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A Partial Least Squares method to determine factors influence Small Medium Enterprises to adopt e-Commerce

Seng Chee Lim, Ahmad Suhaimi Baharudin and Rong Quan Low

Universiti Sains Malaysia, School of Computer Sciences, 11800 USM Penang, Malaysia

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ABSTRACT

There are many literature reviews claimed that e-Commerce bring benefits to Small Medium sized Enterprises (SMEs), unfortunately there is a little information about technology barriers. Malaysia is one of the developing countries enjoy the country economic growth. In developing countries, SMEs do not enjoy benefits from e-Commerce technology. According to ACCCIM, the e-Commerce adoption is low, which is 28%. In this propose framework, there are 5 predictor variables used to investigate the potential factors influence e-Commerce adoption. SmartPLS ver2.0 M3 statistical software used to process the data. Among these variable, 4 variables are significant, the R2 value is 0.578 for the model, which is 57.8% of variance in e-Commerce adoption can be explain with Management support ($\beta=0.381$, t-value=4.136), Organization Readiness ($\beta=0.162$, t-value=1.654), competitor pressure is ($\beta=0.164$, t-value=1.905) and Government Support($\beta=0.250$, t-value=2.933). Based on the statistical result, it shows the parsimony model has good predictive power and useful in explain factors that influence SMEs to adopt e-Commerce.

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INTRODUCTION

Gordon Earle Moore (one of the founder of Intel Corporation) had postulated a statement, the number of “a transistor inside a given chip can be doubled bi-annually”(Moore,1988), lately it known as Moore’s law. The impacts of Moore’s law had revolute the computer hardware industries and software industries. Internet and E-Commerce are one of the prominent examples from the computer revolution history. Combination of these two innovative applications used to help organization to reduce word loads hence, it improve the organization’s effectiveness. E-Commerce is connects to the Internet not only used for communication but also to helps Small Medium Enterprises to extend their current market to borderless market. E-Commerce had changed the traditional way to do business for example, with using a computer generates an electronic invoice and send to respective customer via e-mail, which just take less than 10 minutes to accomplish the task, compared to conventional way by snail mail which requires 2-3 days to reach to customer. From organization point of view, e-commerce helps to expend the marketplace borderless, beside that it also minimal capital outlay, it enables company to reach customers easily, get the best suppliers, and more potential business partners worldwide.(Turban, *et al.*,2000) On the other hand, from consumer’s perspective view, it enhance consumer’s purchase power, electronic commerce provides customers with more choices and product information, so that they have the right to select products from potential vendors (Turban, *et al.*,2000). Although e-Commerce brings many benefits, but in developing country for instance Malaysia, people failure to obtains the benefits from Internet Communication Technologies(Kshetri,2007). Consoli(2012), small medium enterprises unable to get the benefits compared to large organization, this is because small medium enterprises have limited resources such as financial, human (IT talents) etc. There are two research questions used to achieve research objective, RQ1: what is the level of e-Commerce adoption among small medium enterprises (SMEs) in Malaysia? ; RQ2: which the factors have impacts to e-Commerce adoption.

Background Information:

Small Medium Enterprises (SMEs) is corner stone for countries economic. In Malaysia, the Small Medium Enterprises constitute the majority of the business establishments in Malaysia at 97.3%(Zainul,2013) and they contribute about 32% of Gross Domestic Product (GDP) and 59% of total employment.(Teng,2012). In

Corresponding Author: Seng Chee Lim, Universiti Sains Malaysia, School of Computer Sciences, 11800 USM Penang, Malaysia

Malaysia, Small Medium Enterprises are categorized into 2 categories based on two criteria: (1) number of employees and (2) annual sales turnover. Table 1 shows each categories and respective information.

Table 1: SME Categories (SMECrop,2014).

