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What Drives the Adoption of Electronic Markets in Australian Small-and-Medium Sized Enterprises? – An Empirical Study

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Abstract

This paper reports a study of the critical determinants for adopting electronic markets (e-Market) in Australian small-and-medium sized enterprises (SMEs) within the technology-organization-environment (TOE) framework. Structural equation modelling and logistic regression are used for identifying the critical determinants for the adoption of e-Markets by Australian SMEs through testing a proposed conceptual model and proposing an alternative model. This study contributes to existing research by enriching an understanding of the critical determinants of adopting an e-Market in Australian SMEs and by providing a validated model for the inter-relationships of the determinants in technology adoption.

Keywords

E-Market, SMEs, Technology adoption, TOE model, Alternative model

INTRODUCTION

An electronic market (e-Market) is a virtual marketplace in which buyers and sellers are brought together for conducting electronic commerce activities including the exchange of goods, services or information online (Dou and Chou 2002; Grieger 2003). It has been becoming increasingly popular, exemplified in the rapid growth of e-Market product and service offerings (OECD 2007), as well as in the wealth of literature resulted from active research (Wall et al. 2007). The popularity of e-Markets is due to their potential benefits to business, especially to small-and-medium sized enterprises (SMEs) including strengthened customer relationships, ease of reaching targeted markets, improved efficiency, reduced costs, and greater competitive advantages (Daniel et al. 2004).

SMEs are the important contributor to the global economy accounting for approximately 50% of all national gross domestic products (GDP), with approximately 99.5% of all businesses having 100 or less employees (OECD 2007). In Australia, SMEs are essential to the Australian economy as about 96% of businesses are categorized as SMEs, employing approximately 3.5 million people and contributing to an estimated 30% of national GDP.

The rapid advance in information and communication technologies greatly reduces the barriers for SMEs to conduct their businesses online (Molla and Licker 2005). With continuous support from both the federal and state governments, the number of SMEs in adopting e-Markets for electronic business has been increasing in Australia (MacGregor and Vrazalic 2005; Duan et al. 2010). The potential of e-Markets for SMEs, however, has not been fully utilized. A majority of SMEs have not made use of an e-Market and those who have adopted e-Markets have not moved beyond the entry-level adoption (MacGregor and Vrazalic 2005; Molla and Licker 2005). This is due to various barriers that SMEs face in adopting e-Markets (MacGregor and Vrazalic 2005; Love et al. 2005). Such barriers, however, have not been well studied. In particular, what is missing from the existing literature is a profound understanding of the critical determinants for the adoption of e-Market in Australian SMEs (Duan et al. 2010; Standing et al. 2010).

This paper reports a study of the critical determinants for adopting electronic markets (e-Market) in Australian small-and-medium sized enterprises (SMEs) within the technology-organization-environment (TOE) framework. Structural equation modelling (SEM) and logistic regression are used for identifying the critical determinants for the adoption of e-Markets by Australian SMEs through testing a proposed conceptual model and proposing an alternative model. This study contributes to existing research by enriching an understanding of the critical determinants of adopting an e-Market in Australian SMEs and by providing a validated model for the inter-relationships of the determinants in technology adoption.

THEORETICAL BACKGROUND

The TOE framework is a systematic tool for studying the adoption of technology in organizations (Tornatzky and Fleischer 1990; Zhu et al. 2003). It identifies three aspects of an organization that affect the technology adoption including organization, technology, and environment. The technology aspect depicts the technologies that are relevant to the organization in its pursuit of business objectives. The organization aspect is characterized by the firm's size and scope, managerial structure and internal resources. The environment aspect describes how an organization conducts business with its business partners, competitors and the government.

The applicability of the TOE framework for investigating the critical determinants of the technology adoption in SMEs is well exemplified in the existing literature (Iacovou et al. 1995; Chwelos et al. 2001; Kuan and Chau 2001; Ramdani and Kawalek 2009). Iacovou et al. (1995), for example, applied the TOE framework for exploring the determinants of adopting electronic data exchange (EDI) systems in seven small firms, leading to the identification of the perceived benefit, organizational readiness, and external pressure as critical in adopting this technology. This model was tested and validated on a larger sample size of two hundred and eighty six Canadian SMEs (Chwelos et al. 2001). Kuan and Chau (2001) further confirmed the usefulness of the TOE framework in the study of EDI adoption in small firms by proposing a perception-based model incorporating six factors, resulted in the identification of perceived direct benefit, indirect benefits, financial cost, technical competence, industry pressure and government pressure as the critical determinants in adopting EDI in small firms. Ramdani and Kawalek (2009) adopted the TOE framework for predicting the potential enterprise systems adopters in British SMEs, leading to the conclusion that the factors influencing SMEs' adoption of enterprise systems are different from the critical factors in influencing SMEs' adoption of other IS innovations.

