The Evaluation of E-Commerce Using the Customer Satisfaction Index and Importance Performance Analysis

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***Abstract*— The challenges of e-commerce development pressure every company to develop the appeal of the company's business processes, which will impact high business revenue. Evaluation is essential for a company to improve the assessment of the company's products. The purpose of this study is to evaluate the use of e-commerce applications from people's perspectives and perceptions by specifically identifying indicators that have or have not met user expectations in using them. This study is quantitative research. The variables are attributes of service used derived from the Delone & Mclean model. The measurement of user satisfaction level is done using the Customer Satisfaction Index. The data analysis method used is the Importance Performance Analysis (IPA), done by comparing the level of importance and the level of service performance felt by users. The satisfaction index result obtained by the Shopee application is Very Satisfied with a value of 80.23 %, the Tokopedia application obtained a satisfaction index of Satisfied with a value of 78.58%, and the Bukalapak application's satisfaction index is also Satisfied with a value of 73.22%. Importance Performance Analysis (IPA) methods are used to acquire the knowledge of user satisfaction level regarding any factors impacting the e-commerce application's performance level in meeting user satisfaction. The result obtained by the Shopee application for the IPA method is the absence of variables going into the leading priority quadrant. In contrast, the Tokopedia application has four variables, and the Bukalapak application has five variables in the central priority quadrant.**

Keywords*— *Customer Satisfaction Index, Importance Performance Analysis, E-commerce

I. INTRODUCTION

E-commerce or electric commerce is the process of buying, selling, and marketing goods, services, and information via the internet network using an electronic system [1]. The utilization of information and communication technology using the internet is a phenomenon called electronic commerce or e-commerce. This phenomenon is one of the utilization of information and communication technology in which buying and selling of goods or services are carried out via the internet. Online sales made by most businesses started in 2017 to 2018, which amounts to 45,31% [2]. According to the Central Bureau of Statistics, from 13,485 e-commerce businesses, the value of operating revenues from sales via the internet was 17.21 trillion, with a total of 24.82 million online sales transactions [2].

The growth of several e-commerce businesses is thriving rapidly every day, thus leading to intense competition between companies. Every company develops a different business appeal that can generate high revenue. According to the data extort from the website iPrice.co.id filtered based on the business model, it was found that Shopee, Tokopedia, and Bukalapak are ranked 1, 2, and 3 respectively in most web visits [3]. For the implementation of e-commerce company features in Indonesia to bring more significant advantages and maximize those features and the application performance, the organizers and developers need to improve the quality of the application, all in the service quality, system quality, and information quality. Of course, it must be done by paying attention and considering from the user experience perspective.

Several researchers had assessed the quality of Shopee; one of them is by using aspects found in the WebQual with usability, information quality, and service interaction dimensions [4]. Moreover, a researcher is assessing the usability quality of Tokopedia using McCall methods assessing three aspects, namely system, user, and interaction [5]. There is also a study on the quality assessment of Bukalapak using the E-S-QUAL methods on the efficiency, system availability, fulfillment, and privacy dimensions [6]. For these reasons, therefore, the author of this study continues the research related to the previous theme, which is evaluating the quality of the three e-commerce applications (Shopee, Tokopedia, and Bukalapak) and analyzing impacting factors in performance level to improve the quality with the interest of user perspective. The Delone & McLean model is used to measure the user experience perspective on e-commerce applications. Customer Satisfaction Index (CSI) is used to measure the overall level of user satisfaction. In discerning the factors impacting e-commerce applications' level of performance in fulfilling user satisfaction, the researcher used Importance Performance Analysis (IPA) methods, better known as quadrant analysis.

II. RESEARCH METHODS

A. Systematic of the Research

The researcher used the quantitative method since it is more systematic, planned, structured, and not influenced by conditions on the field. Quantitative research emphasizes the

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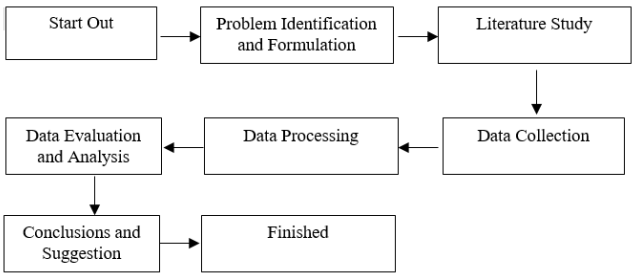
analysis of numeric data, which then be analyzed using the appropriate statistical method following the researcher's needs. The statistical test results present significance with inquire relations. Therefore, the direction of the relationship obtained depends on statistical tests, not scientific logic [7].



