

Understanding the Determinants of e-Commerce Adoption: Evidence from Manufacture Sector in West Malaysia

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Abstract

E-Commerce plays important roles in developed countries and developing countries. However, there are some literature reviews claimed that Small Medium Enterprises in developing countries do not obtained any benefits from e-Commerce technologies. In this adoption research, there are six variables used to explore the relationship with using technological organizational environmental framework. Partial least square techniques are applied into this study. There are total of 200 datasets used SmartPLS v2.0M3 to perform data analysis. Based on the model, it shows that three variables are significant which are top Management, competitor pressure and government. The empirical result bring benefits to the government agencies and non government organization to formulate the IT policies and IT implementation into their organization. Besides that, the empirical result can served as benchmark data for e-Commerce adoption & diffusion researcher in developed and developing countries. From the statistic result, it proved that this parsimony model has a strong prediction toward e-Commerce adoption in Malaysia. The research can be enhanced with differentiate between adopter and non adopter to understand the e-Commerce adoption phenomena in respective context.

Keywords: Adoption, e-Commerce, Structural Equation Model, Small Medium Enterprises

1. Introduction

The emergence of Internet technologies had changed the way of communication and also the nature of business. E-Commerce is one of the prominent examples. Combination of various types of value added networks bring business opportunity to small medium sized enterprises. The successful stories like online largest book store - Amazon, Rackspace web hosting¹ had draw Small Medium Sized Companies' eyesight to this digital medium. In year 1997, the Malaysia government realize the importance of e-Commerce, the government had allocated some financial resource on project Multimedia Super corridor (MSC). The main objective the project is bring world first class technologies compa-

nies into the country and also to groom up local Internet Communication Technologies (ICT) companies². After two decades, the e-Commerce adoption is low, based on the Association Chinese Chamber of Commerce and Industries Malaysia (ACCCIM), Only 28% of Small Medium Enterprises adopt e-Commerce, whereas 24% of Small Medium Enterprises indicated they are planning to adopt e-Commerce.

In the existing adoption & diffusion researches that claimed that e-Commerce brings benefits, conversely, People in developing countries do not obtained benefits from innovative technologies³. This research would like to identify the enabler and impede factors that influence to e-Commerce adoption. There are two research questions arise in here (1) what is the current level of e-Commerce

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adoption rates among Small Medium Enterprises (SMEs) in Malaysia?; (2) What is the enabler and impede factors influence to e-Commerce adoption?

2. Background Information

Small Medium Enterprises are economic backbone for most of the countries. Small Medium Enterprises (SMEs) is corner stone for countries economic and constitute 97% of the business establishments in Malaysia⁴, it contribute about 32% of Gross Domestic Product (GDP) and 65% of total employment. There are two major streams: Manufacture and Services. There are two criteria to identify the size of respective industries: (a) number of employees and (b) the annual sales turnover.

There are many definitions about e-Commerce^{5,6}. Kalakota and Whinston view this definitions from four different perspective views⁷: from technology's perspective view, e-Commerce is the delivery of information, product/services, or payments over telephone lines, computer networks, or any other electronic means; from management's perspective view, e-Commerce is the application of technology toward the automation of business transactions and work flow. From economics' perspective view, e-Commerce is a tool that addresses the desire of firms, consumers, and management to cut service cost while improving the quality of goods and increasing the speed of delivery; and from marketing's perspective view, e-Commerce is provides the capability of buying and selling products and information on the Internet and other online services.

Therefore, in this research, there are two characteristics used to describe e-Commerce, first, types of computer application and technologies (ie: email, e-catalog etc.) support the business activities that enable the business process.

3. Research Problem

In year 2012, the Association of Chinese Chamber Commerce and Industries Malaysia (ACCCIM) had conducted a survey, based on the reported the e-Commerce adoption rates is only 28% while 24% of respondents claimed that they are planned to have it later on⁸. Besides that, the MATRADE officer provides additional information from Google Malaysia indicated that 20% of 700,000 SMEs own website, whereas the remained 80% do not have it.

