Analysis of Level and Barriers of E-Commerce Adoption by Indonesian Small, Medium, and Micro Enterprises (SMMEs)

Rajesri Govindaraju and Dissa R. Chandra

Abstract—The contribution of Indonesian small, medium, and micro enterprises (SMMEs) to the national economy growth has been proven. Today one form of SMMEs empowerments is the adoption of e-commerce. Although e-commerce adoption by SMMEs has many advantages, a number of barriers for the adoption exist. By understanding the current level and the barriers of e-commerce adoption by SMMEs, it is expected that the empowerment of SMMEs can be improved. This paper reports a study on e-commerce adoption by Indonesian SMMEs in the non-oil-and-gas processing and the trading, hotels, and restaurants sectors by using business environment framework. This study found that most of surveyed Indonesian SMMEs have strategic plans to adopt higher level of e-commerce. Further, it is found that human resources, sources of information, and push forces factors are the significant barriers for e-commerce adoption by Indonesian SMMEs.

Index Terms—electronic commerce, information technology adoption, adoption barrier, SMMEs, business environment framework

I. INTRODUCTION

Small and medium enterprises (SMEs) play a major role in countries at all levels of economic development [1]. In addition to the contribution from small and medium enterprises, Indonesia also recognizes the contribution of micro enterprises to the growth of the national economy through employment provision and gross domestic product (GDP) value which reach 91,03% and 33,08% of national achievement, respectively [2]. Therefore, the empowerment of small, medium, and micro enterprises (SMMEs) is one of Indonesian government's programs to develop the national economy [3].

One form of recent SMMEs empowerment is the adoption of e-commerce. There are some different definitions of e-commerce from literatures. This study use a definition of e-commerce as "a process of information exchange and transaction, which involving products and services, using

information technology, such as networks, softwares, non-wireless electronic equipments, and wireless electronic equipments" [4].

In order to enhance the e-commerce adoption by Indonesian SMMEs, Indonesian government has to support the SMMEs. In this situation, it is crucial for Indonesian government to understand the current adoption level and the adoption barriers. Based on the understandings, the government's programs for Indonesian SMMEs will be focused on the real problems effectively.

In the previous studies on e-commerce adoption, Diffusion of Innovation theory and Technology Acceptance Model dominated the researches framework [5]. The focus of the models is the upstream issues of e-commerce, so the detail aspects in the firms and other external aspects that influence the firms were not identified. Furthermore, several studies also used other frameworks, such as external and internal framework [6, 7] and stakeholder theory [8].

Some of the previous researches, such as [6, 8], studied e-commerce adoption by Indonesian SMEs. In [6] the barriers of e-commerce adoption are classified into "too difficult", "unsuitable", and "time/choice" factors. Meanwhile, [8] identifies "Government", "Employees", "Owners", "Competitors", "Customers" and "Managers" as the influential stakeholders in e-commerce adoption by Indonesian SMEs. However, in the studies the external barriers of e-commerce adoption were not identified as detail as the internal barriers.

Therefore, this study aims to give a comprehensive and detail understanding in e-commerce adoption by Indonesian SMMEs. Therefore, the questions in this study are: (1) "What is the current majority level of e-commerce adoption by SMMEs being surveyed in Indonesia?" and (2) "What are the barriers of e-commerce adoption by SMMEs in Indonesia?"

II. METHODOLOGY

Many studies identified and used classification models of e-commerce adoption stages. One of them is a simple and widely used model in [9]. There is also a model in [10] that is based on enterprises characteristics clustering. Recently, a standard model of e-government adoption was released by the UN/ASPA. Although the model was set up to examine the stage of e-government adoption, the model also can be used to assess e-commerce adoption in developing countries [11].