Graphic 1. Research Flow

The steps taken in the analysis started with identifying and formulating a research problem, followed by reading and finding literature for a reference regarding the method used, then collecting the data. Data collection is carried out by cleaning data (eliminating double data, etc.). The collected data was then tested for validity and reliability. When the data met the criteria, data processing of CSI and IPA methods implementation was carried out. The results were then analyzed and evaluated. Finally, the conclusion is drawn following the results obtained.

B. Delone & Mclean Model

Willian Delone and McLean are the successful Delone & McLean model using information system as framework and model to measure complex dependent variables [8].

C. Validity Test

A question is deemed valid if said question's score correlates significantly with the total score. Sugiyono (2010) states, "testing validity is done by correlating the score of each question with the total score."

The formula used to test instruments validity is Product Moment correlation, which is [9]:

The validity test formula can be seen in number (3.2)

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{\{N\sum X^2 - (\sum X)^2\}\{N\sum Y^2 - (\sum Y)^2\}}} \quad (3.1)$$

Description :

rxy = correlation coefficient of an instrument

N = number of respondents

X = score of an instrument

Y = total score

The result of r_xy is compared to the product-moment critical value (r_table). If the results obtained are r_xy > r_table, each tested instrument is valid; otherwise, the questionnaire needs to be revised. The r_table value is with the level of significance of 5%

D. Reliability Test

Said valid questions must then be assessed of their reliability. According to Suharsimi Arikunto (2006), "Reliability refers to an understanding that an instrument is reliable enough to be used as collection data tool since the instruments are acceptable". Reliability test id carried out using the Alpha Cronbach formula, with the provision of:

If r_11 (Cronbach's alpha) > 0.6, questionnaire questions are acceptable.

Reliability test formula can be seen in number (3.2), (3.4) and (3.5), which are[9]:

$$r_{11} = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum S_b^2}{S_t^2}\right) \quad (3.2)$$

$$S_b^2 = \frac{\sum X_i^2 - \frac{(\sum X_i)^2}{N}}{N} \quad (3.3)$$

$$S_t^2 = \frac{\sum Y_i^2 - \frac{(\sum Y_i)^2}{N}}{N} \quad (3.4)$$

Description:

r_11	= Reliability value
S_b^2	= Total variance of each item
S_t^2	= Total variance
k	= number of instrument
N	= number of respondent

E. Customer Satisfaction Index (CSI)

Customer Satisfaction Index (CSI) is the overall user satisfaction index by considering expectations and user interests to the service felt.

The formula for Customer Satisfaction Index method can be seen in number (3.5), (3.7), (3.8), (3.9) and (3.9).

Defining the Mean Importance Score (MIS)

$$MIS = \frac{\sum_{i=1}^{n} Y_i}{n} \quad (3.5)$$

$$\sum_{i=1}^{n} Y_i = Y_1 + Y_2 + Y_3 + \cdots + Y_n \quad (3.6)$$

Description:

n = number of respondent

Y_i = The sum of all variables from i to n atributs (all respondents)

i = importance value of i variable

- Defining Weight Factors (WF)

$$WF = \frac{MIS_i}{\sum_{i=1}^{n} MIS_i}\ x\ 100\% \quad (3.7)$$

$$\sum_{i=1}^{n} Mis_i = Mis_1 + Mis_2 + Mis_3 + \cdots + Mis_n \quad (3.8)$$

Description:

MIS_i = Mean *Importance* Score value of I variable

$\sum_{i=1}^{n} MIS_i$ = The sum of all Mean Importance Score value from i to n

- Defining Mean Satisfaction Score (MSS)

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$$MSS = \frac{\sum_{i=1}^{n} Xi}{n} \quad (3.9)$$

$$\sum_{i=1}^{n} X_i = X_1 + X_2 + X_3 + \cdots + X_n \quad (3.10)$$

Description:

n = number of respondent

X_i = The sum of interest value from i to n attributes.

