Factors Affecting The Adoption of E-logistics in Indonesian E-Commerce Industry Using TOE Framework

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Abstract

This study aims to determine the factors of E-Logistic adoption in E-Commerce industry in Indonesia. Factors in the TOE Framework such as Technology, Organization and the environment are used, with respondents e-Commerce companies included in kateori / sector Classified Ads, Marketplace, Online Retail and Logistics. Analysis and data processing in this research is Partial Least Square (PLS) with unit analysis. The data collects using questionnaires that related to variables and indicators influencing E-Logistic adoption. The results of the analysis of these factors proved to accept adoption of E-Logistic technology with R-Square value of 0.873. With a 95% significance level, each independent variable has a Tvalue > T - table value with the overall path coefficient. The theoretical contribution of this research is to verify the findings of previous studies, most of which qualitative research, in the form of indicators on those factors that could have implications for the adoption of E-Logistics, particularly in the E-Commerce industry in Indonesia.

Keywords: E-Commerce; E-Logistics; TOE Framework; Adoption

Introduction

The logistics sector and supply chain management have become important in the complex E-Commerce business operations (Wang, 2006). Logistics on E-Commerce services can improve efficiency, reduce costs and improve customer responses (Molla, 2005). Automated E-Commerce accounts for 20-30% of the total cost of e-commerce in addition to digital marketing, payment and also goods sold (Kearney, 2016).

The use of IT in logistics management can improve efficiency, reduce costs and improve responsiveness to customers and can process information centrally and quickly. E-Logistics is a Technology that automates logistics processes and provides fulfillment *end-to-end* supply chain. E-Logistics can help E-Commerce in many areas such as, helping business functions, partnership, inventory management and warehousing (Amitrajit, 2013). Additionally E-Logistics can also reduce overhead costs on logistics operations by providing visibility (Hwang, 2016).

Studies on E-Logsitics are currently quite limited and mostly done in large companies in developed countries with qualitative methods (Gong, 2013). Selection of Indonesia as a place of this research, caused Indonesia now has demographic bonus and high economic development. In addition, since Indonesia is an archipelagic country, the fulfillment of E-Commerce logistics services will be very crucial. However, as is common in most developing countries, E-Logistics adoption in Indonesia is still lagging compared to developed countries (Amitrajit, 2013).

TOE as a model that uses an interactive perspective that assumes organizational change is not only determined by individuals within the organization, and also by the organizational traits (Rahayu, 2015). This interactive perspective can explain the adoption of IT innovation. In this case, there are three factors that face the adoption of technological innovation that is technology, organization, and external environment (industrial environment). Based on the problems, this research is going to verify the findings of previous studies, most of which qualitative research, in the form of indicators on those factors and measure them in order to have implications for the adoption of E-Logistics, particularly in the E-Commerce industry in Indonesia.

Literature Review

E-Commerce

E-Commerce can be defined as a process of purchasing, selling, or exchanging products, services or information through a computer network, including the Internet (Rahayu, 2015). The E-Commerce community consists of several related businesses such as a provider of goods, Marketplace, Payment Gateway, Logistics Provider, Delivery/Courier and also Digital Marketer. There are five business models commonly used by E-Commerce businessmen in Indonesia including Classified / classified ads, C2C Marketplace, Shopping Mall, B2C Online Shop, and Online Store in Social Media (Enricko, 2014).

E-Logistics

E-Logistics is a system consisting of data, hardware, software and information rules that automate logistics processes such as fulfillment, warehousing and transportation of goods and provide data integration, visibility, optimization and information tracking of supply chain management end-to-end (Gong, 2013). The process that occurs on E-Logistics is four which consists of: Request for Quotes (RFQ), Shipping/Transport, Warehousing/Inventory, and Tracking (Wang, 2006). According to Coyle (2003), E-Logistics is a system consisting of several parts within which each process can be run separately. The module of E-Logistics extensively consists of: Planning System, Excecution System, Research and Intelligence System, Reports and Outputs System. Other benefits of E-Logistics are reduced operational costs, additional income from advertising and marketing, rapid response to customer needs, and reduced inefficiency. E-Logistics within an E-Commerce company will enable them to be able to determine customized needs estimates in logistics process (Hwang, 2016).