TABLE I
E-COMMERCE ADOPTION STAGE

E-Commerce Adoption Stage	Description
Non-adopter	· No website
Level 1 : *Presence* [16]	· Use websites (including Facebook, Multiply, Indonetwork domain, etc.) only to display information about products and services (provide a one-way communication on the website)
Level 2 : *Portals* [16]	· Use websites (including Facebook, Multiply, Indonetwork domain, etc.) for two-way communication with customers and suppliers
	· Provide services such as product and customization order, product feedback, and also surveys
Level 3 : *Transaction integration* [16]	· Use websites (including Facebook, Multiply, Indonetwork domain, etc.) for two-way communication with customers and suppliers
	· Provide services such as product and customization order, product feedback, and also surveys
	· Provide online payment and / or online order fulfilment
Level 4 : *Enterprise integration* [16]	· Use websites (including Facebook, Multiply, Indonetwork domain, etc.) for two-way communication with customers and suppliers
	· Provide services such as product and customization order, product feedback, and also surveys
	· Provide online payment and / or online order fulfilment
	· Integrate internal processes with online booking
	· Implement Supplier Relationship Management (SRM) and / or Customer Relationship Management (CRM)

In addition, a model of e-commerce adoption stage is presented in Table I [12]. By adding a non-adopter stage, the model was used in this study to categorize the "level of e-commerce adoption by SMMEs".

To analyze the barriers of e-commerce adoption, Business Environment framework [13] is used in this study. The framework is presented in Figure 1. Business Environment framework is an enhancement of Marketing Environment framework [14] that has been widely used as a theoretical base of marketing studies. Business Environment framework was chosen because it can provide a comprehensive approach to analyze the aspects of a company and its business environment. The theory gives us a way to view a company as a dynamic system.

Four components of Business Environment framework are eliminated from the initial model. The elimination process was done based on its effect to e-commerce business operation by SMMEs. They are "machine" and "material" component in the internal environment and "natural" and "demography" component in the macro external environment.

Based on previous studies [6, 7, 15-22], various variables influencing e-commerce adoption by SMMEs were identified. Those variables were grouped into the components of the Business Environment framework. Selection processes of the variables were based on the real situation in Indonesia. To get a better understanding about real situation in Indonesia, a pilot study were done by involving 3 (three) SMMEs. The latent and the measured variables that were used in the initial model are presented in Table II.

The e-commerce adoption barriers for SMMEs influence their e-commerce adoption. In this regards, to establish a structural model, we added a latent variable "e-commerce adoption". The variable represents the concept of SMMEs' e-commerce adoption level which is presented in Table I.

For further data processing, the latent variable "e-commerce adoption" and its' measured variable were transformed into the "obstructed e-commerce adoption" (H) latent variable and "TA" measured variable.

TA = 4 - "level of e-commerce adoption by SMMEs"

Indonesian government suggests that enterprises grouping in Indonesia can be done based on nine economic sectors [23]. The sectors with high employment levels, gross domestic product value, and export values are: (1) trading, hotels, and restaurants sector, and (2) processing industry sector. In addition, the processing industry sector is divided into oil-and-gas industry and non-oil-and-gas industry. Oil-and-gas industry sector only contains large-scale enterprises, while non-oil-and-gas sector is an industry sector with a large number of SMMEs. Therefore, SMMEs in non-oil-and-gas processing sector and trading, hotels, and restaurants sector were chosen as the focus of this study. The classification of SMMEs in this study is based on assets value and gross income value criteria as stated in [24] and shown in Table III.

A questionnaire set was developed using 4 point Likert like scaling, from strongly agree until strongly disagree. Questionnaires were given to 400 SMMEs using email and direct meeting. Follow-up emails and phone calls were made to encourage respondents. The response rate was 21.75% with 87 returned questionnaires, but there are only 85 complete questionnaires that can be used for further analysis.

Respondents are non-oil-and-gas processing, trading, and restaurants SMMEs in 8 provinces. There is no sample from hotel business. The majority is the trading business. Majority of the sample is the micro scale enterprises. The SMMEs' age ranged between below 1 year until 61 years and their e-commerce experience ranged between below 1 year until 7 years. The respondents' profiles are shown in Table IV.
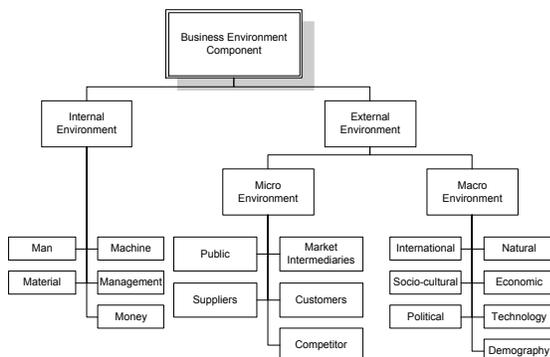

