Factor Analysis of the e-Marketplace Selection Model From a Seller Perspective

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***Abstract*—Each e-marketplace has different characteristics, so in choosing the e-marketplace that the seller will use, he must consider many factors. Based on the research results it is known that (1) the factors that are formed based on factor analysis are as many as 2 factors, namely the Product Quality Service Factor and the Quality and System Factor. This study uses a factor analysis model to carry out analysis using data analysis. The research data used were the results of a questionnaire survey. The questionnaire was made online by e-commerce sellers in Surakarta, Indonesia. The questionnaire is a Likert scale comprising statements representing the attitude of agreeing or disagreeing with the statements specified in the questionnaire. The topic of this research is the e-marketplace selection model from the seller's perspective. The results of the analysis with SPSS show that KMO = 0.908 and spherical Bartlett = 0.000, the contribution levels of the two common factor variants extracted are: F1 = 49.525%, F2 = 20.321%, the data results above show that seller's trust in e-marketplaces and support External is the reason for sellers to choose e-marketplaces to market their products. The Factor Analysis Model for selecting e-marketplaces can add references to the theoretical basis.**

Keywords— analysis, factor, model, selection, e-marketplace

I. Introduction

The benefits of technology in e-commerce activities can be seen as an opportunity, especially for developing countries like Indonesia. E-commerce is the process of buying, selling, or trading goods, data, or services via the internet [1]. E-commerce can positively impact the economy because of its flexibility and ability to create more comprehensive market access [2]. The massive development of e-commerce can significantly contribute to the economic sector. One of the things that have led to the massive development of e-commerce is the increase in internet users due to the importance of the internet as the primary facilitator in e-commerce.

E-marketplaces are a new opportunity for online sellers to market and sell products without the need to invest in a sales platform or have knowledge of legal aspects [3]. Some sellers offer similar products on the E-Marketplace, so sellers must be selective in choosing an e-marketplace to market their products [4], [5]. Success in selecting e-marketplaces requires key factors [6].

II. Literature Review

A. Factor analysis

Factor analysis is carried out to reduce many variables or factors into a smaller set and determine the underlying dimensions between the measured factors and latent constructs, thereby enabling the formation and refinement of theories [7]. Factor analysis can be a tool for studying the relationship structure between many variables by defining related factors [8].

The e-marketplace selection model for online sellers can affect sales profits [9]. One of the functions of factor analysis is to form a model that helps sellers choose marketplaces to sell online. Online sales utilizing the available marketplace platforms have several advantages, including market exposure, worldwide sales reach, and lower operating costs [10]. Several marketplace platforms are available in Indonesia, including Shopee, Tokopedia, Blibli, and Lazada. The many available marketplace options make sellers consider various factors that can increase profits. Previous studies have investigated the factors influencing sellers to sell their goods on e-marketplaces. Several factors influence sellers to sell their products in market-places, namely Ease of use [11]–[13], trust [6], [14]–[18], product [14], [15], [19], service operations [14], [20], [21], marketing and sales [14], [21], [22] payment option [6], [14], [20], platform [23]–[25], product reviews [4], [26], [27] perceived risk [28], information quality [12], [29], [30], Technical [6], [14], [31] Environmental [6], [14], [15], [19],

[31], [32], Organizational [19], [31], [32] dan Technology [31]. The main factors that influence sellers in choosing e-marketplaces to sell online include Ease of use, trust, product, service operation, marketing and sales, payment options, platforms, product reviews, perceived risk, and information quality; the main factors in the selection of e-marketplaces from the seller's perspective is influenced by indicator factors. The main factor of Ease of use is influenced by the indicator factors of Ease of use, navigation, and features [11]–[13]. The main factor of trust is influenced by the privacy indicator factor [6], [14], [23], [33], transaction [6], [14], [15], Information Quality [6], [14], [16], [18]–[20], [23], [32]–[36]. The quality indicator factor influences the main product factor [6], [14], [15], [19], price transparency [6], [14], [19], and price competitiveness [6], [14]. The main factor of service operation is influenced by service quality indicator factors [6], [12], [14], [15], [19], [20], [30], [34], [35], support/help desk [6], [14], [20], [35] and Service convenience [21].

The factor indicator discount influences the main marketing and sales factors [6], [14], [20], [23], Product specification information [14] and brand image [21], [22], [30], [37], [38].

The main factors of payment channels are influenced by credit card service indicator factors, Cash on delivery, bank transfers, and e-wallets [6], [14], [20].

