# Determining the Factors that Influence e-Marketplace Selection from Seller's Perspective Using a Binary Logistic Regression Model

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## ABSTRACT

The rapid development of information and communication technology influences changes in aspects of life in the economic sector. The application of information and communication technology supports business development. The development of the internet has become a technology that makes business activities such as marketing and sales easier. The growth of internet users in Indonesia reached 78% of the total population. E-commerce users in Indonesia reach 34.10% of all business people in Indonesia. One place to sell online is through e-marketplace. Many e-marketplaces require sellers to select e-marketplaces as a place to sell their products online. Each e-marketplace has different characteristics, so you must consider many factors when choosing an e-marketplace. In this research, it is known that two factors are formed based on factor analysis, namely the Product Quality Factor, the Service and Quality Factor, and the System Factor. In addition, the market selection model was determined using binary logistic regression analysis. The model formed in this research is the e-marketplace selection model Tokopedia, Shopee, and Lazada. Based on the results of the feasibility model using binary logistic regression, it produces an overall e-marketplace selection model with an accuracy level of 76.13%. This evaluation model can be used by sellers who want to choose a market that suits the products offered to increase profits.

**Keywords:** factor, selection, e-marketplace, binary, logistic, regression

## 1. Introduction

The rapid development of information technology and the internet has given rise to innovations related to technology and the internet. Electronic commerce kn, known as an e-marketplace, is one of the innovations from the development of technology and the internet. E-marketplace is a place for buying and selling or exchanging goods, services and information using computer network media (Turban et al., 2018) . E-marketplace platforms available in Indonesia include Shopee, Tokopedia, Blibli, Lazada, and Bukalapak. E-marketplaces are a new opportunity for sellers to market and sell products online without needing to invest in a sales platform or have knowledge of legal aspects (Kawa, 2019). Each e-marketplace has different characteristics, so sellers must be selective in choosing an e-marketplace to market their products (Arif et al., 2020; Marlinda et al., 2020). Key factors in choosing an e-marketplace become successful in determining an e-marketplace. Factors that influence e-

marketplace selection are trust, technical, platform, platform owner, product, service operations, sellers, marketing and sales, payment channels, buyers, and environment (Prihastomo et al., 2018).

Factor analysis is a multivariate statistical procedure commonly used to reduce many variables or factors into smaller sets. Additionally, factor analysis can determine the underlying dimensions between measured factors and latent constructs, thereby enabling theory building and refinement (Taherdoost et al., 2022). Factor analysis determines the relationship between many variables by defining a collection of related variables or factors (Hair Jr et al., 2010).

Choosing the right e-marketplace for sellers can influence sales profits (Rofin & Mahanty, 2021). Factor analysis is to form a model that helps sellers choose e-marketplaces to sell online. Sales and marketing through available e-marketplace platforms have several advantages, including market exposure, worldwide sales reach, and lower operational costs (Rerung, 2018). E-marketplace platforms available in Indonesia include Shopee, Tokopedia, Blibli, Lazada, and Bukalapak. The large number of e-marketplace options available makes sellers consider various factors when selecting an e-marketplace. Based on research (Chong et al., 2018), sellers can consider the following factors in choosing an e-marketplace: information quality, product quality, price transparency, service quality, and user-friendly platforms. Sellers need to pay attention to these factors because they are known to improve the performance of Small and Medium Enterprises that use e-marketplaces for online transactions.

Based on research by (Andarwati et al., 2020; Sundjaja et al., 2021; Tran & Nguyen, 2020) sellers choose e-marketplaces to market their products because of the ease of use, then based on the research (Babenko et al., 2019; Chang et al., 2020; Falahat et al., 2019; Hatammimi & Purnama, 2022; Prihastomo et al., 2018; Xiao, 2018) Trust is one of the reasons sellers choose e-marketplaces to sell online. Research conducted by (Babenko et al., 2019; Chong et al., 2018; Hatammimi & Purnama, 2022) the product to be sold is the reason for the seller to choose the e-marketplace as a place to market the product, based on the research of (Candraputri et al., 2020; Hatammimi & Purnama, 2022; Svatosova, 2020) The reason sellers choose e-marketplaces to sell online is the service operations provided by e-marketplaces. Based on these data, several main factors must be considered by sellers in choosing an e-marketplace to sell product online, including ease of use, trust, product, and service operations.