ACCCIM had listed down major impede factors to e-Commerce implementation in Malaysia, among these barriers, poor internet bandwidth ranked at first position (30%), second is cost implementation constitute (25%), followed by technical issues such as security on e-payment (20%), limited network coverage and lack of skilled talent (18%)⁸.

Khatibi and thyagarajan had conducted a study on factor affecting the e-Commerce adoption. Based on their study, attitude toward the utility of e-Commerce, perceived benefits, and perceived barriers toward adoption are measured. The elements used to measure Perceived Benefits and Perceived barriers are listed from respective research⁹.

According to Zhai and Liu, adoption research has four streams, the first stream is focused on benefits such as economic incentives such as reducing cost like search cost, and marketing cost. The second stream focused on organization characteristic such as internal resource, readiness, skilled workers etc. The third stream emphasizing on institutional point, like pressure from government, trading partner, suppliers, and competitors. The forth stream focused on barriers factors to adoption¹⁰.

In the decision making process, decision makers usually are business founder, business owner, business partner or top management. They performed as change agent within the organization, they will encounter dilemma to make decision making either adopt or reject innovation. The evaluation process might take long period to rate the organization's feasibility and capability. There are many unknown factors will lead to final decision, such as knowing the benefits factors or barriers factors from technological, internal and external of organization, institutional factors and environmental issue such as economic, political issue, entrepreneur skills that will enable decision makers to understand the current business development and make a choice to their organization.

4. Literature Reviews

In adoption research, there are several theories used to investigate the relationship between the variables and technology adoption. Among these theories, Tornatzky & Fleisher's framework is popular and widely accepted by researchers¹¹. The dependent variable of TOE framework, can used to surrogate as adoption, acceptance, receptivity, business performance, business value, or combination of related variable¹².

Unlike other popular framework, TOE framework is suitable for organization level unlike theory reasoned action which only focus only single person. TOE framework is consistence with Diffusion of Innovation Framework^{6,11,13,14}. Another reasoned, it able to provide more explanatory power from difference perspective view for environmental, organizational or individual characteristic view. Hence, it is not biased to certain context view. For instance, conventional theory such as Diffusion of Innovation or Technology Acceptance Model focus are more emphasize on technology characteristic (DOI: relative advantage, complexity, compatibility, trialability and observability) only, where as it cannot provide more explanations on others unknown factors which happen to the organization internally or externally. Therefore, in this research, TOE framework is selected.

4.1 Adoption

In this research, we adopt Tornatzky & Fleisher's adoption definition¹¹. In their framework, it has three context, namely, technological context, organizational context, and environmental context.

4.2 Perceived Benefits

Innovative characteristic such as relative advantages, is one of the study factors to adoption¹⁵. Iacovou and Dexter had extend the meaning and the scope of relative advantages, namely "Perceived EDI benefits refer to the level of recognition of the relative advantage that EDI technology can provide the organization"¹⁶. There are many literature reviews^{9,15,16} had listed various benefits can be obtained from e-Commerce technologies.

H1: The higher of perceived benefits, the higher e-Commerce adoption.

4.3 Perceived Barriers

Perceived Barriers are negative action toward innovation adoption. Marin and Oliveira mentioned that when technology is getting complex and sophisticate, perceived obstacle is relevant, and the cost to implement is higher which may caused to adoption process¹⁷. Previous literature reviews^{9,17} had listed down the negative effects that might caused to adoption.

H2: The higher of perceived barriers, the lower of e-Commerce adoption.

4.4 Top Management

Tarafdar and Vaidya mentioned the attitude about e-Commerce technologies across industries depend on management level¹⁹. Favourable and positive managements' attitude will affect the decision to adopt innovative technologies¹⁹. In organization, there are three types of management person who can be change agent namely, leader, senior managers, and top management. Top managements are fully aware of the importance of technology, they will try to influence the peer members within organization to apply and use it²⁰, conversely, they will rejected and refused to change the current practice¹⁹. Top management can successes the project by provide and monitoring the availability of technical & human resource and reduce unnecessary bureaucratic & redundancy procedures.

H3: The higher of top management support, the higher of e-Commerce adoption.