The main factor of the platform is influenced by the user-friendly or user interface quality indicator factor [6], [14], [19], [20], [23], [31], [34], [35], mobile [14], user segmentation [24], reliability [11], [36], integrity [25], website performance [15], [23], [35], [36], [39], flexibility [40] and number of users [6], [14], [36].

The feedback indicator factor influences information quality [12], [14], [29], [41] and notifications [30].

The main technical factors are influenced by Internet-related technology indicator factors [6], [14], Accessibility [6], [14], [15] and e-commerce Cost [31].

The main environmental factors are influenced by the Industry structure indicator factor [6], [14], Government support [6], [14], [15], [19], [32], Competitors [6], [14] and Partner readiness [31]. The main organizational factors are influenced by factors indicators of Financial resources [32], Top management support [19], [31], [32], Technical expertise [31], Perceived value of e-commerce [31] and Employee knowledge [31].

The factors that influence sellers in selecting e-marketplaces are the main factors and indicator factors. These factors are then verified using analysis factors to form a marketplace selection model from the seller's perspective n to test each variable that is a factor in choosing an e-marketplace from the seller's perspective [13]. Several studies that use factor analysis include evaluating the autism rating scale in children [42], Selecting Number of Factors in Exploratory Factor Analysis [43], Training model for compound talents [44], factor analysis of social media use and education [45], actor analysis model in online shopping [46], evaluating challenges in speaking English skills [47], assessing employee satisfaction and performance [48], modeling terrestrial vegetation diversification [49], and assessing factors of financial inclusion [50].

B. e-Marketplaces Selection

The selection of e-marketplaces for sellers relates to what factors influence sellers to choose e-marketplaces in marketing their products. The factors influencing sellers in choosing e-marketplaces need to be analyzed for the linkages between these factors. Factor analysis is performed to reduce many factors into a set of smaller factors. The main factors and indicator factors influencing sellers in choosing e-marketplaces to sell online will be analyzed using Confirmatory Factor Analysis (CFA). *Confirmatory Factor Analysis* is a method used to test how well the measured variable can represent the previously formed construct or factor. Confirmatory Factor Analysis is a form of factor analysis that models the relationship between observed indicators and latent factors [51]. In the Confirmatory Factor Analysis method, there are two kinds of variables: latent variables and indicator variables. The latent variable, in this case, is the main factor that influences the seller in choosing an e-marketplace. In contrast, the indicator variable is an indicator factor that influences the main factor in choosing an e-marketplace from the seller's perspective. The results of factor analysis are used to model the selection of the right marketplace for sellers so that the model for choosing the right marketplace is expected to help sellers increase sales. *Latent variables* cannot be measured directly but can be formed by other measurable or indicator variables [8].

The results of the Confirmatory Factor Analysis show clear patterns for specific consequences that are likely to occur with too few or too many indicators per factor and inadequate sample size [52]. The research conducted [53] analyzed the selection of e-marketplaces using several software quality models implemented with a hierarchical analytical process using the Expert Choice tool.

III. Research Model

A. Selecting Variable

In this study, there are 14 variables used, namely Ease of Use (EOU), Trust (TR), Product (PR), Service Operation (SO), Marketing and Sales (MS), Payment Channel (PO), Platform (PL), Product Reviews (RV), Perceived Risk (RS), Information Quality (IQ), Technical (TC), Environmental (EN), Organizational (OR) and Technology (TY).

B. Selection of Samples

The objects in this study are sellers who market their goods on e-marketplaces Tokopedia, Shopee, and Lazada and have delivery locations for the goods being traded from Indonesia. The number of respondents used in this study was 100, with 29 sellers on the Tokopedia e-marketplace, 58 on the Shopee e-marketplace, and 13 on the Lazada e-marketplace. The sampling technique of primary data used is a questionnaire conducted to sellers online to determine what factors are used in choosing the right e-marketplace.

C. Factor Analysis

To determine whether factor analysis is appropriate for this study, the KMO Measure of Sampling Adequacy value must be more than 0.5. Meanwhile, the significance value of the Bartlett

test must be less than 0.005. The following is the KMO Measure of Sampling Adequacy and the Bartlett Test of Specificity.

TABLE I. KMO *MSA* AND *BARLETT TEST OF SPERICITY*

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0,908
Bartlett's Test of Sphericity	*Approx. Chi-Square*	1109,837
	df	91
	Sig.	0,000

The KMO Measure of Sampling Adequacy value in the table above is 0.908; this value is more significant than 0.5. So the indicators used in this study can be predicted and analyzed further. Then the table above also shows the value of the Bartlett test with a significance value of 0.000. This means it is below 0.005, so the indicators used in this study are correlated, and factor analysis can continue.