## Literatur Review

### E-Marketplace

Very dynamic technological developments are also the main driver of increasing e-commerce potential in Indonesia. The growth of e-commerce services can significantly support the recovery of the economic sector due to the pandemic. This digital trade is also very appropriate and helpful if you look at the geographical conditions of Indonesia, which has thousands of islands and their uneven distribution. In addition, e-commerce can save promotional costs and increase transaction speed. This will help sellers start their businesses because of the high costs of promoting new stores. Through e-commerce, sellers can access a broader market so that consumers will more easily recognize their products (Taher, 2021).

### Selection of E-Marketplace

Selecting e-marketplace that suits the target consumer is one step toward increasing the seller's profits. An approach regarding the selection of appropriate e-commerce can provide advice for sellers in compiling and suggesting competitive marketing strategies and can allocate limited resources to obtain maximum profits (Sahel et al., 2018).

### Factor Analysis

*Factor analysis* is a multivariate statistical method used to explain the relationship between several variables that are mutually independent of one another. Factor analysis reduces many variables or factors into a smaller set. Generally, factor analysis is used in information systems, social sciences, psychology, business, and education which are considered approaches to interpreting surveys (Taherdoost et al., 2022). Factor analysis is a statistical method used to collect types of validity evidence in research. Factor analysis helps researchers explore or confirm relationships between questionnaire items and identify the total number of dimensions represented (Knekta et al., 2019).

## 2. Research Method

Formation of a model for selecting a e-marketplace in this study uses the Confirmatory Factor Analysis method using the IBM SPSS 25. In this study, there are 14 variables used, namely ease of use, trust, product, service operation, marketing and sales, payment channel, platform, product reviews, perceived risk, information quality technical, environmental, organizational and technology. 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. Indicators with factor loading > 0.3 have a weak contribution to the new factor. Binary logistic regression is a statistical method used to analyze the relationship between one or more independent variables and a binary dependent variable. The analysis of binary logistic regression involves several stages commonly undertaken to understand the relationship between independent variables and a binary dependent variable (two categories). The following are the common stages in the analysis of binary logistic regression:

1. Identify multicollinearity with the value of Variance Inflation Factor (VIF).
2. Perform concurrent tests using the Likelihood Ratio Test to see if the independent variable simultaneously affects the dependent variable.
3. Perform a partial test using the Wald test to see which independent variables significantly affect the dependent variable.
4. Conduct a model suitability test using Hosmer-Lemeshow Goodness of Fit to find out whether the model formed is suitable or not with the data used.
5. Output insignificant variables and shape the model until it meets the test in steps 2-4.
6. Perform binary logistic regression analysis modeling
7. Selecting the best model by comparing the AIC value of each model formed
   Calculate the best model misclassification using APER.

## 3. Result and Discussion

After knowing the factors that form several two factors, the next step is to determine each variable that goes into these factors. Determining variables into the formed factors can be seen in the Component Matrix table.

**Table 1. Component Matrix table**

| Variabel | Component | |
|---|---|---|
| | 1 | 2 |
| Ease of use | 0.679 | -0.182 |
| Trust | 0.795 | -0.181 |
| Product | 0.744 | -0.176 |
| Service Operation | 0.806 | -0.208 |
| Marketing and Sales | 0.745 | -0.276 |
| Payment Channel | 0.757 | -0.153 |
| Platform | 0.893 | -0.135 |
| Product Reviews | 0.733 | -0.227 |
| Perceived Risk | 0.632 | -0.183 |
| Information Quality | 0.772 | -0.068 |
| Technical | 0.657 | 0.425 |
| Environmental | 0.648 | 0.565 |
| Organizational | 0.564 | 0.603 |
| Technology | 0.619 | 0.577 |

Based on the table above, each formed factor cannot be interpreted clearly, so it is necessary to do a varimax rotation. *Varimax rotation* is an orthogonal rotation to clarify the variables included in certain factors (Ghozali, 2018). The following is a Component Matrix table that has been rotated using the varimax method.