- Defining *Weight Score (WS)*

$$Ws_i = WFi \; x \; MSS \quad (3.11)$$

Description:

WF_i = Weight Factor of i

MSS = Mean Satisfaction Score

Defining *Customer Satisfaction Index (CSI)*

$$CSI = \frac{\sum_{i=1}^{n} WSi}{HS} x \; 100\% \quad (3.12)$$

$$\sum_{i=1}^{n} WSi = WS_1 + WS_2 + WS_3 + \cdots + WS_n \quad (3.13)$$

Description:

HS = Maximum scale used

$\sum_{i=1}^{n} WSi$ $= The\ sum\ of\ WS\ value\ from\ i\ to\ n$

WT, which is the mean of WS

Table 1. Interpretation Criteria of Customer Satisfaction Index (CSI) Value

No	Index Value (100%)	Criteria
1	80% < satisfaction index ≤ 100%	Very Satisfied
2	60% < satisfaction index ≤ 80%	Satisfied
3	40% < satisfaction index ≤ 60%	Satisfied Enough
4	20% < satisfaction index ≤ 40%	Less Satisfied
5	0% < satisfaction index ≤ 20%	Not Satisfied

F. Customer Satisfaction Index (CSI)

The use of Importance Performance Analysis (IPA) in analyzing user satisfaction is ideal and appropriate.

The formula of Importance Performance Analysis can be seen in numbers (3.12), (3.13), and (3.14).

Calculating Level the Suitability Level

$$TKi = \frac{Xi}{Yi} x \; 100\% \quad (3.12)$$

Description:

TKi = Respondents' suitability level

Xi = Performance evaluation score

Yi = Interest evaluation score

Calculating the average score of importance and performance for each attribute

$$\bar{Y} = \frac{\sum Yi}{n} \qquad \bar{X} = \frac{\sum Xi}{n} \quad (3.13)$$

Description:

$\bar{Y}$ = Average score of importance level

$\bar{X}$ = Average score of performance level

n = Number of respondent

Calculating the average of the average scores of importance and performance for overall attributes

$$\bar{X} = \frac{\sum_{i=1}^{n} \overline{Xi}}{k} \qquad \bar{Y} = \frac{\sum_{i=1}^{n} \overline{Yi}}{k} \quad (3.14)$$

$$\sum_{i=1}^{n} \bar{X}_i = \overline{X_1} + \overline{X_2} + \overline{X_3} + \cdots + \overline{X_n} \quad (3.15)$$

$$\sum_{i=1}^{n} \bar{Y}_i = \overline{Y_1} + \overline{Y_2} + \overline{Y_3} + \cdots + \overline{Y_n} \quad (3.16)$$

Description:

k = Number of attributes

$\sum_{i=1}^{n} \overline{Xi} =$ The sum of average score of performance from attribute i to n

$\sum_{i=1}^{n} \overline{Yi}$ = The sum of average score of interest from attribute i to n

Cartesian Diagram

The result value of the average score of interest and performance level is inserted into a Cartesian Diagram divided into four quadrants.

Description of the quadrants is as follows [10]:

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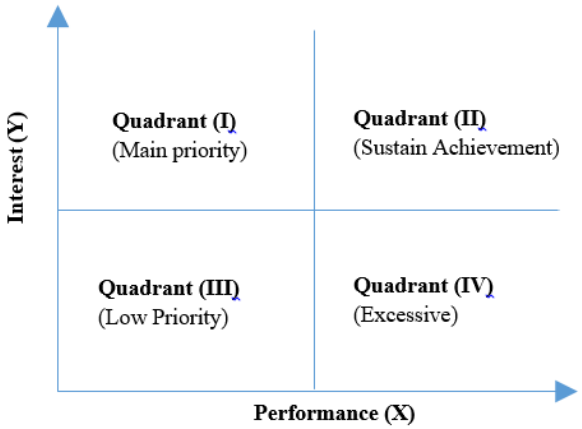

Graphic 2. IPA Cartesian Diagram

- Quadrant I (Main Priority)

The variables included in the quadrant show that the proposed attributes are to be improved because respondents consider them necessary.

- Quadrant II (Sustain Achievement)

The variables included in this quadrant show attributes considered necessary by the respondents and have high service quality.