These studies show the applicability of the TOE framework for studying the technology adoption in SMEs, although different factors are included upon the investigation of the adoption of different technologies in various situations. E-Market is developed with IT and IS support (Guilherme and Aisbett 2003) based on the e-procurement need of an organization (Angeles 2000). The TOE framework suitable for studying the adoption of EDI, e-procurement, IT and IS in organizations is therefore applicable for the study of e-Market adoption.

RESEARCH MODEL AND HYPOTHESIS

Through a comprehensive review of related literature on the adoption of e-Market, this section presents a conceptual model for facilitating the investigation of the adoption of e-Market in Australian SMEs. Figure 1 presents this model consisting of four dimensions including technology, organization, environment and trust.

Technology

The technology dimension is related to the attributes of the innovations perceived by potential adopters (Rogers 2003). Among the 5 widely adopted attributes for affecting the adoption of technology in the technology dimension including perceived benefit, compatibility, complexity, observability and trialability (Kuan and Chau 2001; Ramdani et al. 2009), the perceived benefit is the only attribute consistently identified as critical for IT adoption in small organizations (Kuan and Chau 2001). Small organizations adopt technology when there is a perceived need for using the technology to overcome a perceived performance gap or exploit a business opportunity. The greater the perceived benefit, the more likely an organization will adopt the technology.

The perceived benefit is classified into the direct benefit and the indirect benefit (Joo and Kim 2004). The direct benefit is related to the reduction of operational costs and the increased intangible benefit such as the access to a larger number of customers and increased price transparency (Kuan and Chau 2001; Joo and Kim 2004). The indirect benefit is associated with the impact of adopting e-Market on the management of business processes and customer relationships. It also refers to improving the company's image, increasing operational efficiency, and improving trading-partner relationships (Daniel et al. 2004; Standing et al. 2010). The above argument leads to the following hypothesis:

H1. *The perceived direct benefits positively influence the adoption of e-Market.*

H2. *The perceived indirect benefits positively influence the adoption of e-Market.*

Organization

The organization dimension concerns about the characteristics of an organization on the adoption of technology (Tornatzky and Fleischer 1990). The size of an organization, the organizational readiness and the top management support are considered important in the adoption of e-Market. The size of an organization directly affects the adoption of technologies in the organization (Rogers 2003). Large organizations usually have greater ability to adopt innovations due to the availability of financial and technical resources. Bakos (1991) indicated

that the cost and expertise required to build or adopt an e-Market might favor large organizations. Even within the small business category, a relatively larger organization is in a better position to engage in e-Market. This then leads to the following hypothesis:

H3. *Organization size is positively related to the adoption of e-Market.*

The organization readiness consists of the financial readiness and the technological readiness. The financial readiness of an organization refers to the financial resources available for the e-Market installation cost and for the ongoing expense. The technological readiness is related to the level of sophistication of IT usage and IT management in an organization. The extent by which an organization utilizes IT such as electronic funds transfer, EDI and Internet has a positive impact on the system integration with e-Market (Barry and Milner 2002). Based on the argument above, the following hypothesis is proposed:

H4. *Organization readiness is positively related to the adoption of e-Market.*

Top management support is critical in SMEs for creating a supportive climate and providing adequate resources in adopting technologies. It ensures limited resources and technical expertise to be allocated for supporting the adoption of technology (Ramdani et al. 2009). It helps overcome the barriers and resistance to change in the organization. An SME that is likely to adopt e-Market will most often have the support of top management who have a positive attitude towards the adoption of technology and who is innovative and knowledgeable about IT. This discussion leads to the following hypothesis:

H5. *Top management support positively influences the adoption of e-Market.*

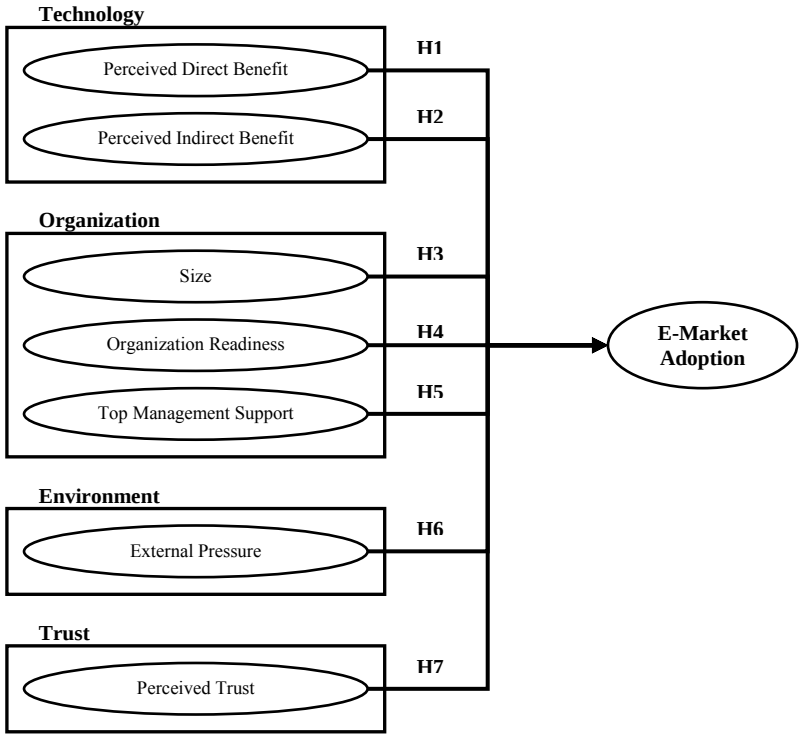

Figure 1: A conceptual model for the adoption of e-Market

Environment

The environment dimension concerns about the external pressure from competitors, trading partners and the government on the organization (Chwelos et al. 2001). The pressure from competitors often forces individual organizations to adopt technology for being competitive in a dynamic environment. In the adoption of e-Market, organizations are more prone to adopt e-Market as competitors become more e-Market capable (Stockdale and Standing 2004). The pressure from trading partners or government departments also has a great influence on the adoption of technology, especially SMEs in the sense that they are more likely to be economically dependent on their larger partners for survival. Thus, the following hypothesis is proposed:

H6. *External pressure is positively related to the adoption of e-Market.*

Trust

The trust dimension considers the degree of trust perceived by SMEs in the adoption of e-Market (Pavlou and Gefen 2004). It is included for extending the TOE framework in this study due to the nature of e-Market in which the main communication method for all participating parties is online. Both economists and sociologists agree that the perceived trust is a crucial enabling factor in the adoption of online technology (Pavlou and Gefen 2004). The perceived trust is relevant to the trustworthiness of the e-Market in handling transactions, securing systems and maintaining relationships as well as the trustworthy in the trading partner for conforming online transaction rules such as for buyers to pay on time, or for suppliers to provide valid product or service information. The more trustworthy SMEs have in e-Markets, the more likely they will adopt an e-Market for electronic business (Pavlou and Gefen 2004; Verhagen et al. 2006). The above argument leads to the following hypothesis:

H7. *Perceived Trust is positively related to the adoption of e-Market.*

RESEARCH METHOD

Data collection

Survey is a technique for studying the cause of a phenomenon as well as the attitudes and behaviours of individuals with empirical evidences (Creswell 2003). The use of survey is appropriate in this study upon which it is possible to test and validate the proposed model empirically while pinpointing the determinants for adopting e-Market in Australian SMEs.

The data collection process involved several steps. First, a sample of 948 SMEs targeted all 8 Australian industries was selected from a database rented from D&B Australia. Australian SMEs are defined as the organizations with less than 200 employees (ABS 2007). The name, email address and mail address of the top executives in SMEs were derived. An initial e-mail was sent out for inviting the top executives in those SMEs to participate in the survey. 126 of these e-mails were undeliverable. Approximately 2 weeks after the initial e-mail, mails were sent out as a follow-up. 71 were declined due to incorrect address or the inexistence of the business. A total of 279 responses were received in 3 months with 67% of these obtained within one month. 16 surveys were unusable, leaving 263 usable responses with a 37.2% response rate.

Constructs Operationalization

To ensure a set of valid measurement is used for analysis, the paradigm for validating measurement models proposed by Straub (1989) were followed. It includes the theoretical modelling of the constructs and statistical test and refinement of the measurement model. The measurement items on the basis of a comprehensive literature review were developed, followed by the pilot test and interviews of experts and top executives for ensuring the content validity (Churchill 1999; Creswell 2003). The constructs were then tested and refined using confirmatory factor analysis (CFA).

Two constructs are directly operationalized by the observed variables. The decision of adopting an e-Market is measured as a dichotomy, represented by 1 or 0 binary number. A SME is classified as an adopter if it has adopted an e-Market and a non-adopter if it has not. The size of SMEs is measured by the number of employees ranged from 1 to 200 based on the Australian national classification of interval (ABS 2007). Other variables are operationalized as multi-item constructs, either measured using a seven-point Likert-type scale ranging from strongly disagree (1) to strongly agree (7), or measured by multiple choices of the preference.

The initial survey instrument was pre-tested with five faculty members with expertise in e-Market, technology adoption and IT. The improved version was pilot-tested with the top management in SMEs for assessing the clarity, readability, understandability and for gaining an initial idea of time commitment. The response to the pilot-test survey was followed up with interviews lasting 30 to 45 minutes with each respondent for gaining a better insight into the comprehensiveness of coverage of the instrument in capturing the important concepts. Minor revision was conducted for rephrasing some statements in the survey. These pre and pilot tests suggest a fair degree of initial content validity to the survey instrument (Straub 1989).

Measurement Model Validation

To empirically assess the validity and reliability of the theoretical constructs and the measurement model proposed in Figure 1, SEM was adopted. SEM is a widely used method with a confirmatory approach for analysing multivariate data. The use of SEM in this study is due to its ability to include latent variables in representing unobserved concepts and its capability for simultaneously assessing the multiple correlations and covariance among variables in the model validity test (Hair et al. 2010).