**Table 2. Matrix Rotation Results**

| Variable | Component | | Factor |
|---|---|---|---|
| | 1 | 2 | |
| Ease of use | 0.675 | 0.197 | 1 |
| Trust | 0.773 | 0.258 | 1 |
| Product | 0.727 | 0.236 | 1 |
| Service Operation | 0.796 | 0.241 | 1 |
| Marketing and Sales | 0.780 | 0.151 | 1 |
| Payment Channel | 0.726 | 0.262 | 1 |
| Platform | 0.833 | 0.349 | 1 |
| Product Reviews | 0.744 | 0.187 | 1 |
| Perceived Risk | 0.635 | 0.172 | 1 |
| Information Quality | 0.695 | 0.344 | 1 |
| Technical | 0.340 | 0.704 | 2 |
| Environmental | 0.260 | 0.819 | 2 |
| Organizational | 0.168 | 0.809 | 2 |
| Technology | 0.228 | 0.815 | 2 |

## Interpretation of Formed Factors

Two factors are formed based on the factor analysis results, which can then be interpreted or named according to the variables formed in these factors.

**Table 3. Factor Interpretation**

| Variable | Loading Factor Value | Factor |
|---|---|---|
| Ease of use | 0.675 | Product & Service Quality |
| Trust | 0.773 | |
| Product | 0.727 | |
| Service Operation | 0.796 | |
| Marketing and Sales | 0.780 | |
| Payment Channel | 0.726 | |
| Platform | 0.833 | |
| Product Reviews | 0.744 | |
| Perceived Risk | 0.635 | |
| Information Quality | 0.695 | |
| Technical | 0.704 | System and Organizational Quality |
| Environmental | 0.819 | |
| Organizational | 0.809 | |
| Technology | 0.815 | |

Factor 1, which consists of the variables ease of use, trust, product, service operation, marketing and sales, payment channel, platform, product reviews, perceived risk, and information quality, is named the Product and Service Quality Factor. In contrast, factor 2 comprises technical, environmental, organizational, and technological variables named System and Organizational Quality Factors.
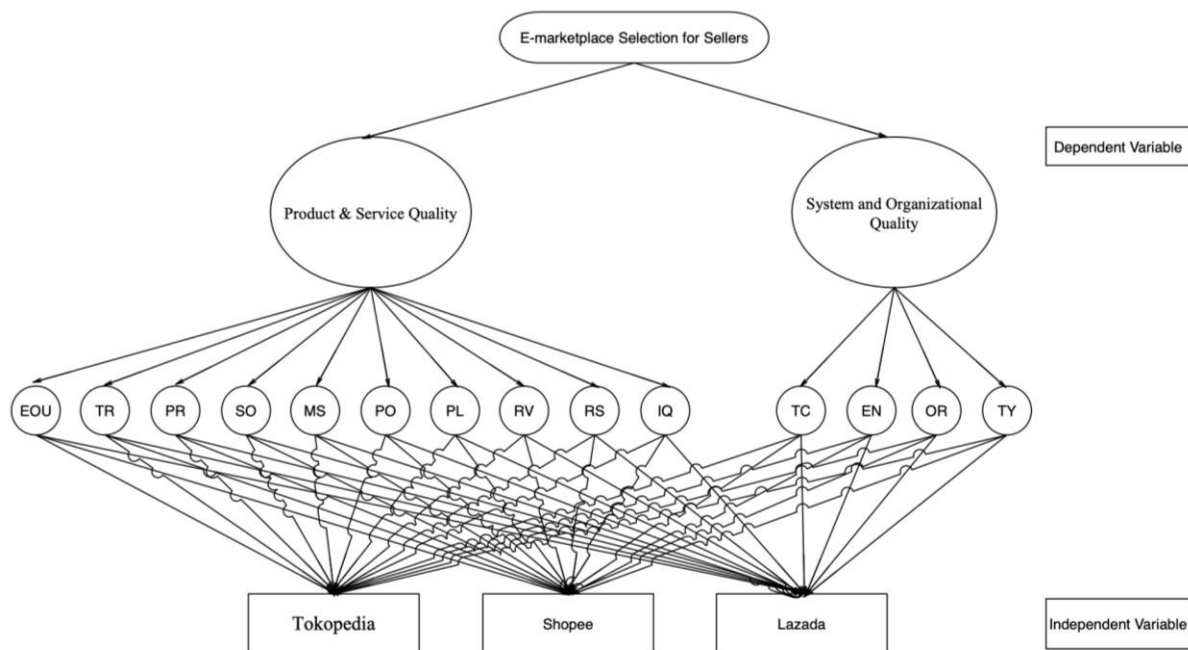
**Figure 1. Proposed models selection e-Marketplace from the seller's perspective**