Figure 1. Business Environment Component (Jain, 2009)

TABLE II
INITIAL LATENT AND MEASURED VARIABLES

Environment	Latent Variabel	Measured Variabel	Code	Environment	Latent Variabel	Measured Variabel	Code
Internal Environment	Man	Lack of educated human resources	M1	Micro External Environment	Partners	Partners have not implemented e-commerce yet	P1
		Lack of resources with IT skills	M2			High cost of internet access	P2
		Employee resistance	M3			Bad service from internet providers	P3
		Lack of knowledge about the benefits of e-commerce	M4			Low internet speed	P4
		Lack of knowledge about the implementation of e-commerce	M5			Lack of application developer	P5
		Lack of experience using information technology / electronic marketing media	M6			Low quality of service delivery	P6
		Lack of time to learn about e-commerce	M7		Publics	The absence of the threat from competitors who are using e-commerce	PU1
		Lack of time to operate e-commerce	M8			Lack of support and input from SMMEs associations	PU2
	Financial	Financial investment for the implementation of e-commerce is too high	F1			Lack of support and input from import export companies association	PU3
		Term of return on investment and capital is too long	F2			Limited number of other organizations that have used e-commerce	PU4
		Lack of financial resources	F3			Lack of information about e-commerce from media	PU5
	Management	Insuitability with the characteristics of e-commerce products	ME1	Macro External Environment	Political	Ambiguity of government regulation	PO1
		Incompatibility of e-commerce with the way organizations conduct business process	ME2			Unclear rules of international cooperation in trading	PO2
		Absence of standards of quality between sellers and buyers	ME3			High intensity of changes in government regulations	PO3
		Lack of support for corporate strategic objectives	ME4			Lack of support from the government	PO4
		Lack of support from management	ME5		Technology	Limited support from online payment system that is feasible and effective	T1
		High level of risk decision to use e-commerce	ME6			Potential security risks in internet network	T2
Micro External Environment	Customers	Incompatibility between customers and e-commerce	K1			Information privacy issues	T3
		Low level of trust from customers about the product quality	K2			Low on-line payment security	T4
		Low level of trust from customers regarding delivery time	K3		Socio-economy	Low popularity of on-line sales and marketing	SE1
		Low level of trust from customers about the added-value of buying the products	K4			Instability of national economic climate	SE2
		Limited numbers of customers who use internet	K5			Poor condition of transportation infrastructure in Indonesia	SE3

TABLE III
CLASSIFICATION OF INDONESIAN SMMES [24]

Enterprises	Assets (excluding land and buildings)	Gross Income
Micro	≤ Rp.50,000,000.00	≤ Rp. 300,000,000.00
Small	> Rp. 50,000,000.00 - Rp. 500,000,000.00	> Rp. 300,000,000.00 - Rp. 2,500,000,000.00
Medium	> Rp. 500,000,000.00 - Rp. 10,000,000,000.00	> Rp. 2,500,000,000.00 - Rp. 50,000,000,000.00

TABLE IV
RESPONDENTS' PROFILES

Profile	Category	%	Profile	Category	%
SMMEs' Age	≤ 1 year	49.4%	Desktop	Yes	63.5%
	> 1 year - ≤ 5 years	30.6%		No	36.5%
	> 5 years - ≤ 10 years	8.2%	Laptop	Yes	69.4%
	> 10 years	11.8%		No	30.6%
Economic Sector	Processing Industry	20.0%	LAN	Yes	24.7%
	Trading	68.2%		No	75.3%
	Restaurant	11.8%	Internet	Yes	77.7%
SMMEs' Classification	Micro	76.5%		No	22.3%
	Small	16.5%	Camera	Yes	67.1%
	Medium	7.1%		No	32.9%
E-Commerce Adoption Stage	Non-adopter	30.6%	Scanner	Yes	32.9%
	Presence	21.2%		No	67.1%
	Portals	38.8%			
	Transactions Integration	8.2%			
	Enterprises Integration	1.2%			

