

THE EFFECT OF INFORMATION QUALITY AND INNOVATION ON CUSTOMER LOYALTY MEDIATING BY CUSTOMER SATISFACTION

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Abstract: This study aimed to analyze the effect of information quality and innovation on customer loyalty through customer satisfaction as a mediating variable for Tokopedia users. Increasing customer satisfaction will certainly have an impact on increasing customer loyalty thus this is the desire of every business person. The sampling technique used was accidental sampling with a total of 200 respondents—using the Roscoe method. Data collection was carried out by using a questionnaire. The exogenous variables were Information Quality and Innovation, while the endogenous variables were Customer Satisfaction and Customer Loyalty. The analytical tool used in this study was Structural Equation Modeling (SEM). The test results show that Information Quality and Innovation have a significant positive effect on Customer Satisfaction. Likewise, Information Quality and Innovation have a significant positive effect on Customer Loyalty. Furthermore, Customer Satisfaction also has a significant positive effect on Tokopedia Customer Loyalty in Pekanbaru.

Keywords: Information Quality, Innovation, Customer Satisfaction, Customer Loyalty, Structural Equation Modeling

1. Introduction

Nowadays, shopping online has become a habit for customers so many merchants of goods or services use e-commerce business techniques. Tokopedia is one of the largest e-commerce websites in Indonesia, owned and run by PT Tokopedia. According to the data obtained by (Iqbal, 2021) it is shown that Tokopedia is ranked first when viewed from the brand popularity index. However, the high popularity of Tokopedia brand does not have much influence on customer loyalty to use Tokopedia. From 2013-2016, it was found that Tokopedia's market share decreased every year. Nationally, the ranking of Tokopedia website visitors has also decreased. Meanwhile, according to the study conducted by (Akbar, 2017) on the level of usability which consists of *learnability*, *efficiency*, *memorability*, *errors* and *satisfaction* on Tokopedia, Shopee and Bukalapak websites—the data show that in the *learnability* component (level of convenience), these three websites have no problems. Next, in the efficiency component, Shopee website has the best level of efficiency. After that, in the memorability component, these three websites also have no problem. Then, in the errors component, Tokopedia website has the least number of complaints. Finally, in the satisfaction component, Tokopedia website has the highest satisfaction score. With this data, Tokopedia

is superior in the aspect of Information Quality as well as in application rating assessment—in which, this assessment is a form of customer satisfaction in using Tokopedia.

Customer complaint data are related to the information system on Tokopedia in responding to customers using a bot system, which causes customers to give a low rating or assessment to Tokopedia. This assessment is one indicator used to assess customer satisfaction. In this case, Tokopedia has experienced problems in the Features factor—in which, this is one of the factors that determine customer satisfaction (Pujani, 2011). If the customers are not satisfied, they may not use Tokopedia again to fulfill their needs. This is supported by the study of (Setyaningsih, 2017) in which the data obtained reveal that satisfaction and trust have a significant effect in increasing customer loyalty. Therefore, satisfaction is very influential in increasing customer loyalty, whether in the form of regular repeat purchases, recommending Tokopedia or showing the advantages of Tokopedia.

Information system is a combination of system and information quality. Information quality is information about products or services that have been provided by the website or the seller—with clear and complete product information through a well-designed system, Information Quality can have an effect on customer satisfaction. This is supported by the studies of (Patma et al., 2021; Wahyudi et al., 2015) in which the data obtained reveal that information quality and service quality have a significant effect on online shopping customer satisfaction, while system quality does not. However, according to the study of (Kartikasari, 2017) information quality and interaction service quality have no significant effect on satisfaction. If the customers are satisfied in using the online shop, a customer loyalty phase will be formed so those customers will repurchase products at the same place. It is supported by the study of (Palma & Andjarwati, 2016) in which the data obtained reveal that Information Quality (product quality and convenience) has a significant effect on repurchase intentions (loyalty).

Innovation is a theoretical concept or design proposed to form a new idea or concept that can improve business, competitiveness and customer service. According to the data reported by (Dipa, 2020), it is shown that in April 2020, Tokopedia made innovations through several features that were issued to make it easier for users to use. New features released by Tokopedia were the Quickly Reply Chat feature, Weekly Summary Sales and Orders, Tokopedia Play, and Direct Purchase features. With these features innovations, it will make it easier for Tokopedia users to shop—which eventually can increase customer satisfaction and impact on customer convenience to re-shop at Tokopedia. This is supported by the study conducted by (Winarti et al., 2021) in which product innovation has a significant effect on customer loyalty. In addition, according to the study conducted by Utami & Wartini (2015), in which the data obtained reveal that service innovation has a positive effect on customer satisfaction. Therefore, this study aimed to analyze the effect of information quality and innovation on customer loyalty through customer satisfaction as a mediating variable.