4.5 Organization Readiness

There are two components in organization readiness which are technological readiness and financial readiness. Financial readiness is refer to available financial resource for innovation to pay for installation costs, implementation cost, implementation any subsequent enhancement costs, and on going expenses during usage¹⁶. From technological point of view, organization readiness as skilled and knowledge of information technology, internal IT support, and support from external parties²¹. Organization Readiness reflects the organization's capability.

H4: The higher of organization readiness, the higher of e-Commerce adoption.

4.6 External Environment

In the external environment context, organization may be influence by the uncertainty markets, potential customers, suppliers, trading partner, and government rules, regulations and policies that influence the decision to adopt an innovation²². Government plays important roles to promote e-Commerce, in developing countries, the government acts catalyst such as government's tax incentive, which will draw investors' attention to setup companies locally²³, besides that the Malaysia government also approve some acts (ie: personal data acts 2010) used to protect online user.

Competitor pressure is another element within environment context, when identical or substitute products appear in the competitive market, in order to differentiate themselves from their competitor, the use of e-Commerce technologies will bring additional benefits to the organization.

H5: The higher of Competitor Pressure, the higher of e-Commerce adoption.

H6: The higher of Government Support, the higher of e-Commerce adoption.

5. Research Methodology

5.1 Data Collection & Procedure

A survey method was applied for data collection. The sample data and target audiences are retrieved from two local government agencies: SMEInfo website²⁴ and SMECorp website²⁵. Based on the information gather, manufacturing sector is selected. There are 2000 mails were send to SMEs such as Chief Executive Officers, Managers, Top Management, senior officers. After several weeks, there are total of 220 mails were returned, after perform data cleaning, 20 mails are discarded, the main reason to discarded is incomplete. Besides that, there also some were returned due to the particular vendors had moved to other location.

The majority measurements are adopted from previous literature reviews^{9,12,16,26,27}. The measurement items were used 7 likert scale point 1- indicated “Strongly Disagree” whereas point 7 - indicated “Strongly Agree”.

In this research, structural equation model technique - partial least square are applied. Based on the propose model, there are six independent variables to predict the relationship between the dependent variable, according to Urbach and Ahlemann²⁸, minimum requirement samples size is 60. After perform data cleansing there are 200 datasets are usable, therefore, we had fulfilled the requirement²⁸. There are two types of validity used to test the model, which are convergent validity and discriminant validity.

5.1.2 Descriptive Data

Table 1 listed all descriptive data for all study variables. The mean of the dependent variable - adoption scored 4.640. The mean value for Competitor pressure, Government support, top management, organization

Table 1. Descriptive Data for variables

Variable	Minimum	Maximum	Mean	Std. Deviation
Competitor Pressure	1.00	7.00	4.606	1.0111
Government Support	1.00	7.00	4.313	1.2488
Top Management	1.00	7.00	4.870	1.1771
Organization Readiness	1.00	7.00	4.684	1.1966
Perceived Barriers	1.00	7.00	4.443	1.1978
Perceived Benefits	1.30	7.00	5.262	.9963
Adoption	1.50	7.00	4.640	1.1482

readiness, perceived barriers and perceived benefits are 4.606, 4.313, 4.870, 4.684, 4.443, and 5.262.

5.2 Convergent Validity

Convergent Validity is established when the score obtained with two different instrument measuring the same concept are highly correlated²⁹. There are three important elements used to assess convergent validity: main loading, average variance explained (AVE), composite reliability (CR)³⁰. Convergent validity is demonstrated if the item load strongly (above 0.5 and higher) associated to their factors³⁰. There are two sub items from perceived barriers namely PBar7 and PBar10 are removed due to the loading do not satisfied the benchmark. The suggestion of benchmark score for Average Variance explained and Composite Reliability, any value must be greater than 0.5 and 0.7 respectively²⁸. Based on the given benchmark value, the generated results from table as following are satisfied the requirements.

