial Least Square (PLS) technique (Chin 1998, <http://www.plsgraph.com>).

### ***5.2 Sample and Procedure***

In this study, the social system can be broadly defined as the small business population of Western Australia. Since there has been limited previous research that linked to the adoption of B2B Trading exchanges, the research process was divided into a number of phases that was considered to enrich the findings of this study. The first phase was the extensive literature review that was followed by a qualitative field study that further enhanced the initial research model developed in the literature phase. The field study phase was concerned with further exploring the factors and variables identified during the literature review with the aim of validating the initial research model and to identify any other relevant factors and variables. The literature was also re-examined to gather further evidence on any new factors identified (Miles and Huberman 1994). The intent was to provide for a more comprehensive research model that could be tested empirically through quantitative measures. For the qualitative field study phase, seven owner/manager of small businesses were selected and interviewed from a list of companies that subscribed to the Western Australian (WA) Government Electronic Marketplace (GEM) initiative. The data for this phase was collected through interviews conducted using the semi-structured interview technique. The interview protocol developed, from the initial research model, was reviewed and tested by a third party prior to conducting the interviews to identify any weaknesses. In total 7 interviews were conducted and all interview were transcribed verbatim into an electronic form to allow the interviews to be analysed and interpreted. The data collected was analysed using Content analysis technique of coding and categorisation as outlined by Holsti (1969). A further review of the data and literature lead to the development of a final research model that was

tested in the quantitative phase of the study. The survey was constructed using a combination of factors and variables identified in the literature review and field study.

Due to page limitations the measurement items used could not be detailed in this paper. The authors can be contacted if more information on the measurement items is required. The final phase of the data collection in this study involved a quantitative survey. The data collected was 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 5 small businesses with each respondent separately 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 1,000 small businesses in Western Australia, satisfying the small business criteria, were selected to participate in the study. The questionnaire was distributed to the owner/manager's of the small business. This data collection exercise produced a response rate that was perceived to be low. It should be noted that low response rates are the norm for surveys involving the small business population in Western Australia, as these small businesses are notorious for the lack of response to surveys. To increase the response rate, further mining of the original 1,000 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 1,000 sample, were distributed. 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. The process involved distributing questionnaire to small business owner/managers that are users of the services offered by this local Business Enterprise Centre. The returned number of valid response from the Local Business Enterprise Centre sample was the lowest and resulted in a reduction of the overall response rate. This sample contained a large proportion of small businesses that are at the smaller end of the small business scale (0-5 employees) and the subject area was complex that would have made it more challenging for the owner managers in this small business segment. The low response rate achieved for this sample is similar to that of Leighton and Schaper (2003) that set out that a response rate of less than 5% was usually the norm for micro-businesses. Micro-businesses is defined as having 0 - 5 employees. Overall, 211 returned surveys were useable out of the 1500 sample. Whilst, the overall response rate, of approximately 14%, is low by absolute standards, judgements on the acceptability of the response rate should take into account of the fact that the survey was unsolicited, without any prior knowledge of the survey on the part of respondents. It should also be noted that the area of research was a complex subject area for small business and low response rates is not uncommon for small businesses in Australia as they are poor at responding to surveys (Karimabady and Brunn 1991). As a comparison, the response rate is similar to those received by other researchers in the Australian small to micro-business field (Dawson et al. 2002; Houghton and Creeda 1999). Reid, Dunn and Cromie (1999) in their study on small business community relating to "Family Orientation in small business" achieved an effective response rate of 10%.

The data gathered from the survey phase were analysed using Partial Least Squares (PLS). 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 (Hulland 1999). The structural model assessed the explanatory power of the independent variables and examined the size and the significance of the path coefficients. The PLS data analysis also tested the hypothesis proposed.