2. Literature Review

Information Quality

According to (Patma et al., 2021; Wahyudi et al., 2015), system quality is the technical quality of the information system itself. System quality means the quality of the combination of hardware and software. Meanwhile, according to Batini in (Alvianna et al., 2021), information quality is a picture of the situation provided by a company or institution regarding the latest information—and this will change every day. The measure of user satisfaction with the information system is reflected by the quality of the system owned. If information quality is good according to the user's perception, then they will tend to feel

satisfied in using the system. Information quality is the degree to which information has characteristics of content, form and timing—which give it value to certain end users.

According to (Isnaini & Udayana, 2019), information system is a system in an organization which is a combination of people, facilities, technology, media, procedures and controls to obtain important communication lines, process certain types of routine transactions, signal to management and others on internal and external important events and provide an information basis for decision making.

Studies on the relationship between Information Quality and Customer Satisfaction, among others (Akbar, 2017) which suggests that Information Quality will have an effect on Customer Satisfaction. Also, (Kartikasari, 2017) which suggests that Information Quality will have an effect on Customer Loyalty.

Innovation

An innovation strategy must be consistent with the company's mission, vision, goals and strategies. Companies must be dedicated to investing in research and development, producing innovative products and achieving substantial performance to be competitive (Karabulut, 2015). A review of the literature on organizational innovation shows that there are many different approaches to measuring innovation performance. According to Pinho in (Kafetzopoulos et al., 2015), innovation in the past was mainly product-oriented. However, to deal with external turbulence and worldwide competition, companies must adopt more process, organizational and technical approaches to innovation.

According to (Antanegoro et al., 2017), business innovation is about embracing change in corporate culture, which is generally described as a system of shared meaning within an organization that determines how employees behave. Whereas, (Winarti et al., 2021) suggest that Product innovation is a combination of various processes that affect each other. This understanding can also be interpreted that innovation is not a new concept, idea, or discovery—and is not a development of a new market, but is a description of all the existing processes.

Studies on the relationship between Innovation and Customer Satisfaction, among others (Diawati et al., 2020; Fauzi & Mandala, 2019; Sukarmen et al., 2013) which suggest that Innovation will have an effect on Customer Satisfaction. Also, (Antanegoro et al., 2017; Utami & Wartini, 2015; Winarti et al., 2021) which suggest that Innovation will have an effect to Customer Loyalty.

Customer satisfaction

According to (Kartikasari, 2017), customer satisfaction is a person's feelings of pleasure or disappointment that arise after comparing the perceived performance (results) of the product—to the expected performance. Furthermore, according to (Danurdara, 2021), satisfaction and dissatisfaction are a post-purchase evaluation where satisfaction means that the chosen alternative is at least equal to or exceeds customer expectations, while dissatisfaction means that the chosen alternative do not meet customer expectations. Meanwhile, according to Oliver in (Bahri et al., 2017), customer satisfaction requires the full fulfillment of customer expectations for products and services. If the perceived performance matches or even exceeds customer expectations for the product/service, they are satisfied. In the real world, dissatisfied customers tend to create negative word of mouth and pass on their negative impressions to other customers.

Studies on the relationship between Customer satisfaction and Customer Loyalty, among others (Bahri et al., 2017; Banahene, 2018; Nyan et al., 2020; Perwira et al., 2016) which suggest that Customer satisfaction will have an effect to Customer Loyalty.

Customer loyalty

Loyalty is a persistent customer commitment to re-subscribe or re-purchase the selected product/service consistently in the future, even though situational influences and marketing efforts have the potential to cause behavioral changes (Rizan et al., 2020). Özkan et al. (2020) state that customer loyalty is a situation where customers consistently spend all available budgets to buy products and services from the same seller.

Griffin (2005), states that the concept of customer loyalty is more associated with behavior than with attitudes. If a person is a loyal customer, he or she exhibits buying behavior which is defined as a non-random purchase expressed from time to time by several decision-making units.