Category	Small	Medium
Manufacturing	Sales turnover from RM300,000 to less than RM15 million OR full-time employees from 5 to less than 75	Sales turnover from RM15 million to not exceeding RM50 million OR full-time employees from 75 to not exceeding 200
Services & Other Sectors	Sales turnover from RM300,000 to less than RM3 million OR full-time employees from 5 to less than 30	Sales turnover from RM3 million to not exceeding RM20 million OR full-time employees from 30 to not exceeding 75

Research Problem / Statement Of Problem:

The Internet had linked the world together, entrepreneur had foreseen the business opportunities from the Internet, and hence Internet changed the business value chain. In year 1997, Malaysia's government realize the importance of Internet and introduced a project namely Multimedia Super Corridor(MSC) to public, which aim to be world first class technologies companies and grooming local Internet communication technologies (ICT) companies(Msc,2012). At the same moment, the Malaysia's government allocated some financial budget, RM 76 billion (US\$1 = RM3.54) into this ICT based infrastructure project(Nair,2010). In the 9th Malaysian Plan(2006 - 2010), the government allocated RM12.9 billion to pace Malaysian e-Commerce master plan(Kamaruzaman and Handrich Yasmin,2010). After more than a decade, the efforts to promote e-Commerce, the results are not expected, e-Commerce is still not widely accepted by small medium enterprises(Kamaruzaman and Handrich Yasmin,2010). The local press reported on 18 April 2012, A Malaysia External Trade Development Corporate (MATRADE) officer commented the e-Commerce adoption still low(TheStar,2012) Alam, *et al.*(2011) had conducted a research to investigate e-Commerce adoption among 200 Small Medium Enterprises in Malaysia. Based on their finding, relative advantages, compatibility, organization readiness, manager's characteristic and security have significant impacts to e-Commerce adoption. There also some limitation of his research, where the research is conducted at Klang Valley, which might affect the generalizability of the studies.Hussin and Noor(2005) get the information from SMI Association of Malaysia that stated ICT implementation among SMEs at basic level. Majorities of SMEs use personal computer (PC) to complete simple operation, such as word processing, financial data, accounting, generate invoice, delivery orders. In this study are focus on major technical characteristic such as relative advantages, compatibility, complexity, trialability and observability, and two other variables such as organization readiness, In other studies, such as Mukti(2000) listed list of technical barriers factors, Khatibi, *et al.*(2003) listed benefits and barriers factors to adoption, which these result might cause the result are prone to technical based, other non technical factors are neglects. In any organization, decision maker like business owners, chief executive officer (CEO), top management always encounter a dilemma of decision making either adopt or reject an innovation technologies into an organizational after evaluating the feasibility of an organization. There are various potential factors influence the decision of adoption of e-Commerce, knowing about technological, internal and external of organization and uncertainty environmental issue that will affect to the decision makers to understand the current business development to know their current market position hence it helps organization to get better decision.

Literature reviews:

Theoretical framework:

There are two main stream of adoption theoretical framework which is individual level and organizational level. Technology Acceptance Model (TAM) (Davis,1989), Diffusion of Innovation (DOI) (Rogers,1983) and Unified theory of Acceptance and use of Technology (UTAUT) (Venkatesh,2013)are favor framework among individual level. Although these theories are popular but it cannot be applied into organization level. In organization, the decision making process usually involved some of stakeholder within the organization members. As a result, we adopt Technological-Organizational-Environmental, which provide more holistic view to understand the organization decision to adopt innovation technologies. Tornatzky and Fleischer(1990) had introduced a framework named Technological-Organizational-Environmental (T.O.E) to investigate information system studies. In this framework, it contains three important pillars, i) Technological context:- "describes both the internal and external technologies relevant to the firm. This includes current practices and equipment internal to the firm, as well as the set of available technologies external to the firm." ; ii) Organizational context:- "refers to descriptive measure about the organization such as scope, size and managerial structure.";iii) Environment factors:- "management support, organizational readiness, government support, and pressures from partners, customers and competition."(Tornatzky and Fleischer,1990)

Dependent Variable – Adoption:

Diffusion and adoption are one of the favor topics of information system research, which is used to investigate about new innovation, acceptance and perception by public. In this research, we followed Tornatzky

and Fleischer(1990)'s TOE adoption definition, "acceptance of innovations depends on organizational, environmental, and technological factors."