### ***5.3 Data Examination***

It was the intention of the study to sample both the adopter and non-adopters to capture the views and beliefs from both perspectives, however the number of responses from adopters was extremely low. The low numbers of adopters returned meant that it was not possible to conduct any meaningful statistical analysis on this sample. These adopters were removed from the sample. The remaining non-adopters, that intended to adopt B2B trading exchanges in the future, were included in the dataset that was used for PLS analysis. As mentioned earlier, the low initial response rate received from the primary 1,000 sample of small businesses necessitated the mail out of 2 additional surveys with a sample of 500 each. Since this represented 3 different waves of data collection, the study performed a non-response bias analysis, using the Mann-Whitney U test. This tested for significant differences between key demographic and attitude towards B2B Trading Exchanges related variables.

The objectives of the non-response bias analysis were to determine which of the different waves of responses could be combined for the PLS analysis. The non-response bias analysis showed that it was reasonable to conclude 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 non-response bias analysis for the Wave 1/Wave 2 and Wave 3 samples identified the Wave 3 sample as distinct from combined Wave 1/Wave 2 sample. Therefore, the Wave 3 sample was separated from the Wave 1/Wave 2 dataset for PLS analysis. The Wave 1/Wave 2 sample analysed comprised of 147 valid responses in the dataset. The total of 147 responses satisfied the minimum sample size requirement of ten times the number of items in the most complex construct in the research model, as argued by Gefen et al (2000). In this research model the most complex constructs was Perceived Benefit with 12 items. This translated to a minimum requirement of 120 cases for the dataset. The Wave 3 sample consisted of 47 valid responses and therefore violated the minimum requirement for PLS. As such, no PLS analysis was performed on the Wave 3 dataset.

## 6. Results

### 6.1 Assessment of Measurement Properties

The initial research model consisted of 67 observed variables. As per the PLS procedure suggested by 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), that states items loading below 0.5 are deemed to be unreliable, 11 of the items were considered to be unreliable. The item loadings calculated are detailed in Table 1 with the low loading items marked as *ll*. There was no persuasive argument found in the literature to support the use of these items in measuring the construct. In the interest of maintaining the relationships between the constructs, these low loading items were removed. Removing these items was considered to prevent the lessening of the estimates of the true relationship between the constructs. As such, these low loading items were removed from any subsequent analysis to improve the item reliabilities. The revised model with 56 observed variables were again tested using PLS and all item reliabilities exceeded the 0.5 reliability criteria. The Fornell's and Larcker (1981) method was used to evaluate the model for internal consistency and this study adopted the internal consistency acceptable limit of 0.70, as suggested by Nunnally (1978). The results in Table 2 detail the Fornel and Larcker values calculated. The results show that all constructs exceeded the suggested 0.70 value with constructs Vendors, Government, Trading partners, Vendor Support, Critical Mass, Perceived Benefits, Perceived Indirect Benefits, Attitude and Intention to Adopt showing high reliability scores in excess of 0.9.