Relationship between variables

Information System Quality is a system which consists of the combination of hardware and software. System quality can be measured through ease of use, speed of access, system reliability, flexibility and security. Information quality is a customer's perception of the quality of information about a product or service provided by a website (Savalas, 2018). Therefore, if an information system has good quality, it will increase customer satisfaction—which is judged by the quality of e-commerce products or services. If customer satisfaction has been achieved, it can increase Customer Loyalty. This can be seen from repeat uses or repeat purchases from the same e-commerce on a regular basis, recommending products to other consumers.

In addition to information system quality, innovation is something that can affect customer satisfaction as well. Innovation is a knowledge and technique that can produce new concepts that can later help consumers in terms of using the website. If the innovation is considered quite effective in its use by consumers, then this innovation will shape customer satisfaction—this can affect the increase in customer loyalty, because e-commerce has a new innovation that is not owned by other e-commerce and is considered effective in its use. Therefore, the following relationships between variables were compiled by the researchers:

Information System Quality on Customer Satisfaction

The rise of online shops among the public requires e-commerce companies to further develop information systems effectively and efficiently for customers or consumers to be interested in buying or using the same e-commerce. A quality information system will lead to satisfaction of its users. In this concept, an effective and efficient information system is one indicator to achieve customer satisfaction. The more effective and the better the information provided by an e-commerce, the better the level of customer satisfaction.

The success of an information system is affected by the information quality. The information quality can have significant effects on individuals. The expected positive effects include increasing decision-making abilities, increasing work effectiveness and improving work quality (DeLone and McLean, 2003 in (Rakhmadian et al., 2017). The higher the quality of the information system owned, the higher the level of user satisfaction with the information system (Rakhmadian et al., 2017).

At the level of learnability, memorability, errors and satisfaction, Tokopedia is superior to other e-commerce (Akbar, 2017). From these data, it has been proven that Tokopedia has a good and superior level of ease of use, memory in application reuse, customer complaint and application assessment. With the good quality of Tokopedia's information system, customers will feel satisfied in using Tokopedia's e-commerce.

H1. There is an effect between the Information System Quality on Customer Satisfaction

Information System Quality on Customer Loyalty

Information system is a combination of system and quality of information. The system that is easier to use and remember by customers or consumers will attract them to use the same e-commerce. The repeat use of e-commerce within a certain period of time—is one of the characteristics of loyal customers.

According to Keith in (Mughtar & Astuti, n.d), the ultimate goal of the company's success in establishing relationships with its customers is to form strong loyalty. In this case, the quality of a good information system will lead to customer loyalty.

H2. There is an effect between the Information System Quality on Customer Loyalty

Innovation on Customer Satisfaction

Innovation is a new idea designed by a company to form a new concept that is better than before, whether new innovation for the company or for the market—or for both. Innovation that satisfies and helps customers in the use [of the e-commerce] will form customer satisfaction. (Shodiq, Hidayatullah, & Ardianto, 2018) state that in the era of intense business competition, company innovation is needed, especially in information system in order to achieve customer satisfaction.

Therefore, innovation is one of the factors to achieve customer satisfaction because a new innovation that is not owned by other e-commerce becomes a separate additional point for an e-commerce.

H3. There is an effect between Innovation on Customer Satisfaction

Innovation on Customer Loyalty

The tight business competition nowadays, makes e-commerce companies launch various innovations that attract the attention of consumers to use their e-commerce. (Hapsara et al., 2020) state that in the era of intense business competition, company innovation is needed, especially in information system—to achieve customer satisfaction which in the study conducted by (Hidayatullah et al., 2019) has been proven to have an effect on customer loyalty. With this concept, in addition to information system, innovation will also affect customer loyalty—if the innovation is considered effective and profitable by consumers or users.

H4. There is an effect between Innovation on Customer Loyalty

Customer Satisfaction on Customer Loyalty

Satisfaction is a picture of a person's feelings in assessing an expected performance. Customer satisfaction can be shown in the form of comments, assessments of an e-commerce. Satisfaction is an evaluation for companies to improve or increase the performance of a system that is considered less effective and less attractive to consumers. If someone is satisfied in using e-commerce, loyalty will be formed, because satisfied customers will make repeat purchases or recommendations to others to use e-commerce.

Winarti et al. (2021) state that in the era of intense business competition, company innovation is needed, especially in information system—to achieve customer satisfaction and affect customer loyalty. With this concept, satisfied customers make it possible for customer loyalty to occur, in which loyalty is the ultimate goal of the company's success in establishing relationships with its customers (Keshavarz & Jamshidi, 2018; Mahsyar & Surapati, 2020; Narotama, 2019; Setyaningsih, 2017).