D. Measure of Sampling Adequacy (MSA)

In order to perform factor analysis, the data matrix must have a correlation expressed by an MSA value of more than 0.3. The following is the Measure of Sampling Adequacy (MSA).

TABLE II. MEASURE OF SAMPLING ADEQUACY

Code	MSA	Information
EOU	0,397	Valid
TR	0,729	Valid
PR	0,655	Valid
SO	0,691	Valid
MS	0,718	Valid
PO	0,792	Valid
PL	0,851	Valid
RV	0,567	Valid
RS	0,481	Valid
IQ	0,620	Valid
TC	0,802	Valid
EN	0,875	Valid
OR	0,747	Valid
TY	0,853	Valid

E. Principal Component Analysis

In determining the number of new factors that are formed, it is done by looking at the Eigenvalues that are more than 1.

TABLE III. TOTAL VARIANCE EXPLAINED

Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings	
		% of Variance	Cumulative %	Total	% of Variance
1	6.933	49.525	49.525	6.933	49.525
2	2.845	20.321	69.845	2.845	20.321
3	.826	5.899	75.745		
4	.722	5.160	80.905		
5	.483	3.449	84.354		
6	.466	3.329	87.683		
7	.357	2.553	90.236		
8	.291	2.079	92.316		
9	.253	1.805	94.121		
10	.230	1.641	95.762		
11	.187	1.337	97.099		
12	.164	1.169	98.268		
13	.142	1.013	99.281		
14	.101	.719	100.000		

Based on the analysis results, two factors are formed because there are two components whose Eigenvalues are more than 1, so the results of the analysis form 2 factors.

F. Factor matrix dan Rotated Factor Matrix

This study uses a varimax rotation, which forms a correlation of dominant items on only one factor. Item correlations are made close to the absolute values of 1 and 0 for each factor, so the interpretation of dominant indicators can be made more quickly. To interpret and determine the distribution of indicators into new factors based on each item's highest factor loading value, marked with a yellow background color in the table below. Indicators with factor loading > 0.3 have a weak contribution to the new factor.

TABLE IV. ROTATED COMPONENT MATRIX

Code	Component 1	Component 2
TOTAL EOU	0,622	0,105
TOTAL TR	0,853	0,048
TOTAL PR	0,801	0,119
TOTAL SO	0,827	0,084
TOTAL MS	0,846	0,038
TOTAL PO	0,869	0,194
TOTAL PL	0,884	0,262
TOTAL RV	0,736	0,157
TOTAL RS	0,693	-0,011
TOTAL IQ	0,763	0,196
TOTAL TC	0,023	0,895
TOTAL EN	0,118	0,928
TOTAL OR	0,190	0,843
TOTAL TY	0,169	0,908

The interpretation of the distribution of variables on the new factors according to the table 4 above is as follows:

The first factor consists of ten variables. The first variable is Ease of Use, with a loading value of 0.622. The second variable is Trust, with a loading value of 0.853. The third variable is the Product with a loading value of 0.801. The fourth variable is Service Operation, with a loading value of 0.827. The fifth variable is Marketing and Sales, with a loading value of 0.846. The sixth variable is the Payment Option, with a loading value of 0.869. The seventh variable is the Platform, with a loading value of 0.884. The eighth variable is Product Reviews, with a loading value of 0.736. The ninth variable is Perceived risk, with a loading value of 0.693. The tenth variable is Information Quality, with a loading value of 0.763, So this factor is named the seller's Trust in the e-marketplace.

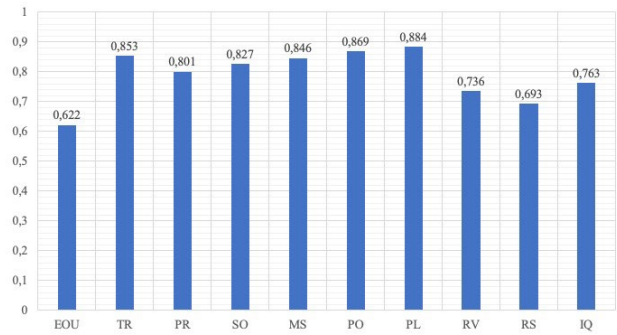

Figure 1. Factor Loading Value of Seller Trust in e-marketplaces

The second factor consists of four variables. The first variable is Technical, with a loading value of 0.895. The second variable is Environmental, with a loading value of 0.925. The third variable is Organizational, with a loading value of 0.843. The fourth variable is Technology, with a loading value of 0.908, So this factor is named the seller's external support.