IT Adoption Model

In contrast to other theories that focus more on individual perspectives, Technology-Organization-Environment (TOE) Framework models provide greater focus on organizational perspectives. Within this framework, there are three aspects of the context that influence the adoption of innovation, the technological context, the organizational context, and the external context of enviromental / industrial environments (Oliviera, 2014).

Research Methodology

In this research, the factors influencing E-Commerce actors in E-Logistics adoption are classified into three factors / latent variables with 12 indicators / manifest variables.

Technology

Technological factors included tools and processes used, both internally and externally relevant to the company. In this research on Technology factor there are five indicators, including Visibility, Complexity, Compatibility, Financing Value Chain, and Optimized Logistics Process. Visibility is the ability to monitor any ongoing process will make the company can make improvements. Meanwhile Complexity is the level of ease in the use of a technological innovation. The implementation of a technological innovation requires resources that may not be available within the company. Then Compatibility refers to the degree of conformity of the implementation of technological innovation to the needs of adopters and systems that have run on an adopter environment (Rahayu, 2015). Logistic service providers have many partners with a various characteristics in each engagement, revenue sharing and SLA. The Financing Value Chain aspect preserves business conformity with the financial aspect of the company. A long series of processes and multiple parties' involvement in the logistics process make many processes difficult to control. The Optimized Logistics Process feature is required to perform much needed resource efficiency to increase competitive advantage (Gong, 2013).

Organization

The organizational context refers to the characteristics, values and resources of the firm, including Firm Size, Preceived Benefit, Top Management Support, and Security as indicators. Firm Size refers to the size of the

company, which can be seen from the aspects of financial performance, number of employees, and share in the industry. Then Preceived Benefit is the level of acceptance of an innovation in delivering benefits and benefits to the company relatively well from strategic and operational benefits. The characteristics of E-Commerce companies that are still centralized make the decision still in the top level management. Top Management Support that refers to the level of management acceptance of a technological innovation, becomes crucial (Rahayu, 2015). While Security will provide security of the system to the company in running the business (Oliviera, 2014).

Environment

Environmental factors are influences that arise from outside the company such as industry competition, macroeconomic conditions, and regional policy. As for this in this research some of the indicators proposed are Customers / Suppliers Pressure, Competitor Pessure, and Government Support. Many of its parties are involved in the logistics process as well as the high SLA makes Customers / Suppliers Pressure an important factor (Molla, 2005). Then a high Competitor Pessure encourages companies to adopt technology to gain a competitive advantage. Meanwhile Government Support is needed to maintaining business climate as well as encouraging assimilation of IT innovations by companies in the field of E-Commerce (Hwang, 2016).

Research Model & Hypothesis

Based on the previous explanation, this research will use TOE Framework with three variables: technology, environmental and organization with 12 indicators. Below are three hypothesis proposed and research model used:

1. H1: Technology factor affects to adoption of E-Logistics in E-Commerce company
2. H2: Organization factor affects to adoption of E-Logistics in E-Commerce company
3. H3: Environment factor affects to adoption of E-Logistics in E-Commerce company