**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>II</sup>  |
|                                     | Promotion using trade magazines             | 0.888                | <b>Perceived Direct Benefit</b>   | Reduce Cost                               | 0.903                |
|                                     | Promotion using Seminars                    | 0.903                |                                   | Reduce staff                              | 0.858                |
|                                     | Promotion using trade fairs                 | 0.884                |                                   | Reduce Paperwork                          | 0.877                |
|                                     |   |                      |                                   | Reduce Clerical error                     | 0.847                |
|                                     | Direct Mailing                              | 0.792                |                                   | Increase turnover                         | 0.798                |
|                                     | Sales People                                | 0.845                |                                   | Cost of Training                          | 0.01 <sup>II</sup>   |
| <b>Competition</b>                  | Competitors using B2B Trading Exchanges     | 0.532                |                                   | High costs of the solution                | -0.265 <sup>II</sup> |
|                                     | Driven by competitors                       | 0.945                |                                   | Security risk                             | -0.004 <sup>II</sup> |
|                                     | Competitive Industry                        | 0.842                |                                   | Easy to use                               | -0.192 <sup>II</sup> |
| <b>Government</b>                   | Government Leadership                       | 0.873                |                                   | Compatible with business                  | -0.127 <sup>II</sup> |
|                                     | Government as User                          | 0.886                |                                   | Complex to implement                      | -0.178 <sup>II</sup> |
|                                     | Government Direct Subsidy                   | 0.885                |                                   | Integrated with other systems             | -0.135 <sup>II</sup> |
|                                     | Government provides low cost infrastructure | 0.921                | <b>Perceived Indirect Benefit</b> | Increases Ability to compete              | 0.929                |
| <b>Trading Partners</b>             | Influence from important business partners  | 0.893                |                                   | Increase working relationship             | 0.927                |
|                                     | Influence from important Major Supplier     | 0.855                |                                   | Status Symbol                             | 0.393 <sup>II</sup>  |
|                                     | Influence from important customer           | 0.88                 | <b>Attitude</b>                   | I intend to use within the next 12 months | 0.949                |
| <b>Awareness</b>                    | An important innovation                     | 0.859                |                                   | Replace current methods                   | 0.968                |
|                                     | Familiar with benefits                      | 0.682                |                                   | Recommend the use                         | 0.954                |
|                                     | More Competitive                            | 0.912                | <b>Intention to Adopt</b>         | I intend to use within the next 12 months | 0.949                |
| <b>Vendor Support</b>               | Access to someone to make it work           | 0.871                |                                   | Replace current methods                   | 0.968                |
|                                     | Customer Hotlines                           | 0.947                |                                   | Recommend the use                         | 0.954                |
|                                     | External training                           | 0.912                | <b>Coercion</b>                   | Mandatory measures by Government          | 0.631                |
| <b>Critical Mass</b>                | Number of Users                             | 0.724                |                                   | 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                | <b>Organisation Readiness</b>     | Level of Financial Resources              | 0.566                |
| <b>Organisation Characteristics</b> | 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>II</sup> |                                   | Computer literate                         | 0.316 <sup>II</sup>  |

<sup>II</sup> low loading items discarded

**Table 2: Internal Consistencies**

| Latent Variables       | Internal Consistencies | Latent Variables              | Internal Consistencies |
|------------------------|------------------------|-------------------------------|------------------------|
| Vendor                 | 1                      | 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                   |

This study used the square root of the AVE to assess the discriminant validity as suggested by Igbaria et al. (1995b). 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. Therefore, this study calculated the Average variance extracted (AVE) for each of the latent variable. The square roots of the AVE were then compared against the correlations among the latent variables. The results are detailed in Table 3 in *Appendix A* with the square roots of the AVEs shown in the main

diagonal of Table 3. The off-diagonal elements represent the correlations among the latent variables. Using Barclay et.al (1995) guidelines for discriminant validity, the square root of the AVE should be greater than the off-diagonal elements in the corresponding rows and columns. Table 3 indicates that the discriminant validity of the latent variables was met, which means that all the latent variables are different from each other.

## 6.2 The Structural Model and Tests of Hypotheses

The results of the bootstrapping calculations of the model detailing the path coefficients and t-statistics are summarised in Table 4.

It is observed that among the primary hypotheses H<sub>1</sub>, H<sub>5</sub>, H<sub>6</sub>, H<sub>9</sub>, H<sub>11</sub>, H<sub>13</sub>, H<sub>14</sub> and H<sub>15</sub> were supported (significant t-values) while hypotheses H<sub>2</sub>, H<sub>3</sub>, H<sub>4</sub>, H<sub>7</sub>, H<sub>8</sub>, H<sub>10</sub>, and H<sub>12</sub> are not supported (insignificant t-values). The model explains 56% of the variance of the Intention to Adopt (see Figure 1 and Table 4), which is reasonably good.