A CFA analysis on the measurement model was conducted by using AMOS 8.0 based on the survey data. The processes involved 3 steps. The first step was the model specification, in which the adequate sample sizes of 263 and the multivariate normality distribution in the data set guarantee the use of the maximum likelihood method in the estimation. The second step was an iterative model modification process for developing a best set of items to represent a construct through refinement and retesting. The last step was to estimate the goodness of fit (GOF) parameters of the overall model to test the extent to which the data support the research model. The most commonly used parameters are the likelihood ration chi-square (χ^2), the ratio of χ^2 to degrees of freedom (χ^2/df), the root mean square error of approximation (RMSEA), and comparative fit index (CFI). Table 1 shows the results of the CFA analysis on the measurement model.

Table 1. The Measurement Model Validation Statistics

Construct	Item	FL	IR	$\chi 2/df$	p	CFI	RMSEA	α
Perceived direct benefit (PDB)	PDB3	0.92 ***	0.85	0.48	0.62	1.00	0.000	0.91
	PDB5	0.92 ***	0.85					
Perceived indirect benefit (PIB)	PIB3	0.75 ***	0.56	0.12	0.89	1.00	0.000	0.85
	PIB5	0.81 ***	0.66					
	PIB6	0.86 ***	0.74					
Organization readiness (OR)	OR2	0.98 ***	0.96	0.28	0.59	1.00	0.000	0.98
	OR4	0.98 ***	0.96					
Top management support (TMS)	TMS1	0.87 ***	0.75	1.66	0.20	1.00	0.050	0.86
	TMS2	0.87 ***	0.75					
External pressure (EP)	EP1	0.86 ***	0.74	0.00	1.00	1.00	0.000	0.85
	EP3	0.86 ***	0.74					
Perceived trust (PT)	PT1	0.87 ***	0.76	0.24	0.78	1.00	0.000	0.85
	PT2	0.90 ***	0.81					
	PT3	0.69 ***	0.48					
Full measurement model				1.24	0.10	0.99	0.034	
Recommended value		≥ 0.7	≥ 0.5	≤ 3.0	≥ 0.05	≥ 0.9	≤ 0.08	≥ 0.7

****p≤0.001, **p≤0.01, *p≤0.05.*

The convergent validity and the discriminant validity were tested in the iterative model modification process. Assessing the convergent validity includes three steps. The first step was to calculate the χ^2 values for each of the constructs. If any χ^2 rejects a factor at $p < 0.05$, modification indices were used to identify the common factors among items. The last step was to drop those items that do not fit into any factor from the subsequent analysis. The factor loading (FL) value was computed in examining the convergent validity. A rule of thumb is that the FL should be at least 0.50, and ideally 0.70 or higher with all FLs statistically significant. Following this rule, 11 items were dropped from 30 items in the original conceptual model. Other items with FLs ranged from 0.69 to 0.98 indicate a high convergent validity.

The discriminant validity of the construct was assessed by comparing the average variance extracted (AVE) for each construct with the squared correlation of this construct to any other constructs (Hair et al. 2010). The AVE should be greater than any of the squared correlation for that construct to show the discriminant validity. 5 items were dropped in the discriminant validity process, resulting in 14 items in 6 constructs for the final conceptual model. Table 2 shows the correlation matrix between the constructs. All 6 constructs demonstrate the high discriminant validity with AVE ranged from 0.59 to 0.82.

Table 2. An AVE and Squared Correlation Matrix

	PDB	PIB	OR	TMS	EP	PT
PDB	0.74					
PIB	0.53	0.74				
OR	0.04	0.10	0.59			
TMS	0.23	0.53	0.38	0.66		
EP	0.18	0.47	0.11	0.52	0.76	
PT	0.47	0.42	0.07	0.35	0.44	0.82

The reliability test of the constructs includes the assessment of the item reliability and the construct reliability (Hair et al. 2010). The item reliability (IR) indicates the amount of variance in an item due to underlying construct rather than error (Chau 1997). It was assessed using the squared multiple correlation value or the square of the strandardized FL. An item is considered to be reliable if IR is greater than 0.50 (Hair et al. 2010).

IR values for all the items ranging from 0.56 to 0.96 are higher than the threshold therefore deemed to be sufficient measuring the constructs.

The construct reliability measures the degree of consistency between multiple items of a construct. It is tested by calculating the Cronbach's alpha coefficient with an acceptable value of 0.70. All 6 constructs show the high Cronbach's alpha coefficients ranged above 0.85. The construct reliability is thus considered to be strong.

The GOF of the final measurement model was assessed after the validity and reliability tests. The insignificance of parameters χ^2 73.39 and χ^2/df 1.24 within the acceptable value χ^2/df 3.00 indicate that the final model is not significantly different from the survey data. The RMSEA value 0.034 less than the recommended value 0.08 and the CFI value 0.99 greater than the threshold 0.90 show a good match between the final measurement model and the survey data. The final measurement model consisting 14 items in 6 factors is therefore suitable to proceed for further hypothesis testing.