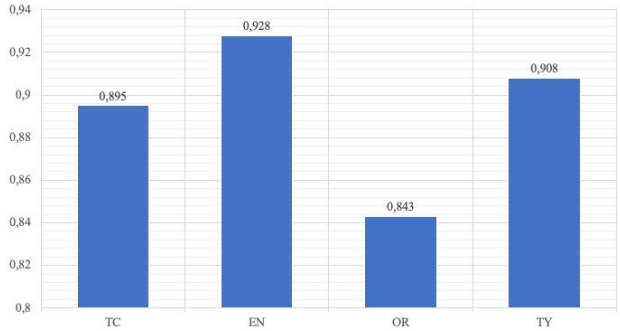

Figure 2. Seller's External Support Factor Loading Value

IV. Result and Discussion

Based on the results of the research that has been done, two factors can attract sellers to choose e-marketplaces as a place to market their products. These two factors are a grouping of 14 factors in the selection of e-marketplaces by sellers to market their products. All factors have a factor loading above 0.3, which means that all factors contribute to the selection of e-marketplaces by sellers to market their products. The most dominant factor in selecting e-marketplace sellers to market their products to e-marketplace sites comes from environmental factors, with a loading value of 0.928. This environment is a factor related to Industry Structure, Government Support, Competitors, and Partner Readiness which is a consideration for sellers in choosing e-marketplaces to market their products. Sellers, in choosing e-marketplaces, consider e-marketplaces that get support from other industries, such as the technology, finance, and logistics industries. In addition, sellers also consider e-marketplaces that have received support from the government as a place to market their products. Another consideration in selecting e-marketplaces by sellers is the large number of other sellers who sell similar products on e-marketplaces and partners in developing their business through e-marketplaces. The next factor is the Technology owned by the e-marketplace, which has a loading value of 0.908. This factor is supported by indicators of the latest features and Technology that e-marketplaces have, as well as application features that other e-marketplaces do not have. This technology factor becomes very important for sellers when choosing an e-marketplace to market their products. The next factor is Technical, with a loading value of 0.895. Indicators of Internet-related Technology and e-commerce Cost support this factor. This technical factor becomes very important for sellers selecting e-marketplaces to market their products because e-marketplaces must be used anywhere through internet technology. In addition, sellers also consider operational costs incurred in selecting e-marketplaces.

The next factor is the Platform, with a loading value of 0.884. This factor is supported by indicators User friendly, Mobile, user segmentation, Reliability, Integrity, Website performance, Flexibility, and Number of users. The e-marketplace platform is a consideration for sellers in choosing an e-marketplace to market their products because the e-marketplace platform must be easy to use or operate, then can be accessed via mobile devices or cell phones. In addition, the e-marketplace platform has a customer mapping feature as a consideration in selling products. Sellers also consider an e-marketplace platform that is reliable and stable in transactions, has good integrity, can be accessed via the web, is flexible, and has many users who join the e-marketplace platform. The next factor is the Payment Channel, with a loading value of 0.869. Indicators of Credit card service, Cash on delivery, Bank transfers, and e-wallets support this factor. Payment channels provided by e-marketplaces are a consideration for sellers in choosing e-marketplaces to market their products because e-marketplaces provide payment channels as a tool to make it easier for sellers and buyers to make payments. E-marketplaces that can provide payment methods are credit cards, Cash on delivery, bank transfers, and e-wallets.

The next factor is Trust, with a loading value of 0.853. Privacy, Transaction, Information Quality, and Service Quality Indicators support this factor. Seller trust in e-marketplaces is essential in selecting e-marketplaces to market their products. The e-marketplace must guarantee the confidentiality of the seller's personal information and guarantee the seller's security in the transaction; the information provided by the e-marketplace must be of good quality, and the e-marketplace must provide good quality transaction services. Because the confidentiality of personal information and security guarantees in transactions are essential for sellers and buyers in the process of buying and selling transactions through e-marketplaces. The next factor is Marketing and Sales, with a loading value of 0.846. Discount indicators, Product specification information, and brand image support this factor. Marketing and Sales provided by e-marketplaces is an essential factors for sellers in selecting e-marketplaces to market their products. Price discounts given to customers are reasons for sellers to market their products through e-marketplaces. In addition, the information features of precise product specifications and personal branding owned by e-marketplaces are why seller`s market their products through e-marketplaces. The next factor is Organizational, with a loading value of 0.843. Financial resource indicators, top management support, technical expertise, the perceived value of e-commerce, and employee knowledge support this factor. In choosing e-marketplaces to market their products, sellers also consider organizational factors. Sellers consider financial resources originating from internal organizations, management support, understanding of using e-marketplaces, using e-marketplaces can provide benefits over selling offline, and understanding of employees using e-marketplace applications. The next factor is Service Operation with a loading value of 0.827. This factor is supported by service quality indicators, Support/help desk, feedback, and Delivery service. The services provided by e-marketplaces are a factor for sellers in choosing e-marketplaces to market their products. Good service quality and assistance services from e-marketplaces can provide convenient transactions between sellers and buyers.