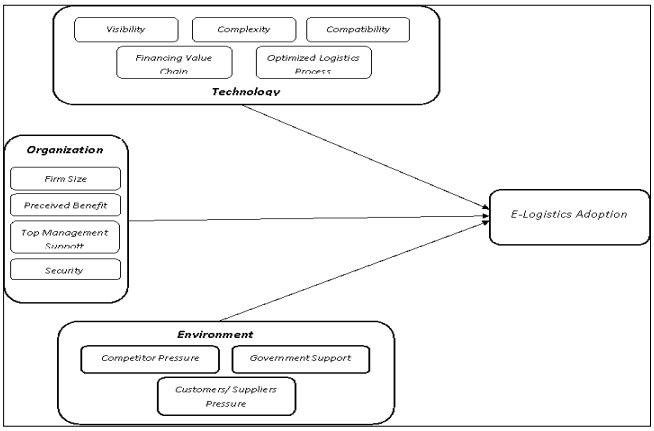


Figure 1. Research Model

Data Analysis

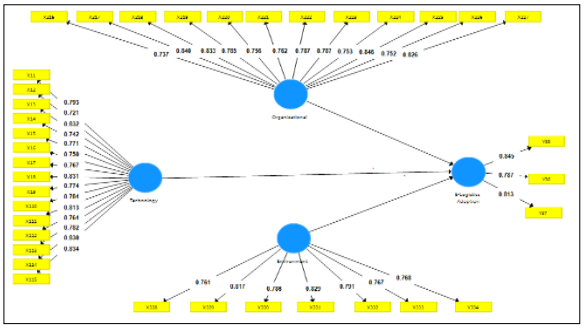
This study includes the type of causal research using quantitative methods. This research will examine the relationship of variables based on TOE Framework, *Technology-Organization-Environment*, to E-Logistics adoption on companies serving E-Commerce service. To find out the relationship, a survey was conducted by distributing questionnaires to 194 E-Commerce companies included in the Classified Ads category, Marketplace, Online Retail and Logistics. The questionnaire consists of four questions to describe the characteristics of respondents and 37 questions that represent the variables. Technique of analysis and data processing in this research uses Partial Least Square (PLS). Data were collected in the form of scores on the Likert scale.

Result and Discussion

From the questionnaires distributed, collected data from 194 respondents who are ready to be processed. The total sample collected can be used as input in data processing using PLS with SmartPLS 3.0 software.

Masurement Model Evaluation

Testing Convergent Validity in this study using the Average Variance Extracted (AVE) & communanlity and loading factor methods. The results of AVE & communality and loading factor testing are shown in Table 2 and Figure 2 below.



Variables	AVE	Communality	Root AVE
Technology (X1)	0,792	0,792	0,889
Organization (X2)	0,843	0,843	0,918
Environment (X3)	0,806	0,806	0,898
E-Logistics Adoption (Y)	0,712	0,712	0,844

Figure 2. AVE & Communality Factor; Table 2. Loading Factor

Referring to Table 2 and Figure 2 above, each variable in this study has an AVE and communality value> 0.5 and a loading factor above 0.7. Therefore it can be said that this research has good convergent validity.

Discriminant validity test performed with cross loading and latent variable correlation method. Cross loading testing to test the relationship between the indicator and its variables.

Table 3. Cross Loading Among Variables

	Technology (X1)	Organization (X2)	Environment (X3)	E-Logistics Adoption (Y)
X1_1	**0.793**	0.379	0.488	0.418
X1_2	**0.721**	0.470	0.491	0.521
X1_3	**0.832**	0.440	0.416	0.529
X1_4	**0.742**	0.443	0.479	0.398
X1_5	**0.771**	0.371	0.518	0.455
X1_6	**0.750**	0.416	0.344	0.428
X1_7	**0.767**	0.412	0.404	0.526
X1_8	**0.831**	0.457	0.533	0.387
X1_9	**0.774**	0.334	0.368	0.442
X1_10	**0.784**	0.398	0.515	0.413
X1_11	**0.813**	0.397	0.450	0.372

	Technology (X1)	Organization (X2)	Environment (X3)	E-Logistics Adoption (Y)
X2_21	0.445	**0.762**	0.421	0.488
X2_22	0.412	**0.787**	0.446	0.429
X2_23	0.415	**0.787**	0.412	0.436
X2_24	0.444	**0.753**	0.414	0.380
X2_25	0.380	**0.846**	0.448	0.438
X2_26	0.413	**0.752**	0.516	0.517
X2_27	0.380	**0.826**	0.467	0.425
X3_28	0.373	0.441	**0.761**	0.387
X3_29	0.417	0.373	**0.817**	0.485
X3_30	0.413	0.438	**0.786**	0.438
X3_31	0.412	0.465	**0.829**	0.449

	Technology (X1)	Organization (X2)	Environment (X3)	E-Logistics Adoption (Y)
X1_12	**0.764**	0.531	0.432	0.467
X1_13	**0.782**	0.372	0.402	0.526
X1_14	**0.830**	0.482	0.452	0.525
X1_15	**0.834**	0.342	0.403	0.495
X2_16	0.495	**0.737**	0.498	0.468
X2_17	0.422	**0.840**	0.412	0.448
X2_18	0.445	**0.833**	0.421	0.451
X2_19	0.479	**0.758**	0.435	0.463
X2_20	0.376	**0.756**	0.448	0.386
X3_32	0.350	0.425	**0.791**	0.374
X3_33	0.513	0.471	**0.767**	0.386
X3_34	0.426	0.460	**0.768**	0.362
Y_35	0.486	0.421	0.490	**0.845**
Y_36	0.452	0.393	0.453	**0.787**
Y_37	0.486	0.460	0.483	**0.813**

Table 4.8 depict that the value of Cross Loading on the indicator of the latent variable itself has a value greater than 0.7 and also greater when compared with the loading factor of other latent variables. Latent Variable Correlation test is used to see the relationship between variables. The test results are shown in the following table.