DATA ANALYSIS AND RESULTS

Logistic Regression

Logistic regression analysis is a technique for predicting the probability of event occurrence by fitting data to a logit-function logistic curve (Ramdani et al. 2009). This multivariate statistical technique is chosen to empirically test the research hypotheses because the dependent variable is dichotomous (Hair et al. 2010). By maximizing the likelihood of the adoption decision represented by binary number 0 or 1, the significance of each independent variable is estimated. Based on the validated model for adopting e-Market, the logistic regression model is defined as follows:

$$P\ (Adoption = 1) = \Lambda\ (\beta_0 + \beta_1 \cdot PDB + \beta_2 \cdot PIB + \beta_3 \cdot S + \beta_4 \cdot OR + \beta_5 \cdot TMS + \beta_6 \cdot EP + \beta_7 \cdot T + \varepsilon)$$

Where $\Lambda\ (\cdot)$ denotes the probability density function of the logistic distribution. β_1 to β_7 represent the estimated coefficient between the independent variable and dependent variable. ε is the measurement error in the parameter estimation process. Four statistical tests were conducted in this stage for providing reliable hypothesis testing, including (a) a χ^2 test for the change in -2 times the log of the likelihood (*-2LL*) value from the base model, (b) Hosmer and Lemeshow test of model fit and the explanation power, (c) classification ability test and (d) Wald statistic estimation. Table 3 shows the results of these four statistical tests.

The χ^2 test for the deduction of *-2LL* value was conducted for assessing whether the set of independent variables in the research model is significant in improving the model fit (Hair et al. 2010). A null base model is first created to act as the baseline for making the comparison between the improvements in model fit with the research model. The significant deduction of *-2LL* from 270.83 to 192.46 shown as Δ (*-2LL*) with $p \leq 0.001$ in Table 3 reflect a great improvement from the null base model to the research model. This demonstrates an adequate model fit.

Table 3. Statistical Results of Logistic Regression Model

<table>
<tr><td colspan="6">Estimates</td></tr>
<tr><td>Factor</td><td colspan="2">Coefficient (β)</td><td>Wald</td><td>p-value</td><td>Support for model</td></tr>
<tr><td>Perceived direct benefit</td><td colspan="2">0.22*</td><td>5.15</td><td>0.021</td><td>H1: Yes</td></tr>
<tr><td>Perceived indirect benefit</td><td colspan="2">0.01</td><td>1.61</td><td>0.194</td><td>H2: No</td></tr>
<tr><td>Size</td><td colspan="2">0.20</td><td>0.06</td><td>0.812</td><td>H3: No</td></tr>
<tr><td>Organization readiness</td><td colspan="2">0.04</td><td>2.05</td><td>0.156</td><td>H4: No</td></tr>
<tr><td>Top management support</td><td colspan="2">0.61***</td><td>15.16</td><td>0.000</td><td>H5: Yes</td></tr>
<tr><td>External pressure</td><td colspan="2">0.42*</td><td>6.01</td><td>0.014</td><td>H6: Yes</td></tr>
<tr><td>Perceived trust</td><td colspan="2">0.09**</td><td>9.32</td><td>0.002</td><td>H7: Yes</td></tr>
<tr><td colspan="6">Goodness-of-fit
Final (-2LL) = 192.46 Δ (-2LL) = 78.37***
Hosmer-Lemeshow χ^2 = 12.71 p = 0.13
Pseudo R^2 = 0.27 Cox and Snell R^2 = 0.26 Nagelkerke R^2 = 0.35</td></tr>
<tr><td rowspan="5">Classification Ability</td><td></td><td colspan="2">Predicted</td><td colspan="2" rowspan="2">% Correct</td></tr>
<tr><td></td><td>Non-adopter</td><td>Adopter</td></tr>
<tr><td>Observed</td><td colspan="3"></td></tr>
<tr><td>Non-adopter</td><td>150</td><td>15</td><td colspan="2">90.9</td></tr>
<tr><td>Adopter</td><td>47</td><td>51</td><td colspan="2">52.0</td></tr>
<tr><td>Overall</td><td colspan="2"></td><td colspan="2">76.4</td></tr>
</table>

****p≤0.001, **p≤0.01, *p≤0.05.*

The Hosmer-Lemeshow test is another χ^2 test for comparing the research model with the base model. The base model is used to classify the respondents into their respective groups correctly (Zhu et al. 2003; Hair et al. 2010). An insignificant Hosmer-Leshow χ^2 (χ^2 = 12.70, p = 0.13) implies that the research model is not much different from the base model. In addition to the χ^2 value, three R_2 measures including Pseudo R_2, Cox and Snell R_2 and Nagelkerke R_2 were calculated for measuring the explanatory power of the model based on the reduction in the *-2LL*. Nagelkerke R_2 of 0.35, for example, represents 35% of the change in the dependent variable due to the reduction of *-2LL* value performed in the previous step can be explained by the research model. The insignificant Hosmer-Leshow χ^2 and satisfactory R_2 suggest a good model fit with a satisfactory explanation capability.