Perceived Barriers:

In developing countries, Perceived Barriers is favor factors studied by researchers. Perceived Barrier is negative action toward on technology adoption. Martins and Oliveira(2008) mentioned that when the technologies are getting advance and the process become more complex, the perceived obstacle is relevant, besides that, it caused costly to implement innovative technologies. MacGregor and Vrazalic(2005) mentioned there are many literature reviews show e-Commerce brings benefits to large organization, but not small medium sized organization. Kshetri(2007) provide some barriers issues on developing countries such as: low adoption among business is due to underdeveloped financial system, unavailability of ICT & other support infrastructures, from human factor point of view, people prefer face to face communication instead of by using e-mail etc. Khan, *et al.*(2010) separated technical barriers into two groups: external barriers such as the lack of understanding, technology standards and e-competence ; internal barriers such as benefits identification, global trading financial resources, supply chain and e-environment understandings.

H1: Perceived Barriers has negative impacts to e-Commerce adoption.

Organization Readiness:

Small medium enterprises always encounter limited resources, due to scarcity of resources, decision maker has to aware about resources, which might affect to organization's performance. Iacovou, *et al.*(1995) is first person who introduce this term, and defined it as the availability of the needed organizational resources for adoption. Organization readiness has two components: (1) financial and (2) technological resource in the organization. "Financial readiness refers to financial resources available for IT to pay for installation costs, implementation of any subsequent enhancements, and ongoing expenses during usage (such as communication charges, usage fees, etc.)" (Pham, *et al.*,2010) "Technological readiness is concerned with the level of sophistication of IT usage and IT management in an organization." (Pham, *et al.*,2010).

H2: Organization Readiness has positive impact to e-Commerce adoption.

Management Support:

Positive and favorable managements' attitude has some influence power to the decision to adopt. In any organization has their own change agent(Ifinedo,2011), usually is manager, which will influence the organization future development. If manager is aware of the importance of technology, they will influence other members to use it. Tarafdar and Vaidya(2006) mentioned "organizational leader were favorable towards the introduction of E-Commerce technologies. However they wary of making fundamental technology driven changes in their products and processes based on new and untested technology." The decision to adopt on new technology will depend on the consensus decision by top management.

H3: Top Management has positive impact to e-Commerce adoption.

External Pressure – Competitor Pressure And Government Support:

In the competitive market environment, organization maybe pressure by uncertainty market environment, customers, suppliers, trading partner, and government which influence their decision to adopt an innovation technologies into organization.(Ifinedo,2011) Government plays very important roles in respective countries. In developing countries, governments perform as catalyst to pace the speed of innovative technologies adoption. Conversely, in developed countries, the government play as different roles, they enact laws to encourage small business to implement it, for instance in United State, an executive order was issued in response to paper reduce acts, which require federal agencies to convert to electronic commerce by January 1997. (Kuan and Chau,2001).In the perfect competitive market, it is difficult to lead the market and enjoy the benefits, if the pricing of the product is either increase or reduce. In order to differentiate between the competitor, organization had make a change to their practice by adopt innovative technologies. Wang and Ahmed(2009) further explain "when competitor in the industry take the lead and enjoy advantages brought by the new technology, a firm has to consider whether or not to follow its competitor".

H4: Government Support has positive impact to e-Commerce adoption.

H5: Competitor Pressure has positive impact to e-Commerce adoption.

Research methodology:

Data collection:

The target audiences' information are retrieved from one of the government agencies' website named SMEInfo . The total of number of registered members inside the database is 17,165. There are 6,003 registered members inside manufacturing category (SMEInfo,2012). In this research, the unit of analysis is focus on manufacture sector. This research use simple random sampling technique to choose sample from the population.