TABLE V
DELETED AND TRANSFORMED VARIABLES

Test	Transformed	Eliminated
Construct Validity		PO3
		PO4
		T2
		SE2
Reliability		-
Normality	ME2	-
	ME4	ME4
	ME5	-
	P5	-
	PU2	PU2
	PU3	-
	PO2	-
Multicolinearity		SE3

III. RESULT

Construct validity of each variable was assessed by calculating the correlation between the value of each variable and the sum value of each respondent answer using software SPSS 17.0. Variables with insignificant correlation were eliminated from the model. Then, reliability was assessed by calculating the Cronbach alpha coefficient. The calculation showed that the Cronbach alpha coefficient was above 0.7. In the next step, we found 7 variables with non-normal distribution from normality test by calculating z score of data's skewness and curtosis. After transforming them using LISREL 8.7, we eliminated 2 variables. Then, sample size adequacy and multicolinearity were calculated using KMO and Bartlett's Test respectively. The KMO value was 0.780. It means that the sample size was enough for statistical analysis. Lastly, based on the value of each variable's MSA, we had to eliminate 1 variable. The transformed and eliminated variables are shown in Table V.

Exploratory Factor Analysis (EFA) was conducted to validate the initial model. There were 10 factors extracted from 37 measured variables in the EFA's result. In the initial model, there were 9 components from 44 measured variables. The difference of measured variables was caused by the elimination of 7 measured variables in the data preparation process.

Although the number of latent variables and factors were different, there were 2 factors from EFA that were exactly the same with 2 latent variables defined in the initial model. They are shown in the Table VI. In addition, high similarity is indicated by factor 1 with "man" latent variable, factor 2 with "customers" latent variable, factor 4 with "partners" latent variable, and factor 5 with "technology" latent variable. It is shown in the Table VII.

To obtain appropriate names for the factors, generalizations were done. It could be observed that all of the measured variables in each factor expressed a general idea. Then, the general idea was adjusted and established as the factors' name. As the result, factor 2 expresses "market" which are products, customers, and service delivery providers, factor 4 expresses "internet services" as the SMMEs partners, factor 5 represents "security" of information technology, factor 7 expresses "push forces" which is encouragements from the internal and external environment, factor 8 is "sources of information" about e-commerce for SMMEs, factor 9 measures supports and inputs from "enterprises association", and factor 10 associates with the "e-commerce popularity" in general.
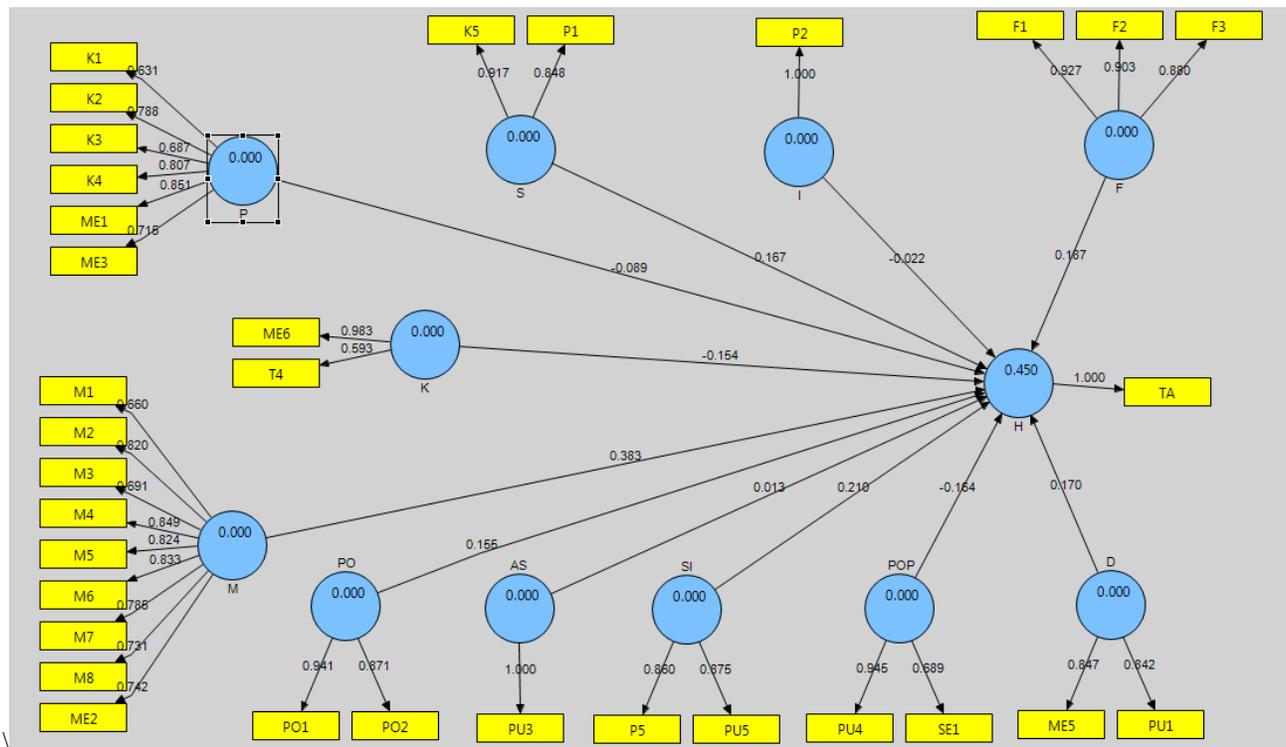
Figure 2. SmartPLS Result