## Binary Logistics Model in E-Marketplace

The binary logistic regression model aims to determine the factors influencing the selection of e-marketplaces in Indonesia. The dependent variable, i.e., e-marketplace encoded with 1, is Tokopedia, and 0 is another e-marketplace. The e-marketplaces used in this study are influenced by ease of use, trust, product, service operation, marketing and sales, payment channel, platform, product reviews, perceived risk, information quality, technical, environmental, organizational, and technology. The first stage that must be carried out is the detection of multicollinearity. The assumption that must be met in binary logistic regression is no multicollinearity. This detection can be done by looking at the Variance Inflation Factors (VIF) value. If the value of VIF is greater than 10, then there is multicollinearity in the variable. Here are the results of multicollinearity.

**Table 4. Results of multicollinearity test**

| Variable | VIF |
|----------|----------|
| X1.1 | 1.577979 |
| X1.2 | 2.487781 |
| X1.3 | 2.551722 |
| X1.4 | 2.745715 |
| X1.5 | 2.373742 |
| X1.6 | 2.933881 |
| X1.7 | 5.285871 |
| X1.8 | 2.589472 |
| X1.9 | 1.524198 |
| X1.10 | 2.535275 |
| X2.1 | 2.260333 |
| X2.2 | 2.247196 |
| X2.3 | 1.849407 |
| X2.4 | 2.256512 |

**Table 5. Parameter Estimation Results for Binary Logistic Model**

| Model Tetsing | The Test Simultaneously | The e-Marketplace Model | The Hosmer and Lemeshow tests | The Akaike Information Criterion |
|---|---|---|---|---|
| Model 1 | 23.68479 | $g(x) = 6.6631 - 2.7991X_{1.3} + 2.2972X_{1.8}$ | 21.66 | 452.6326 |
| Model 2 | 22.36203 | $g(x) = 6.5420 - 2.7946X_{1.3} - 3.5220X_{1.7} + 2.2955X_{1.8}$ | 21.64 | 450.6487 |
| Model 3 | 21.02607 | $g(x) = 6.6954 - 2.80576X_{1.3} - 3.5892X_{1.7} + 2.2878X_{1.8}$ | 18.33 | 448.6700 |
| Model 4 | 19.67514 | $g(x) = 6.6402 - 2.8430X_{1.3} - 3.3765X_{1.7} + 2.3429X_{1.8}$ | 16.174 | 446.7285 |
| Model 5 | 18.30704 | $g(x) = 7.6138 - 2.7925X_{1.3} - 3.3945X_{1.7} + 2.2868X_{1.8}$ | 10.005 | 445.1516 |
| Model 6 | 16.91898 | $g(x) = 7.4638 - 2.8438X_{1.3} - 3.5971X_{1.7} + 2.2937X_{1.8}$ | 9.1012 | 443.5457 |
| Model 7 | 15.50731 | $g(x) = 7.5510 - 2.5167X_{1.3} - 3.1698X_{1.7} + 2.3973X_{1.8}$ | 12.603 | 442.5060 |
| Model 8 | 14.06714 | $g(x) = 7.5213 - 2.4539X_{1.3} + 2.5757X_{1.8}$ | 13.639 | 441.5589 |
| Model 9 | 12.59159 | $g(x) = 7.5889 - 2.3852X_{1.3} - 2.9266X_{1.7} + 2.2177X_{1.8}$ | 7.801 | 441.1811 |