H5. There is an effect between Customer Satisfaction and Customer Loyalty

The structural relationship of the four research variables is presented in the research model as shown in the following Figure 1.

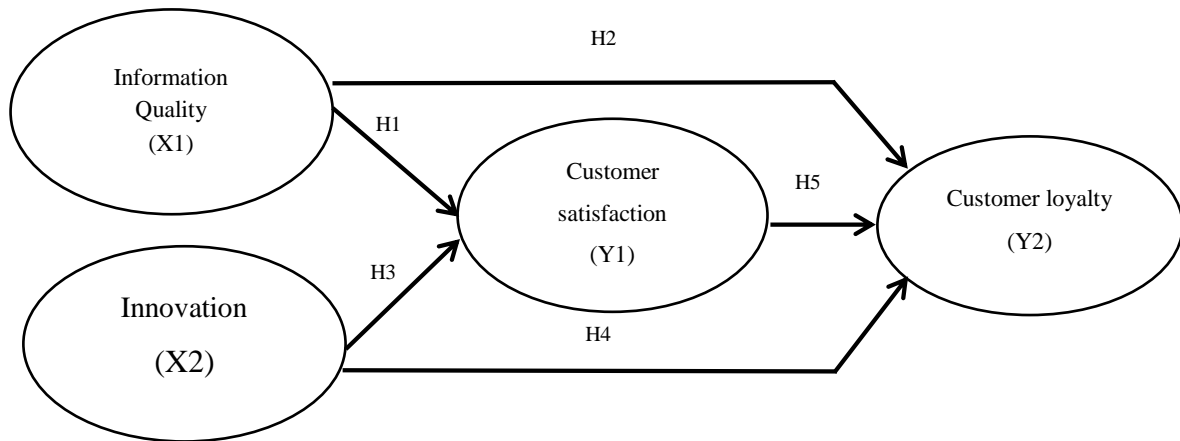


Figure 1: Research Model
Source: Processed Data, 2022

3. Method

Research Instruments

In this study, the independent variables used were Information Quality (X1) and Innovation (X2). Meanwhile, the dependent variables used were Customer Satisfaction (Y1) and Customer Loyalty (Y2). Therefore, the research instrument compiled by the researchers is presented as shown in the following Table 1.

Table 1. Research Instruments

No.	Variable Name	Indicator	Source	Measurement Scale
1.	Information Quality (X1)	1. Accuracy, 2. Timeliness, 3. Completeness, 4. Information presentation (Format) 5. Ease of use 6. Ease of access (system flexibility) 7. Access speed (response time) 8. System security	(Wahyudi et al., 2015)	Interval
2.	Innovation (X2)	1. Use of new technology/features 2. More sophisticated and according to needs 3. Different from other products 4. Has a characteristic when compared to other online shops 5. Improvement made to improve quality 6. Has more value than others	(Karabulut, 2015)	Interval
3.	Customer Satisfaction (Y1)	1. Remain satisfied with the ability to perform the promised service, 2. Satisfaction with willingness to help customers 3. Satisfaction with knowledge and courtesy 4. Satisfaction with caring for customers	(Özkan et al., 2020)	Interval
4.	Customer Loyalty (Y2)	1. Make regular purchases 2. Purchase from outside the product/service line 3. Recommend other products	Griffin (2005)	Interval

No.	Variable Name	Indicator	Source	Measurement Scale
		4. Demonstrate immunity from the attraction of similar products from competitors.		

Source: Processed Data, 2022

Population and Sample

The population in this study was Tokopedia online shop users in Pekanbaru whose number is not known with certainty. To determine the sample, non-probability sampling with accidental sampling technique was used and obtained a number of samples of 200 respondents to be studied using the Roscoe method calculation (Sugiyono, 2007) where the sample size for research is provided as follows:

- a. The feasible sample size in the study is between 30 to 500
- b. If the sample is divided into categories (for example: male-female, civil-private employees—and others) then the number of sample members in each category is at least 30
- c. If the study is to conduct multivariate analysis (correlation or multiple regression for example), then the number of sample members is at least 10 times the number of variables studied.
- d. For simple experimental research—which uses an experimental group and a control group, the number of sample members is 10 to 20 each.

In this study, there were 5 variables studied so the number of samples taken by the researchers was $5 \times 40 = 200$ people.