- Quadrant III (Low Priority)

The variables in this quadrant show attribute that are below the average score of interest or performance level.

- Quadrant IV (Excessive)

Variables in this quadrant show below-average interest scores and above-average performance scores.

G. Sample

Population and research samples are needed to collect data. The use of overall value to determine the sample size in research is based on the Slovin formula, with a sampling error of 10%. The sample size taken using the Slovin formula is as follows [11]:

$$n = \frac{N}{N(e)^2+1} \qquad (3.17)$$

Description:

n = Sample size

N = Popolation size

E = Percentage of tolerable sampling error

The percentage of sampling error is 5 to 10%. This study admits 10% tolerable sampling error [12], derived from the Slovin formula using the above equation.

The population counting of this study is based on the data from play store with the category of the number of e-commerce application downloaders, namely n Shopee = 100000000, n Tokopedia = 50000000, and n Bukalapak = 10000000. Therefore, based on the Slovin formula's sample of Shopee, Tokopedia, and Bukalapak, there is a minimum of 100 respondents, respectively.

III. RESULTS AND DISCUSSION

A. Questionnaire Distribution

There are two questions on the distributed questionnaire, namely application performance and attribute of interest or statement from users. The questionnaire also uses Delone & McLean's variables and indicators. The table is as follows.

B. Data Collection

Data collection was carried out in two stages of testing. The first test was testing the accuracy of the measuring instrument (questionnaire statement) lest stated valid by the validity test. It is then followed by the second testing using the reliability tests to fathom how far the measuring instrument (respondent's answers) can be trusted. All testing was carried out by distributing questionnaires developed from indicators of every variable. The questionnaire was distributed online to hundreds of respondents. Data from questionnaire collected for Shopee = 124, Tokopedia =113, and Bukalapak =100.

C. Customer Satisfaction Index (CSI)

Calculation example for the Shopee application using variable number 1 is:

1. Interest average : $MIS_{S1} = \overline{Y_{S1}} = \frac{\sum Y_{S1}}{n} = \frac{5+4+5+5+4+\cdots+5}{124} = 4.34$
2. WF % = $\frac{MIS_{S1}}{\sum_{i=1}^{n} MIS_1} = \frac{4.34}{88} x\ 100\% = 4.93$
3. Performance average = $MSS = \overline{X_{S1}} = \frac{\sum X_{S1}}{n} = \frac{4+4+5+5+4+\cdots+4}{120} = 4.34$
4. WS = WF % x $\overline{X_{S1}} = 4.93\ x\ 4.35 = 21.43$

Tabel 2. The CSI Result of Shopee

No.	Variable	Average Level of Performance	No.	Variable	Average Level of Performance
1	S1	4.35	4.93	4.34	21.43
2	S2	4.22	4.84	4.26	20.41
3	S3	3.68	4.62	4.06	16.99
4	S4	3.68	4.59	4.04	16.88
5	S5	4.09	4.86	4.27	19.86
...	....	....	....	....	....
...	....	....	....	....	....

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No.	Variable	Average Level of Performance	No.	Variable	Average Level of Performance
21	N5	4.13	4.89	4.31	20.21
Total	88	401.17			

Index Value of Shopee Users Satisfaction with WT value of 401.17:

= (WT : maximum scale) x 100%

= (401.17 : 5) x 100%

= 80.23 %

The index value of user satisfaction acquired from Shopee application service of 80.23% is on a scale of 80% - 100%, meaning that Shopee application service is of Very Satisfied index.

Table 4.2 The CSI Result of Tokopedia

No.	Variable	Average Level of Performance	No.	Variable	Average Level of Performance
1	S1	4.03	4.71	4.25	21.43
2	S2	4.02	4.81	4.34	20.41
3	S3	3.90	4.79	4.32	16.99
4	S4	3.92	4.75	4.28	16.88
5	S5	4.04	4.84	4.36	19.86
...	....	....	....	....	....
...	....	....	....	....	....
21	N5	4.05	4.82	4.35	20.21
Total	90.10	392.88			

Index Value of Tokopedia Users Satisfaction with WT value of 392.88;

= (WT : maximum scale) x 100%

= (392.88 : 5) x 100%

= 78.58 %

The index value of user satisfaction acquired from Tokopedia application service of 78.58% is on a scale of 60% - 80%, meaning that Tokopedia application service is of Satisfied index.