The classification-ability test was used for assessing the predictive accuracy of the model in classifying the respondents into the correct group (Hair et al. 2010). In our study it examines the capability of the research model to correctly classify the adopter and non-adopter. Based on the observation-prediction section in Table 3, the rate of the correct predication by the logistic model and that by random guess was computed. The logistic model has an overall prediction accuracy of 76.4%. As there were 98 adopters and 165 non-adopters, the classification accuracy by random guess would be $(98/263)^2 + (165/263)^2 = 53.25\%$. Thus, the logistic model is claimed to have much higher classification-ability.

The Wald test was performed for measuring the level of significance of individual coefficients (Ramdani et al. 2009; Hair et al. 2010). Table 3 shows that the perceived direct benefit, top management support, external pressure and perceived trust emerged as the significant determinants of adopting e-Market, among which top management support is the critical determinant with strongest significant *p* value 0.000 and highest coefficient 0.61. Whereas perceived indirect benefit, size and organization readiness have less effect, even though the correlation of 0.20 between size and the adoption is higher than most of the other determinants. As a result, hypothesis 1, 5, 6 and 7 are supported.

An Alternative Model

Among the seven determinants for adopting e-Market, it is somewhat surprising to find out that perceived indirect benefit, size and organization readiness did not emerge as significant. Additional analysis using t-test was then conducted for examining if these three determinants do have little influence in differentiating the e-Market adopter and the non-adopter. The results in Table 4, however, show that the perceived indirect benefit (t = 4.626, p≤0.001) and the organization readiness (t = 3.554, p≤0.001) are significantly higher for the e-Market adopter than the non-adopters. This sheds a new light on the possibility of a more complex relationship between these two determinants and the adoption of e-Market.

Table 4. T-tests for Perceived Indirect Benefit, Size and Organization Readiness

	Mean		Difference in Mean	*t*-value	*p*-value
	Adopter	Non-adopter			
Perceived indirect benefit	4.90	4.17	0.73	4.626	0.000
Size	2.69	2.68	0.01	0.068	0.946
Organization Readiness	5.01	4.32	0.69	3.554	0.000

****p≤0.001, **p≤0.01, *p≤0.05.*

One possible reason for the insignificance of the perceived indirect benefit and the organization readiness may be related to multi-colinearity in the survey data. Multicolinearity is a statistical phenomenon where two or more variables in the regression model are highly correlated (Hair et al. 2010). A common diagnostic used for assessing the degree of multicolinearity is to examine whether the squared correlation among the variables approaches 0.80 or not. Table 2 shows that the highest correlation is 0.53 between external pressure and top management support, which is much lower than 0.80. This means that multicolinearity may not be the source for insignificance of these two variables. This shows that the influence of perceived indirect benefit and organization readiness to the adoption of e-Market were probably more complex than the direct links as proposed in Figure 1.

An alternative model was developed for further exploring the influence of the determinants on the adoption of e-Market by considering the correlation between the variables. Top management support and perceived trust serve as the mediators between perceived direct benefit, perceived indirect benefit and organization readiness and e-Market adoption, which are in turn influenced by external pressure. Figure 2 shows the alternative model. The GOF statistics were used for assessing the overall model fitness. The insignificance ($p > 0.05$) of parameters χ^2 63.26 and χ^2/df 0.99 suggest that the survey data fits the alternative model. The RMSEA value of 0.000 indicates an exact fit of the model with the data. The overall model fit is further exemplified by other GOF statistics such as CFI 1.00, GFI 0.96 and AGFI 0.94 which are greater than the threshold of 0.90 (Hair et al. 2010).