IT skills, employees' resistance, knowledge about the benefit and implementation of e-commerce, time to learn about e-commerce, and the organization way of doing business. It indicates that in Indonesian SMMEs the organization way of doing business is strongly bounded with the human resources. Therefore, it is possible that the question about the organization way of doing business had been translated by respondents into the human resources way of doing their job.

The other result indicates that Indonesian SMMEs need more sources of information about e-commerce. The sources can be e-commerce application vendors, IT consultants and public information media. In some cases, e-commerce application vendors or consultants are also direct sources of e-commerce information.

Eight latent variables have no significant influence on e-commerce adoption by Indonesian SMMEs. It is good for further studies to test again the influence of those variables in a better setting, such as better variable definition, better operationalization, and better data sample.

This study did not use a proportional sample because we did not know about e-commerce adoption level proportion of the population. Until now, it has been no census data about e-commerce adoption by SMMEs in Indonesia. However, we realize that we could use SMMEs' geographic location or government classification to define the SMMEs groups and their proportion. Future studies could consider using a proportional sample.

V. CONCLUSION

From the study, it is found that most of Indonesian SMMEs participating in the study have strategic plans to adopt higher level of e-commerce, though majority of the firms currently adopt e-commerce at the lower level. Furthermore, there are three significant barriers of e-commerce adoption by Indonesian SMMEs. They are "Push Force", "Man", and "Sources of Information".

As "Man" is an internal barrier, it can be solved by the SMMEs itself and by the help of government. Examples of the solutions for this problem are recruitment of IT employees, improvement of employees' skill by SMMEs, and e-commerce workshop for SMMEs employees held by government. In relation to "Push Forces" barrier., to solve the lack of management support in SMMES, the role of SMMEs owner as a part of management is very important. Another aspect of "Push Force" is the threat from enterprises using e-commerce. The result indicates that e-commerce usage by other companies has not threatened Indonesian SMMEs yet. Consequently, it can be expected that government's effort to support Indonesian SMMEs to adopt ecommerce which can be done through socialization, education and training may increase the adoption rate exponentially.

The "Sources of Information" problems need to be solved by external entities including government and other associations outside the SMMEs. As an example, public information media can be arranged by Indonesian government. If the number and the quality of these sources are increased, the barrier of e-commerce adoption in Indonesian SMMEs can be reduced. In this case the role of government as the initiator and facilitator is very important.

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