Based on the test results above, it can be seen. This means that if accepted, the model used is in accordance with the data. Based on the nine models formed, the best model was chosen to predict the selection of the best e-marketplace in Indonesia. Selection of the best model based on the value of *the Akaike Information Criterion* (AIC). AIC is a method that can be used to select the best regression model discovered by Akaike and Schwarz. According to the AIC method, the best regression model is the regression model that has the smallest AIC value. Based on the output above, it can be seen that the model with the smallest AIC is the "Model 9," with an AIC value of 411.1811. After obtaining the best model, it is evaluated for classification accuracy. This classification accuracy is used to determine the feasibility of a model by indicating the percentage of correct classifications.

**Classification Accuracy**

**Table 6. Classification Accuracy for Binary Logistic Regression Model**

| E-Marketplace | Prediction | |
|---|---|---|
| | Other E-marketplace (0) | Tokopedia (1) |
| Other E-marketplace (0) | 298 | 2 |
| Tokopedia (1) | 93 | 5 |

Based on the classification table above, 298 observations have an e-marketplace value equal to 0 and are predicted as 0 by the model. 2 observations have an e-marketplace value equal to 0 but are predicted as one by the model. Then 93 observations have an e-marketplace value equal to 1 but are predicted as 0 by the model, and five observations have an e-marketplace value equal to 1. They are predicted as one by the model.

$$APER = \frac{number\ of\ incorrect\ predictions}{total\ number\ of\ predictions} \times 100\%$$

$$= \frac{n_{12} + n_{21}}{n_{11} + n_{12} + n_{21} + n_{22}} \times 100\%$$

$$= \frac{2 + 93}{298 + 2 + 93 + 5} \times 100\%$$

$$= 0.2387$$

The percentage of classification error rate (accuracy) with the *Average Percentage Error* (APER) method in the binary logistic regression model is 23.87%, so the percentage value of classification

accuracy is obtained. Then, the accuracy of classification was calculated to be equal to or equal to 76.13%.

The binary logistic regression model aims to determine the influence between factors that influence the selection of e-marketplaces in Indonesia. After forming 9 models to obtain the best model, the best model was obtained by removing several factors until the remaining six variables, namely ease of use (X1.1), product (X1.3), service operation (X1.4, platform (X1.7), product reviews (X1.8), and technology (X2.4). Through this model, it is known that the seller's selection of e-marketplace is influenced by product, platform, and product reviews. Based on this model, 3 significant variables were obtained in the e-marketplace selection model, namely product, platform, and product reviews. The model has a classification accuracy of 76.13% which means indicating that the binary logistic regression model is suitable for predicting e-marketplace selection in Indonesia. In this model, e-marketplace selection is influenced by product, platform, and product review factors.

## 4. Conclusion

This study analyses binary logistic regression for overall e-marketplace selection. Based on this model, the model feasibility was obtained at 76.13%. These results indicate that the binary logistic regression model is suitable for predicting e-marketplace selection in Indonesia. In this model, e-marketplace selection is influenced by product, platform and product reviews.

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