Calculation example for the Bukalapak application using variable number 1 is:

1. Interest average: $MIS_{S1} = \overline{Y_{S1}} = \frac{\sum Y_{S1}}{n} = \frac{4+4+5+4+5+\cdots+5}{100} = 4.27$
2. WF % = $\frac{MIS_{S1}}{\sum_{i=1}^{n} MIS_1} = \frac{4.27}{89.89\ x\ 100} = 4.75$
3. Performance average = $MSS = \overline{X_{S1}} = \frac{\sum X_{S1}}{n} = \frac{4+4+5+4+5+\cdots+3}{100} = 3.63$
4. WS = WF % x $\overline{X_{S1}} = 4.75\ x\ 3.63 = 17.24$

Table 4.4 The CSI Result of Bukalapak

No.	Variable	Average Level of Performance	No.	Variable	Average Level of Performance
1	S1	3.63	4.75	4.27	17.24
2	S2	3.77	4.76	4.28	17.95
3	S3	3.63	4.76	4.28	17.28
4	S4	3.61	4.69	4.22	16.95
5	S5	3.67	4.72	4.24	17.31
...	....	....	....	....	....
...	....	....	....	....	....
21	N5	3.75	4.93	4.43	18.48
Total	89.89	366.12			

Index Value of Bukalapak Users Satisfaction with WT value of 366.12 :

= (WT : maximum scale) x 100%

= (366.12 : 5) x 100%

= 73.22 %

Based on the index value of user satisfaction acquired from the Bukalapak application service of 73.22 % is on a scale of 60% - 80%, meaning that the Bukalapak application service is of the Satisfied index.

D. Mistakes Importance Performance Analysis (IPA)

- Shopee

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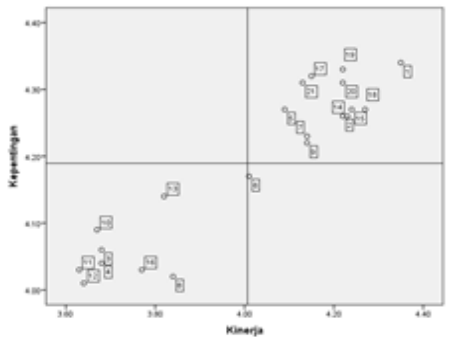
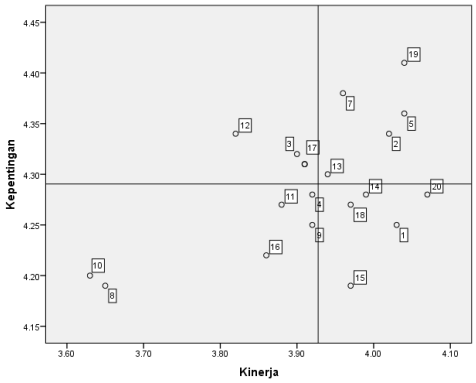


Graphic 3. Cartesian Diagram Results of Shopee

In the above picture, it is concluded that each variable covers all quadrants. It is indicated from the diagram that there are no variables that fall into the category of quadrant I (Main Priority).

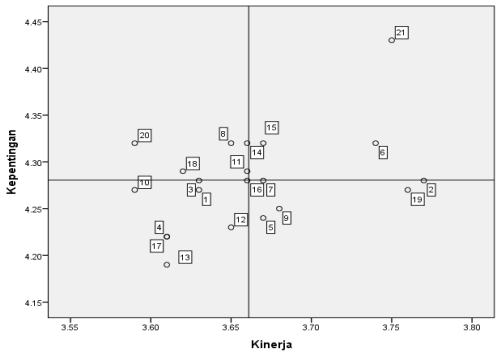
- Tokopedia



Graphic 4. Cartesian Diagram Results of Tokopedia

In the above picture, it is concluded that each variable covers all quadrants. Furthermore, those that fall into quadrant one of the main priorities for improving performance are S3, I1, C2, and N1 variables.

- Bukalapak



Graphic 5. Cartesian Diagram Results of Bukalapak

In the above picture, it is concluded that each variable covers all quadrants. Moreover, those fall into quadrant one, or the main priority are I3, C1, U1, N2, and N4 variables.