**Table 4: Tests of Hypotheses**

| Hypotheses   | Path coefficient | t-value        | Hypotheses   | Path coefficient | t-value        |
|--|------------------|----------------|--|------------------|----------------|
| <b>H<sub>1</sub>: Vendors → Awareness</b>                    | 0.614            | <b>7.937*</b>  | <b>H<sub>9</sub>: Critical Mass → Attitude</b>                 | 0.143            | <b>1.708*</b>  |
| H <sub>2</sub> : Competition → Awareness                     | 0.032            | 0.358          | H <sub>10</sub> : Organisation Readiness → Attitude            | 0.035            | 0.502          |
| H <sub>3</sub> : Government → Awareness                      | -0.061           | 0.834          | <b>H<sub>11</sub>: Organisation Characteristics → Attitude</b> | 0.201            | <b>2.308*</b>  |
| H <sub>4</sub> : Trading Partners → Awareness                | 0.157            | 1.584          | H <sub>12</sub> : Owner Manager → Attitude                     | 0.094            | 1.290          |
| <b>H<sub>5</sub>: Awareness → Perceived Direct Benefit</b>   | 0.692            | <b>16.279*</b> | <b>H<sub>13</sub>: Perceived Benefit → Attitude</b>            | 0.25             | <b>2.483*</b>  |
| <b>H<sub>6</sub>: Awareness → Perceived Indirect Benefit</b> | 0.541            | <b>6.575*</b>  | <b>H<sub>14</sub>: Perceived Indirect Benefit → Attitude</b>   | 0.272            | <b>3.905*</b>  |
| H <sub>7</sub> : Coercion → Attitude                         | 0.111            | 1.156          | <b>H<sub>15</sub>: Attitude → Intention to Adopt</b>           | 0.751            | <b>20.788*</b> |
| H <sub>8</sub> : Vendor Support → Attitude                   | -0.023           | 0.343          |  |                  |                |

*\*p < 0.05*

**R<sup>2</sup> for Intention to Adopt = 0.56; R<sup>2</sup> for Attitude = 0.62; R<sup>2</sup> for Perceived Direct Benefit = 0.48; R<sup>2</sup> for Perceived Indirect Direct Benefit = 0.29; R<sup>2</sup> for Awareness = 0.52**

## 7. Discussion

As hypothesized, the findings of this study confirmed that a positive attitude towards B2B Trading exchanges drives the intention to adopt B2B Trading exchanges in small businesses. The findings also confirmed that external, belief, contextual and control factors influence the attitude towards B2B Trading exchanges in small businesses. The study found that the external factor of vendor has an influence in raising the awareness of an innovation. However external factors of competition, government and business partners were not found to be significant in influencing the awareness of an innovation. Consequently, the findings showed that an awareness of an innovation has an effect on the perception of the perceived direct and indirect benefits of the innovation. The positive evaluation of the benefits leads to the development of a positive attitude that ultimately leads to an intention to adopt.

This study also theorised that organisation characteristics was a significant predictor of the attitude towards the adoption of B2B Trading exchanges in small businesses. The findings of this study found that the organisation characteristics of the small business are likely to create conditions under which the adoption is more able to occur and as a consequence influence the attitude towards adopting a B2B Trading exchange. However, the study did not statistically support the relationship that the owner/manager characteristics significantly influence the attitude towards B2B Trading exchanges in small businesses. The test of hypotheses, relating to control factors, found that the internal control factor of organisation readiness was not significant. The findings of this study also did not support the significance of the external control factors, vendor support. However it supported the significance of critical mass as an external control factor. Therefore, factors of external control were considered to

have a significant influence on the attitude towards the intention to adopt a B2B Trading exchange in small businesses. The findings of the study also did not support the factor of Coercion as a belief factor although the belief factors of perceived direct benefits and perceived indirect benefits were found to be significant. These findings confirmed the appropriateness of the research model in using the TRA and TPB as the theoretical basis underpinning the model. The major theoretical contribution of this study, apart from extending the traditional innovation diffusion framework for an innovation type B2B Trading exchanges and the context of small business, is awareness. This study confirmed awareness as a significant perception or belief factor. 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 intention to adopt is driven by a positive attitude towards the innovation.

## 8. Conclusions

In terms of the limitations of this study, there is some lack of generalisability of the findings as the response rate was relatively low. There is also a potential response bias as the returned sample returned an unusable number of users of B2B Trading exchanges. The restriction of the survey to the owner/managers meant that the views and opinions of significant staff at the operational level of the small business were not represented in the findings of this study. The study also did not control the effect of size even though this could potentially lead to a different effect on the outcome. The findings and conclusions of the study could also not be generalised, as the context of this study was restricted to the small business population in Western Australia. Further studies could be conducted to test the validity of research model for the adoption of B2B Trading exchange for small business by replicating the study in other Australian and international contexts. It would also be interesting to extend the sample to B2B Trading exchange users as means of comparing the findings of this study against a replicated study using a small business sample of B2B Trading exchanges users. Finally, further studies could also be undertaken to investigate the integration and impact of B2B Trading exchanges on small businesses, as this study was bounded to the intention to adopt. Despite the above limitations this research unearths some interesting findings and provides some valuable insights in the factors that influence the adoption of B2B Trading exchanges in small businesses.