There are some rules of thumb to choose sample size, for instance Kerjcie and Morgan(1970) produce a sample table based on number of population. On the other hand, Joseph F. Hair, *et al.*(2014) also proposed a rule of thumb of 10 cases per predictor, whereby the overall sample size is 10 times the largest of two possibilities: (1) the block with the largest number of indicators or (2) the dependent variable with the largest number of independent variables impacting it. This research followed Joseph F. Hair, *et al.*(2014)'s rule of thumb, one of the reason, Kerjcie and Morgan(1970) 's practice is outdated, this technique is about 40 years left behind. Based on Chin Joseph F. Hair, *et al.*(2014)'s thumb rule I, there are 5 predictor variables used to investigate the relationship between the dependent variable, therefore the minimum requirement for the sample size is 50 dataset. Based on the thumb rule II, there are 5 arrows point to the dependent variable. Therefore, the minimum sample size is 50. As conclusion, this research fulfils both of the thumb rules proposed by Joseph F. Hair, *et al.*(2014).

All of the questionnaires were adapted from previous literature reviews such as Alam, *et al.*(2004), Ainin and Noorismawati(2003), Ifinedo(2011) and Sutanonpaiboon and Pearson(2006)

The data collection duration is takes 120 days. There are 1200 survey questionnaires were used to collect data from respective respondents. After the period, 134 sets data are returned. The audience to answer for the survey is someone has authority power to make decision for organization. In this research, there are some threshold criteria, (i) potential adopter and non-adopter and (ii) others than manufacture sector; are excluded. After applied above listed filter criteria, a total of 100 sets of dataset are valid and used for analysis, which is 8.3 % respond rates.

Level Of E-Commerce Development

Rao, *et al.*(2003) had categories the e-Commerce development stages into four groups: web presence, portal, transactive and enterprise. When the development is moving to the next stages, the level of technical complexity is getting increase, the cost of investment of respective application also increase, and toward automated process. Table 2 shows respective information of SMEs current practice, application and level of e-Commerce developments.

Table 2: level of e-Commerce development.

(I) Web Presence Respondent (n/100)	E-Mail 96	Website 44	FAQ 17	Other 3
(II) Portal Respondent (n/100)	Instance Messenger (IM) 17	Online Form 15	Forum 5	GuestBook / Feedback 19
(III) Transactive Respondent (n/100)	Catalogue 24	Payment Gateway 20	Online bank 32	E.F.T. 20
(IV) Enterprise Respondent (n/100)	E.D.I 14	Logistic 15	Procurement 17	

Measures And Assessment Of Goodness Of Measures:

Structural equation modeling has emerged as integral tools in both managerial and academic research (Joseph F. Hair, *et al.*,1992). Structure equation modeling is a multivariate technique combine aspect of multiple regression (examining dependence relationship) and factor analysis (representing unmeasured concepts factors with multiple variables) to estimate a series of interrelated dependence relationships. Besides that, PLS techniques is getting popular in information system research (Henseler, *et al.*,2009, Kwong and Wong,2013), besides that this technique also can applied into other social sciences research. The research objective is used to explore and finding the phenomena and factor to influence e-commerce adoption, therefore, PLS-SEM analysis technique is appropriate for the research. In this research, we applied SmartPLS2.0 M3 to perform data analysis, processing and data Interpretation(Ringle, *et al.*,2014). Convergent validity:- “signifies that a set of indicators represents one and the same underlying construct, which can be demonstrated through their unidimensionality.” (Henseler, *et al.*,2009) Discriminant validity:- “is established when, based on theory, two variable are predicted to be uncorrelated, and the score obtained by measuring them are indeed empirically found to be so”. (Sekaran and Bougie,2009) used to examine the measurement models.