The next factor is the Product with a loading value of 0.801. Indicators of Quality, Price transparency, and Price competitiveness support this factor. Products promoted through

e-marketplaces are quality products and are in demand by customers, which is one of the reasons sellers choose e-marketplaces to market their products. The transparency of product prices and competitive product prices provided by e-marketplaces is why sellers choose e-marketplaces. The next factor is Information Quality, with a loading value of 0.763. This factor is supported by Feedback and Notifications. E-marketplace has a list of questions and answers frequently asked by users. It has notifications for the latest notifications, which is why sellers choose e-marketplaces to market their products. The next factor is Product Reviews with a loading value of 0.736. Product reviews on e-marketplaces are one of the reasons sellers choose e-marketplaces to market their products. Because the product reviews provided by buyers can be used as a reference for sellers to find out the products that buyers are interested in on the e-marketplace. The next factor is Perceived risk, with a loading value of 0.693. E-marketplaces provide complaint facilities if the Product the buyer purchases differs from what is expected. The last factor is the Ease of Use with a loading value of 0.622. This factor is supported by Ease of use, navigation, and features. Ease of use, navigation, and features in e-marketplaces are reasons sellers choose e-marketplaces to market their products.

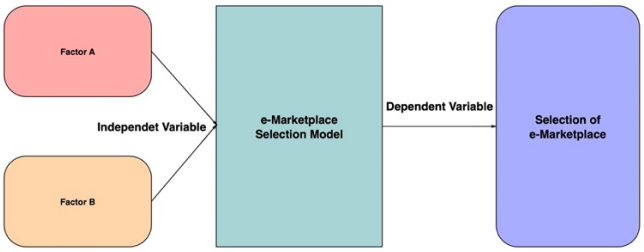

Figure 3. An overview of the e-marketplace selection model

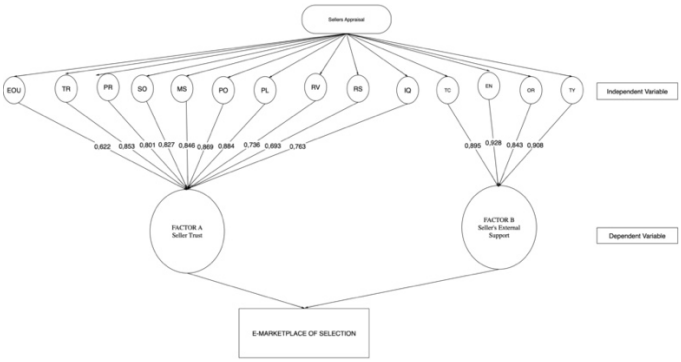

Figure 4. Proposed models selection e-Marketplace

Formed is with the input of two factors, namely factor A (Seller's Trust in the e-marketplace) and factor B (Seller's External Support). Both of these factors become input based on the assessment of the seller. Then the e-marketplace selection model will find e-marketplaces that match the factors inputted by the seller, resulting in the output of e-marketplace selection by the seller.

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Based on the research that has been done, two new factors have been found that can attract sellers to market their products to e-marketplace sites. These factors are factor A (Seller's Trust in the e-marketplace) and factor B (Seller's External Support). These two factors have 14 variables that attract sellers to market their products through e-marketplaces. Factor A (Seller's Trust in the e-marketplace) -marketplace) supported by Ease of Use (EOU), Trust (TR), Product (PR), Service Operation (SO), Marketing and Sales (MS), Payment Channel (PO), Platform (PL), Product Reviews (RV), Perceived Risk (RS) and Information Quality (IQ) while factor B (Seller's External Support) is supported by Technical (TC), Environmental (EN), Organizational (OR) and Technology (TY) variables. Attracting sellers to market their products to the e-marketplace site comes from environmental factors. In choosing an e-marketplace, sellers consider e-marketplaces that have support from other industries, such as the technology, finance, and logistics industries. In addition, sellers also consider e-marketplaces that have received support from the government as a place to market their products. Another consideration in selecting e-marketplaces by sellers is the large number of other sellers who sell similar products on e-marketplaces and partners in developing their business through e-marketplaces.

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