The findings have implications for vendors and governments in that the adoption of B2B Trading exchanges in small businesses does not only occur as a result of the adopter's perception of the innovation adoption attributes or benefits. More detailed and focused promotional work needs to be conducted on the part of government and vendors to increase the awareness of these benefits of B2B Trading exchanges in small businesses to improve the adoption rate. The results of the study will provide vendors of the innovation and government a better insight into the factors that influence the intention to adopt B2B Trading exchanges in small businesses. This will enable them to better target their promotional activities to raise the awareness of the benefits as a means of improving the adoption rate of B2B Trading exchanges in small businesses. Understanding the factors that influence the adoption of B2B Trading exchanges is becoming increasingly important due to the unique opportunities that electronic commerce provides to small businesses. It is also becoming an increasing relevant issue as there is a growing number of organisations adopting some form of electronic interaction with customers, suppliers and business partners.

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## APPENDIX A

Table 3: Correlation of Latent Variables & Square Roots of AVE

|                               | Vendors      | Competition  | Government   | Trading Partners | Awareness    | Vendor Support | Critical Mass | Organisation Readiness | Organisation Characteristics | Owner Manager Characteristics | Perceived Direct Benefit | Perceived Indirect Benefit | Attitude     | Intention to Adopt | Coercion     |
|-------------------------------|--------------|--------------|--------------|------------------|--------------|----------------|---------------|------------------------|------------------------------|-------------------------------|--------------------------|----------------------------|--------------|--------------------|--------------|
| Vendors                       | <b>0.852</b> |              |              |                  |              |                |               |                        |                              |                               |                          |                            |              |                    |              |
| Competition                   | 0.523        | <b>0.793</b> |              |                  |              |                |               |                        |                              |                               |                          |                            |              |                    |              |
| Government                    | 0.468        | 0.621        | <b>0.891</b> |                  |              |                |               |                        |                              |                               |                          |                            |              |                    |              |
| Trading Partners              | 0.681        | 0.639        | 0.465        | <b>0.876</b>     |              |                |               |                        |                              |                               |                          |                            |              |                    |              |
| Awareness                     | 0.709        | 0.415        | 0.319        | 0.566            | <b>0.818</b> |                |               |                        |                              |                               |                          |                            |              |                    |              |
| Vendor Support                | 0.323        | 0.405        | 0.617        | 0.404            | 0.251        | <b>0.910</b>   |               |                        |                              |                               |                          |                            |              |                    |              |
| Critical Mass                 | 0.499        | 0.539        | 0.446        | 0.493            | 0.566        | 0.451          | <b>0.877</b>  |                        |                              |                               |                          |                            |              |                    |              |
| Organisation Readiness        | -0.094       | -0.098       | -0.061       | -0.12            | -0.188       | 0.015          | -0.12         | <b>0.679</b>           |                              |                               |                          |                            |              |                    |              |
| Organisation Character        | 0.518        | 0.443        | 0.325        | 0.435            | 0.59         | 0.26           | 0.607         | -0.182                 | <b>0.769</b>                 |                               |                          |                            |              |                    |              |
| Owner Manager Characteristics | 0.382        | 0.205        | 0.189        | 0.346            | 0.519        | 0.22           | 0.382         | -0.131                 | 0.489                        | <b>0.697</b>                  |                          |                            |              |                    |              |
| Perceived Benefits            | 0.63         | 0.201        | 0.148        | 0.412            | 0.692        | 0.061          | 0.371         | -0.303                 | 0.514                        | 0.434                         | <b>0.857</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>0.928</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>0.931</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>0.957</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>0.785</b> |

*(The shaded and bold elements in the main diagonal are the square roots of AVE)*