Convergent Validity:

In convergent validity test, there are 3 items used to measure the construct model: Main Loading, Composite Reliability (CR) and Average Variance Extracted (AVE). Joseph F. Hair, *et al.*(1992) provide benchmark value to access the criteria for main loading value, it must be at least is ≥ 0.5 and greater, other than that, it will be removed from particular construct(Ifinedo,2012). A sub item from Barriers construct namely PBar10 was removed to increase the AVE value of the construct. The threshold value for composite reliability is ≥ 0.7 , greater CR value are preferable which indicate the internal consistency of data(Ifinedo,2012, Joseph F. Hair, *et al.*,1992). The main loadings value for all items aboved the recommended value of 0.5, the AVE value ranges from 0.511 – 0.887, the composite reliability value ranges 0.886 – 0.969. Based on the suggested

guideline provided by Joseph F. Hair, *et al.*(1992), Ifinedo(2012) the AVE's value, main loading's value and Composite Reliability's, value had fulfilled all access criteria and benchmark value. The result as following table:

Table 3: Measurement Model.

Construct	Item	Main Loading	AVE	CR
Perceived Barriers	PBar1	0.563	0.511	0.903
	PBar2	0.763		
	PBar3	0.778		
	PBar4	0.671		
	PBar5	0.733		
	PBar6	0.710		
	PBar7	0.566		
	PBar8	0.797		
	PBar9	0.808		
Top Management	TM1	0.902	0.838	0.954
	TM2	0.934		
	TM3	0.906		
	TM4	0.920		
Organization Readiness	OR1	0.928	0.887	0.969
	OR2	0.945		
	OR3	0.952		
	OR4	0.942		
Competitor Pressure	CP1	0.776	0.662	0.886
	CP2	0.758		
	CP3	0.900		
	CP4	0.814		
Government Support	GS1	0.821	0.707	0.906
	GS2	0.916		
	GS3	0.800		
	GS4	0.821		
Adoption	ADT1	0.784	0.651	0.937
	ADT2	0.782		
	ADT3	0.703		
	ADT4	0.850		
	ADT5	0.815		
	ADT6	0.827		
	ADT7	0.836		
	ADT8	0.846		

Discriminant Validity:

Table 4 display the discriminant validity result. There are two conditional need to follow: (i) the minimal value of AVE value ≥ 0.50 ; (b) the square root of the AVEs must greater than all items' value inside cross-correlations either row-wise or column wise. The square root of AVE ranges from 0.715 – 0.942, which surpass the benchmark value. This shows that the measurement model shows the adequate of Convergent validity and Discriminat validity.

Table 4: Discriminant Validity Result.

	Adoption	Barrier	Competitor	Government	Management	Organization
Adoption	0.807					
Barrier	-0.176	0.715				
Competitor	0.489	0.036	0.814			
Government	0.555	-0.037	0.477	0.841		
Management	0.654	-0.082	0.419	0.408	0.915	
Organization	0.554	-0.176	0.310	0.411	0.572	0.942

Bold Text represent square root of AVE value

Assessment To The Model:

Table 5 shows the result path coefficient Beta value (β) (the strength of relationship between independent value and dependent value), t-value (path analysis) and hypothesis statement decision for e-Commerce adoption model. In this research there are 5 predictor variables: Perceived Barriers, Top Management Support, Organization Readiness, Government Support and Competitor Pressure used to assess the models, the R^2 value is 0.578, which is 57.8% of variance in e-Commerce adoption can be explain with Top Management Support obtained β value= 0.381, and t-value=4.136; Organization Readiness (β =0.162; t-value=1.65); Competitor Pressure obtained β value =0.164, and t-value= 1.905) and Government Support(β =0.250; t-value=2.933). Based

on the calculated result, it shows the parsimony propose model has a high predict power and useful in explaining the adoption phenomena among small medium enterprises in Malaysia.

Table 5: Path analysis, Beta Value and t-test Value.