5.3 Discriminant Validity

Discriminant validity are checked by comparing the average variance value for each constructs with squared the correlation of this construct to another construct²⁹. Which means the bold text value must be greater than any value inside the column, either in row wise or column wise. Based on the display result as following table, all the values are satisfied the rules and it shows the adequate convergent validity and discriminant validity.

Table 2. Construct Model

Variable Name	Items	Main Loading	AVE	CR
Competitor Pressure	CP1	0.634	0.593	0.852
	CP2	0.751		
	CP3	0.871		
	CP4	0.804		
Government Support	GS1	0.822	0.717	0.910
	GS2	0.919		
	GS3	0.814		
	GS4	0.828		
Adoption	INT1	0.750	0.616	0.928
	INT2	0.734		
	INT3	0.762		
	INT4	0.787		
	INT5	0.780		
	INT6	0.807		
	INT7	0.820		
	INT8	0.834		
Organization Readiness	OR1	0.913	0.861	0.961
	OR2	0.926		
	OR3	0.934		
	OR4	0.937		
Perceived Benefits	PB1	0.685	0.591	0.935
	PB10	0.741		
	PB2	0.694		
	PB3	0.807		
	PB4	0.781		
	PB5	0.771		
	PB6	0.763		
	PB7	0.734		
	PB8	0.841		
PB9	0.849			
Perceived Barriers	PBar1	0.637	0.534	0.901
	PBar2	0.750		
	PBar3	0.695		
	PBar4	0.684		
	PBar5	0.740		
	PBar6	0.816		
	PBar8	0.752		
	PBar9	0.760		

Top Management	TM1	0.891	0.793	0.939
	TM2	0.916		
	TM3	0.855		
	TM4	0.899		

5.4 Assess to the Model

The structure model provides beta co-efficient value and squared R (R^2) value and the decision of the hypothesis statements. In this propose model, there are six independent variables to assess to the model, perceived benefits, perceived barriers, top management, organization readiness, competitor pressure and government support. Among these variables, two variables from technological context do not show any significant result, perceived barriers and perceived benefits and organization readiness from organization context. The R squared value for the entire model is 0.5137, which means is 51.4% that can be explained with top Management, competitor pressure and government support, with respectively beta value: 0.367, 0.210, and 0.193; t-value: 4.80, 3.334, and 2.887. Based on the statistical result, the propose model able explain more than half of the model, which means it show that TOE framework is a parsimony model yet power model to explain the e-Commerce adoption.

5.5 Discussion & Conclusion

First of all, the research objectives are achieved, the e-commerce adoption level is 4.64. The second objective is to identify enabler factor, competitor pressures, government support, and top management support are enable factor.

In this research, there are six independent variables: perceived benefits, perceived barriers, top management, organization readiness, competitor pressure and government support used to investigate the relationship between e-Commerce adoption. Among these six variables, three variables are not significant: perceived benefits, perceived barriers and organizational readiness and another three variables: top management, competitor pressure and government support are significant.

Top management is considered crucial for any innovative adoption in organization¹². When the top management understand the role of technology in organization, they will play their roles and influence members to accept it. This is supported by previous literature review^{12,20}.