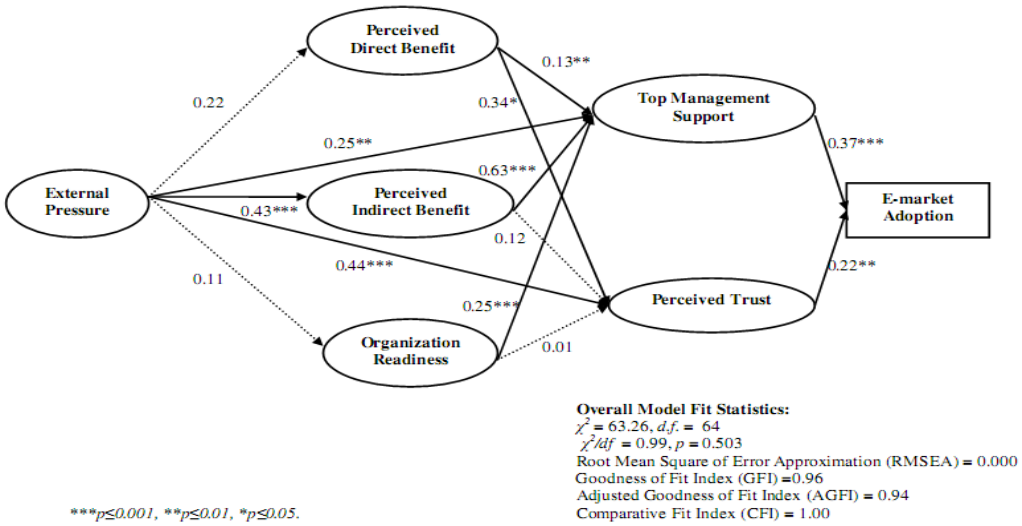

Figure 2. An Alternative Model for the Adoption of E-Market

Figure 2 provides the estimates of the structural coefficient for each path and their significance. The results indicate that top management support and perceived trust have a significant influence in the e-Market adoption. The perceived direct benefit has a significant influence on top management support and perceived trust. Both the perceived indirect benefit and the organization readiness have a significant positive influence on top management support but no influence on perceived trust. The external pressure has a significant positive influence on other determinants except on the perceived direct benefit and the organization readiness in adopting an e-Market.

Analysis and Discussion

The perceived direct benefit, top management support, external pressure and perceived trust are found to be significant for adopting e-Markets in Australian SMEs, among which top management support is the most critical. The perceived indirect benefit and the organization readiness show less direct influence in adopting e-Market. They demonstrate a positive influence on the adoption of e-Market by affecting the top management support. The size of SME emerges as an insignificant factor in adopting an e-Market.

The significant impact of the perceived direct benefit on the adoption of e-Market in Australian SMEs is in line with previous findings in the literature (Kuan and Chau 2001; Ramdani et al. 2009). The positive relationship between the perceived direct benefit and the adoption of e-Market suggest that e-Market is considered as a mean for gaining the immediate benefit such as increasing the operational efficiency, reaching larger number of customers, and saving cost. Compared with the insignificant direct influence from the perceived indirect benefit to the adoption of e-Market, this shows that SMEs is more concerned with the immediate short term benefit that e-Market can bring instead of the long term indirect benefit. This suggests the e-Market service providers place emphasis on broadcasting the direct benefits of e-Market to SMEs in promoting the adoption of e-Market for their electronic business.

The top management support is the most critical determinant on the adoption of e-Market. Such a finding is consistent with all the previous technology adoption studies (Pavlou and Gefen 2004; Pan and Jang 2008). In Australian SMEs, the primary decision maker is the owner or manager of the business. Their support guarantees the allocation of limited resources for the adoption of e-Market and creates a supportive climate in overcoming the barriers and resistance to the adoption. As a result, it is essential to communicate with the top management on the potential benefits of e-Market.

The external pressure has a significant influence on the adoption of e-Market. The importance of external pressure is consistent with the previous studies such as Kuan and Chau's (2001) study of EDI adoption in small businesses and Teo et al.'s (2003) study in e-procurement services. In this study, the positive relationship between external pressure and the adoption of e-Market reveals that Australian SMEs are more prone to adopt e-Market in order to maintain their competitive position and their relationship with trading partners. The adoption of e-Market by the influential trading partners or competitors would accelerate their decision in adopting e-Market. This suggests that e-Market service providers may consider give some free adoption offers and incentives to the influential parties for promoting the adoption of e-Market in SMEs. After realizing the benefit of e-Market, the influential parties are able to encourage SMEs to adopt e-Market. In addition, the assistance

from government through the development of policies and programs for improving the economic environment and the growth prospect for SMEs also facilitate the adoption of e-Market.

The perceived trust has a significant influence on the adoption of e-Market in Australian SMEs. This is consistent with existing research in the online technology adoption (Pavlou and Gefen 2004). In the adoption of e-Market, perceived trust involves the trustworthy of e-Market itself as well as of other trading parties. To increase the adoption of e-Market, e-Market service providers should consider not only to promote the trust of SMEs in e-Market by enhancing the online transaction security control, such as including escrow services to control the payment process and credit card guarantee services to safeguard the transaction, but also to boost the trustworthy between trading parties by providing accurate and reliable information to each other.

The perceived indirect benefit does not have a significant direct influence on the adoption of e-Market. One possible reason is the lack of awareness of those indirect benefits by SMEs. This finding echoes the result of Kuan and Chau (2001) in which the indirect benefit of new technology is not recognized as a competitive advantage in small businesses because small businesses are less informed. Another explanation for such a finding might be that even e-Market is able to provide indirect benefits to SMEs, it falls behind SMEs' expectations and therefore the perceived indirect benefit does not result in a positive adoption decision. If this is the case, not only is it important for e-Market service providers to provide information on positive indirect benefits to SMEs, but it is also important that such benefits match or even exceed the expectation of SMEs.