Path Analysis	Beta	Std Error	t-value	Decision
Barrier -> Adoption (H1)	-0.112	0.110	1.018	Not Support
Competitor -> Adoption (H5)	0.164	0.086	1.905	Support
Government -> Adoption (H4)	0.250	0.085	2.933	Support
Management -> Adoption (H3)	0.381	0.092	4.136	Support
Organization -> Adoption (H2)	0.162	0.098	1.654	Support

Discussion:

In the research, there are 5 predictor variables used TOE framework to investigate and evaluate factors influence to e-Commerce adoption among Small Medium Enterprises in Malaysia. Among the testing hypotheses the variable named Perceived Barriers from technological context is not supported. Other predictor variables: competitor pressure, government support, top management, and organization readiness are supported. Among these four variables, top management achieved highest t- test value, which shows that top management are gazelle in organization, also as changed agent which will revolute organization practice, as mentioned by (Ifinedo,2011) where is also proven previous literature review Ifinedo(2011), Ifinedo(2012) and Tarafdar and Vaidya(2006)

Organization Readiness also has some influence power on adoption. Unlike large organization, small and medium sized Enterprises encounter scared resource to adoption. Therefore having sufficient financial and technical resources are important to organization. Ramdani, *et al.*(2009) mentioned that without sufficient resource, it is difficult to adopt any innovation. This result is proven previous literature review by Iacovou, *et al.*(1995)

Ifinedo(2011) mentioned pressure from external environment can increase the rates of adoption. Competitor Pressure is found significant in this research. When competition is happen between same industries, the decision to adopt innovation is relevant. In order to gain larger market shares and better market position in the industries, the organization will adopt technologies to differentiate their products and services from their competitor.

Last but not least, government support also found significant. In developing countries, the small and medium enterprises' decision to adopt innovation are relying on the government support, and country development plan. Alam and Noor Mohd Kamal(2009) provide some evidence, in some countries such as United States, Singapore, and Malaysia, the government put more efforts to setup up the Network Infrastructures for example Malaysia(Kamaruzaman and Handrich Yasmin,2010). Besides that, the government also introduced cyber law: Personal Data Acts 2010, to protect sensitive data of person with respect to online transactions etc., so that the government can digitize their country's economic.

In this research, Perceived Barriers is not significant, which is totally different from previous literatures reviews. One of the potential reasoned is depend on which level of their e-Commerce development as mentioned by Rao, *et al.*(2003). From the table 2, we can observed that, most of SMEs current stages still fall on web presence and transactive stage, which they are emphasize information exchange. E-mail and Online Banking, these two applications are common practice in Malaysia, and it is free of charge, which also available as long as user connected to the Internet, therefore SMEs will not afraid of financial burden because it is provided and support by respective service provider. As a result, perceived barriers is not significant.

Limitation:

There also some limitation for this research, first, the number of respondent considered small (n=100), will might affect the generalization to the entire population. The research finding is focus on manufacture sector, where the model might not work well on other categories. The result R squared can be improved with applied SPSS with removed the outliers data, hence it improve the accuracy of research. Lastly, the result are depend on the honesty of respondents, in certain context, individual would agree more on social desirable and disagree on more on undesirable answer rather than truly express this feeling and opnions, as a consequence it may not fully reflected the actual scenarios.

Practical & Theoretical Contribution:

The research study offers theoretical and practical implications. It provides support the suitability and relevance of the TOE framework as a useful model to discuss innovative adoption. The study offer empirical support to findings and observation regarding the factors that influence the adoption/ acceptance of e-Commerce in SMEs. The predictor variables: Organization Readiness, Top Management, Competitor Pressure, Government Support as important factors to pace the speed of adoption in country. Besides that, it also provide some practitioner contribution to government agencies like Malaysian Communication And Multimedia

Commission(MCMC), Multimedia Development Corporation (MDeC), Small and Medium Industries Development Corporation(SMIDEC), and other non government organization to have better awareness of the benefits of electronic commerce to pace the speed of adoption rates in the country.

Conclusion:

The purpose of the study is to determine factors influence small and medium enterprise to adopt e-Commerce. The study also extends our understanding Internet as medium for commercial use in manufacture sectors. It helps to indentifies rationales for adoption and reject the innovation by SMEs. From Managerial point of view, it helps top managements gather more information, and evaluate the feasibility of the project and make finale decision to the organization. This finding result may be applicable served as a initial benchmark score value for adoption and diffusion research topic for other developing countries.

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