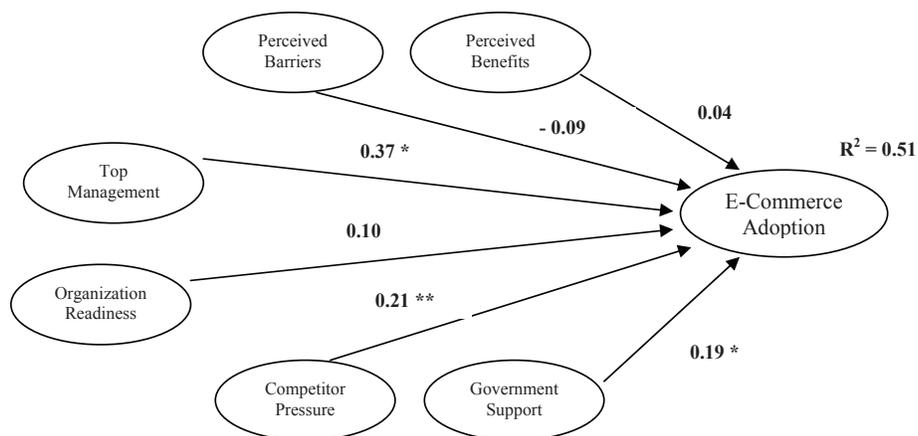
Table 3. Discriminant validity result

	1	2	3	4	5	6	7
(1) Adoption	0.785						
(2) Barrier	-0.081	0.731					
(3) Benefits	0.376	0.149	0.769				
(4) Competitor	0.513	0.120	0.444	0.770			
(5) Government	0.499	0.056	0.271	0.439	0.847		
(6) Management	0.640	-0.067	0.465	0.478	0.440	0.890	
(7) Organization	0.489	-0.090	0.265	0.323	0.438	0.582	0.928

** **Bold text** value represent squared root of AVE value

Table 4. Path Analysis and Result

Path Analysis	Beta Value	Std. Error	t-value	Decision
Barrier -> Adoption	-0.0901	0.0906	0.9947	Not Support
Benefits -> Adoption	0.0462	0.0583	0.7927	Not Support
Competitor -> Adoption	0.2103	0.0631	3.3343	Support
Government -> Adoption	0.1926	0.0667	2.8863	Support
Management -> Adoption	0.3673	0.0765	4.7991	Support
Organization -> Adoption	0.1025	0.0689	1.4883	Not Support



* = Significant at $p < 0.05$; ** = Significant at $p < 0.001$

Figure 1. SmartPLS data and result for the propose model.

Competitor Pressure and government support from environment context are recognized as significant variables. When fierce competitive is occurred in the market, the existing of innovative technology will bring extra additional advantages to the organization. The use of technology will help organization to position themselves in the market and develop relationship with their trading partner²⁷. Besides that, government support also considered another important factor, SMEs encountered scarcity of resources especially in financial resource and knowledge, the incentive such as training/technical workshop, cyberlaws, and financial aids provided by the government will promote e-Commerce adoption, such benefits will lead to more SMEs aware of the government roles in promoting e-Commerce.

Organization readiness is found that not significant in this study. Explained that manufacturing firms may perceive that these innovative technology are as advance manufacturing machines and equipment, but that does not mean that the organization to adopt e-commerce technology³¹.

Both of the technological context are not significant, it will lead to a chaos situation where we unable to determine whether the pros or cons of technology that will lead to adoption or reject the innovation. one of the plausible explanation from Cho mentioned that without clear and tangible benefits, the manager will hesitate on the issue of adoption³². Other the other hand, Cho provide another sight of view on perceived barriers, on the early adoption stage, if the employee are slow learner about the technology³², it will consume some time to the productivity is regained. The will lead to increase to hindrance and reduce the organization's interest to use it.

TOE is a good framework to predict the e-Commerce adoption among SMEs in Malaysia, however there are many uncover factors need to be explore. The empirical data can be served as initial benchmark value for government and non government organization to refine their policy, besides that it also can contribute to adoption & diffusion research to extend body of knowledge.

6. Practical and Theoretical Contribution

The study offers both practical and theoretical contribution. It proved that TOE framework is a suitable framework used to investigation factors influence SMEs

in Malaysia to adopt e-Commerce. The empirical data can be served at benchmark value to extend the body of knowledge for adoption & diffusion research in developing countries. From management's perspective view, the study can provide the company policy maker to refine their policy by choosing appropriate e-commerce technologies to improve the organization business process.

7. Limitation

There are some limitation for this study, this study is focus on manufacture sector, whereas the propose framework and variables cannot be applied into other sector. Secondly, the model might not applicable to borneo Malaysia due to difference culture and practice. The statistical software smartPLS v2.0 M3 might be fadeout due to its own version, and the java technical issues³³.

8. Acknowledgements

The authors would like to sincerely thank the School of Computer Sciences, Universiti Sains Malaysia (USM) as this research has been supported from the Research University Grant (RUI) [Account Number: 1001/PKOMP/811251] and from the Short Term Research Grant [Account Number: 304/PKOMP/6312103] from the Universiti Sains Malaysia.

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