The significant effect that perceived indirect benefit has on top management support, however, confirms the rationality that top management would grant more commitment and support in the adoption of e-Market once the indirect benefit of adopting an e-Market, such as improving operational efficiency and enhancing the competitive advantage of an organization (Joo and Kim 2004; Stockdale and Standing 2004) is realized. The existence of a significant influence from the external pressure to the perceived indirect benefit as shown in Figure 2 suggests that the influence from larger trading partners or government greatly promotes the awareness of the indirect benefit of adopting e-Market in SMEs. The policies and initiatives for creating a sound environment for supporting Australian SMEs in adopting technology are beneficial.

The organization readiness is insignificant in directly affecting the decision of adopting e-Market. In this study, the organization readiness is determined by the financial readiness and technological readiness. The possible reason of the insignificant direct effect of the organization readiness to the e-Market adoption is due to the less financial and technical requirement involved in adopting e-Market compared to other high-end technologies. This is in line with the previous studies in online technology adoption. In an Internet adoption study in SMEs (Mehrtens et al. 2001), the financial readiness was not raised as an issue because most of the internet adoption were accomplished in house with no appreciable expenses incurred. In the online stock trading adoption research by Chan and Mills (2002), it is unable to conclude that the organization readiness is the determinant due to the insufficient support. However, the significant impact from the organization readiness to the top management support reveals that the sufficient organization readiness generates significant confidence on the top management that the organization has the ability to adopt the technology. Once such confidence has been generated, it leads to an actual decision of adopting e-Market, as indicated by the significant positive effect on the e-Market adoption.

The size of SMEs is always considered as critical in technology adoption in the literature (Teo and Pian 2003; Ramdani et al. 2009). Larger organizations have a greater propensity for adopting technology than smaller ones due to the availability of resources and technical expertise. This study, however, shows that it is not the case in adopting e-Market in Australian SMEs. This finding is consistent with the finding of Mehrtens et al. (2001). The lower adoption cost and the maintenance need decrease the importance of size to the adoption of technology. This is true in the adoption of e-Market as the cost and the technical requirement of adopting e-Market are very low. With the growing popularity of affordable e-Market relevant technologies, most SMEs are affordable to adopting e-Market. Furthermore, the high level of Internet penetration in Australian SMEs also reduces the barrier to the adoption of e-Market (Stockdale and Standing 2004).

CONCLUSION

This study investigated the critical determinants of adopting e-Market in Australian SMEs. It showed that the determinants of adopting e-Market by Australian SMEs in the order of importance are top management support, perceived trust, external pressure and perceived direct benefit. Surprisingly the perceived indirect benefit, size and organization readiness, emerged as critical factors for the adoption of technology in the existing literature, did not show a significant impact on the adoption of e-Market in Australian SMEs. A *t*-test analysis for comparing the influence of these three insignificant factors in differentiating the e-Market adopters and the non-adopters, however, revealed that the perceived indirect benefit and the organization readiness are more favorable by the e-Market adopter, leading to the chance to explore a more comprehensive model in understanding the underlying relationships among the determinants. The result from the alternative model proposed showed that

both the perceived indirect benefit and the organization readiness affect the adoption of e-Markets by influencing the top management support. This study supports the previous research on the finding of the critical role of top management champion for the adoption of e-Market in Australian SMEs.

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APPENDIX 1 E-MARKET ADOPTION CONSTRUCTS, ITEMS AND ORIGINS

Constructs	Items	Source of items
Dependent Variable		
Adoption	Dichotomy, 1 = e-market adopter, 0 = e-market non-adopter	
Independent Variable		
Perceived direct benefit	PDB1 Expand customer base	Tan and Nah (2003), Joo and Kim (2004)
	PDB2 Reduce product cost	
	PDB3 Reduce information dissemination cost	
	PDB4 Increase price transparency	
	PDB5 Reduce operation cost	
Perceived indirect benefit	PIB1 Improve organization image	Kuan and Chau (2001), Joo and Kim (2004)
	PIB2 Improve the competitive advantage	
	PIB3 Improve customer service	
	PIB4 Improve relationship with trading partners	
	PIB5 Increase operational efficiency	
Size	Number of staff	ABS (2010)
Organization readiness	OR1 Sufficient financial resource to adopt e-market	Kuan and Chau (2001), Teo et al. (2009)
	OR2 Sufficient financial resource to maintain e-market	
	OR3 Sufficient technological resource to adopt e-market	
	OR4 Sufficient technological resource to maintain e-market	
Top management support	TMS1 Top management aware of the benefits	Ramdani et al. (2009)
	TMS2 Top management highly interested	
	TMS3 Top management allocates adequate resources	
External pressure	EP1 Recommended by important business partners	Chwelos et al. (2001), Kuan and Chau (2001), Joo and Kim (2004)
	EP2 Recommended by majority of business partners	
	EP3 Adopted by the majority of competitors	
	EP4 Adopted by the majority of competitors	
	EP5 Recommended by the government	
Perceived trust	PT1 E-market can be trusted at all times	Pavlou and Gefen (2004), Verhagen et al. (2006)
	PT2 E-market guarantees transaction security	
	PT3 Trading partners are in general reliable	
	PT4 Trading partners are in general trustworthy	

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