Table 4. Latent Variable Correlation

Variables	Technology (X1)	Organization (X2)	Environment (X3)	E-Logistics Adoption (Y)
Technology (X1)	1.000			
Organization (X2)	0,471	1.000		
Environment (X3)	0,337	0,440	1.000	
E-Logistics Adoption (Y)	0,464	0,316	0,428	1.000

From Table 4 it can be seen that the laten variable correlation value is smaller than the AVE root value. This shows that each variable used has a difference compared to other variables. From the above exposure can be concluded that the model used in this study is reliable.

Internal concistency reliability in this research using composite reability (CR) and cronbach's alpha (CA) method. The results show that all variables have values above 0.7 in the following table.

Table 5. Internal Cosistency Reliability

Variables	CA	CR	Status
Technology (X1)	0,866	0,898	Valid
Organization (X2)	0,921	0,919	Valid
Environment (X3)	0,932	0,925	Valid
E-Logistics Adoption (Y)	0,968	0,979	Valid

Structural Model Evaluation

Structural model test (Inner Model) is used to know the relationship between variables. R-square value to evaluate research model, meanwhile T-value value and Path Coefficents were conducted to test the correlation significance between variables.

The higher R-square value show thet the predicted result of the model being studied is better. The results of R-Square in this study is 0.873. It shows that the model is in the "Substantial" category. This explains that the independent variables of Technology (X1), Organization (X2), and Environment (X3) can define the dependent variable of E-Logistics Adoption (Y) of 87.3%.

Using the same bootstraping method, the t-value and coeffiecnt value for each dependent variable to the independent variable as shown in the following table.

Table 6. Internal Cosistency Reliability

	Path Coefficient	Sample Mean (M)	Standard Deviation (STDEV)	T Value (|O/STERR|)	Status
X1 -> Y	0,828	0,870	0,283	2,816	Accepted
X2 -> Y	1,354	0,551	0,295	3,499	Accepted
X3 -> Y	1,166	0,259	0,260	2,533	Accepted

Conclusion

The result and discussion of the research about the influence of the Technology-Organization-Environment factors on E-Logistics adoption shows that:

a. Technological factors affects to companies in E-Commerce industry in Indonesia to adopt E-Logistics with t-value value 2,816> 1,962 and positive path coefficient. Where the respondents stated that the Optimized Logistics Process indicator is the indicator with the highest percentage of influence value and Compitability is the indicator with the lowest percentage of influence value. This is in line with the research that states that the burgeoning and dynamic business of ¬E-Commerce in Indonesia requires the company to be able to improve its logistics capability to continue to provide services for customers (Hwang, 2016).

b. Organizational factors positively affect companies in the E-Commerce industry in Indonesia to adopt E-Logistics with the highest t-value of 3,499 with positive path coefficient values. Respondents stated that Firm Size indicator is an indicator with the highest percentage of influence value while Top Management Support is the indicator with the lowest percentage of influence value. This is also due to the dynamic business environment and growing very fast, making the E-Commerce industry structure tend to be centralized and transformative, therefore changes that occur will be greatly influenced by the structure, value and culture of the company (Gong, 2013).

c. Adoption of E-Logistics in E-Commerce industry in Indonesia is positively influenced by Environmental Factor. Although this variable is the weakest factor affecting E-Logistics adoption with t-value value 2,533 and also positive coefficient path. Indicators Customers / Suppliers Pressure is an indicator with the highest percentage of influence value. While the indicator with the lowest percentage of influence value is Government Support. A new industry that is developing very quickly still has many obstacles to be solved as well as the support of various other stakeholders in running the company's business operations (Wang, 2006).

There are some limitations in this study that can still be discussed in next research. First, the constructs discussed in this study are limited to the Technology-Organization-Environment factor because of the use of the TOE Framework to verify the previous research which is still small and exploratory. There is a possibility in the future that there are influences from other factors proposed to examine the adoption of E-Logistics. Then the object of research that is limited to one community can be developed by extending the range to provide more accurate results.

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