IV. CONCLUSION

The user satisfaction index based on Delone & McLean model approach and the Customer Satisfaction Index calculation for the Shopee application is Very Satisfied with a value of 80.23%. The satisfaction index for the Tokopedia application is Satisfied with a value of 78,58%. The satisfaction index for the Bukalapak application is Satisfied with a value of 73.22 %. Therefore, according to the satisfaction index value, Shopee is ranked first, while Tokopedia and Bukalapak ranked second and third, respectively.

Based on the Importance Performance Analysis (IPA) method using the Delone & McLean model approach from users' perception and perspective for Shopee application, there are no variables in quadrant one that falls into main priority. At the same time, there are four variables for said quadrant for Tokopedia application and seven variables for Bukalapak application.

REFERENCES

[1] D. I. G. H. Wirhan Fahrozi, Samsir, “Penerapan E-Commerce Pada Toko Bunga Underwear,” J. Tek. Inform., vol. 04, no. 01, pp. 1–6, 2020.

[2] Badan Pusat Statistik, Statistik E-Commerce 2019. 2019.

[3] IPrice, “Daftar 50 Website & Aplikasi E-Commerce di Indonesia 2019.” 2020, [Online]. Available: https://iprice.co.id/insights/mapofecommerce/.

[4] A. P. Ayudhitama and U. Pujianto, “Analisa Kualitas Dan Usability Berdasarkan Persepsi Pada Website Shopee,” J. Inform. Polinema, vol. 6, no. 1, pp. 61–70, 2019, doi: 10.33795/jip.v6i1.275.

[5] I. Ermis and A. A. Reformasi, “Analisa Usability Pengguna Website Tokopedia Menggunakan Metode Mccall,” Multinetics, vol. 5, no. 2, pp. 120–124, 2019, doi: 10.32722/multinetics.v5i2.2775.

[6] C. F. Safira, A. Kusyanti, and H. Aryadita, “Analisis Kualitas Layanan Website Bukalapak Terhadap Kepuasan Pengguna Menggunakan E-S-QUAL,” J. Pengemb. Teknol. Inf. dan Ilmu Komput., vol. 1, no. 12, pp. 1813–1821, 2017, [Online]. Available: http://j-ptiik.ub.ac.id.

[7] M. . Dr. Sandu Siyoto, SKM., M.Kes M. Ali Sodik, DASAR METODOLOGI PENELITIAN, 1st ed., vol. 5, no. 1. Sleman, Yogyakarta: Literasi Media, 2015.

[8] W. H. DeLone and E. R. McLean, "The DeLone and McLean model of information systems success: A ten-year update," J. Manag. Inf. Syst., vol. 19, no. 4, pp. 9–30, 2003, DOI: 10.1080/07421222.2003.11045748.

[9] I. P. A. A. P. I Gusti Agung Ngurah Trisna Jayantuka, “Panduan Penelitian Eksperimen Beserta Analisis Statistik dengan SPSS - I Putu Ade Andre Payadnya dan I Gusti Agung Ngurah Trisna Jayantika - Google Books,” Deepublish. 2018, [Online]. Available: https://books.google.co.id/books?hl=en&lr=&id=NaCHDwAAQBAJ&oi=fnd&pg=PR5&dq=uji+validitas+statistik&ots=1kcwQrfvDN&sig=ay7Do4SU78iCMeJUUXenQ66aVc0&redir_esc=y#v=snippet&q=product moment&f=false.

[10] T. Agustin, H. Nuryaman, and K. Kawalu, “Kinerja Kelembagaan Agribisnis Pepaya California,” Agristan, vol. 1, no. 2, pp. 106–116, 2019.

[11] N. Yunita, “FAKTOR-FAKTOR YANG MEMPENGARUHI TERHADAP PEROLEHAN INFORMASI NASABAH (STUDI BNI SYARIAH KOTA BOGOR),” J. Ilm. Perbank. Syariah, vol. 6, no. 1, pp. 1–30, 2020.

[12] Wirdha Purnomo dan Dyah Riandadar, “ANALISA KEPUASAN PELANGGAN TERHADAP BENGKEL DENGAN METODE IPA (IMPORTANCE PERFORMANCE ANALYSIS) DI PT . ARINA PARAMA JAYA GRESIK,” JTM, vol. 03, no. 03, pp. 54–63, 2015.

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