Data analysis method

This study used the SEM PLS data analysis technique. This method is an alternative method of the Structural Equation Model (SEM). The PLS model is used when the theoretical basis for model design is still weak and the measurement indicators do not meet the ideal measurement model, because PLS can be used for prediction. The inferential statistical data analysis was measured using Smart PLS (Partial Least Square) software starting from the measurement model (outer model), structural model (inner model) and hypothesis testing.

4. Result And Discussion

Characteristics of Respondents

As the beginning of the analysis process in the results of this study, an analysis of the characteristics of the respondents was carried out. Characteristics of respondents are important to analyze because data on the characteristics of respondents can show certain behavioral characteristics. The characteristics of the respondents analyzed in this study are gender, age and occupation.

Table 2. Characteristics of Respondents

Demographics	Category	Amount	Percentage (%)
Gender	Male	84	42.0
	Female	116	58.0
	Student	92	46.0
Occupation	Civil/ Private Employees	47	23.5
	Entrepreneur	22	11.0
	Housewife	28	14.0
	Other	11	5.5
Educational Background	Primary School	2	1.0
	Junior High School	11	5.5

Demographics	Category	Amount	Percentage (%)
	Senior High School	115	57.5
	Diploma	14	7.0
	Bachelor's	58	29.0

Source: Processed Data, 2022

Based on the data in Table 2, it can be seen that the male respondents are 84 people or 42.00% while female respondents are 116 people or 58.00%. This shows that there are more female respondents than male respondents in this study where women indeed tend to prefer online shopping than men.

Based on the data in Table 2, it can be seen that the respondents who are students are 92 people or 46.50%, civil/private employees are 47 people or 23.50%, entrepreneurs are 22 people or 11.00%, housewives are 28 people or 14.00% and the remaining 11 people or 5.50% have other occupations. This shows that the majority of respondents who use the Tokopedia online shop are students (High School/ University students). This is because students are currently more active in using gadgets for both social media and online shopping.

Based on the data in Table 2, it can also be seen that the respondents with the educational background at Primary School are 2 people or 1.00%, Junior High School are 11 people or 5.50%, Senior High School are 115 people or 57.50%, Diploma are 14 people or 7.00% and University (Bachelor's degree) are 58 people or 29.00%. From the results of this study, it can be concluded that the majority of respondents in this study are respondents with Senior High School education. This is supported by the results of the distribution of questionnaires which show that most of the respondents are students.

Variable Descriptive Analysis

The Information Quality variable in this study was measured through 8 statement items. The results of the calculation of the overall average value for the Information Quality variable show that the respondents' responses to the Information Quality on the Tokopedia website are good. The highest average value of the statement is 4.27 in the 1st statement, while the lowest average value of the statement is 4.05 in the 7th statement. This shows that respondents feel that the responses given on Tokopedia website is still not fast, both in terms of customer service responses and online shop admin at Tokopedia responses.

The innovation variable in this study was measured through 6 statement items. Of the six questions used to measure the innovation variable, the results of the calculation of the overall average value for the innovation variable show that respondents' responses to innovation variable at Tokopedia are good. The highest average value of the statements is 4.21 in the 1st statement, while the lowest average value of the statement is 4.06 in the 3rd statement. This shows that respondents feel that Tokopedia does not yet have a distinctive feature compared to other online shops/e-commerce.

The Customer Satisfaction variable in this study was measured through 5 statement items. The results of the calculation of the average value of the statements used to measure the Customer Satisfaction variable are high—where the highest average value of the statements is 4.25 in the 1st statement, while the lowest average value of the statements is 4.11 in the 4th statement. This shows that respondents' responses to customer satisfaction at Tokopedia are high.

Furthermore, the customer loyalty variable in this study was measured through 4 statement items, the 1st statement has the highest average value of 4.30 while the 4th statement has the lowest average value. The customer loyalty variable shows a high value, so it can be concluded that the respondents' responses about Customer Loyalty at Tokopedia are high.

Research Validity and Reliability Test

Table 3. Validity and Reliability Test

Variable Items	CITC	Standard	Information	Cronbach's Alpha	Rest	Description
KI_1	0.612		Valid	0.875		Reliable
KI_2	0.644		Valid			
KI_3	0.729		Valid			
KI_4	0.613		Valid			
KI_5	0.620		Valid			
KI_6	0.614		Valid			
KI_7	0.619		Valid			
KI_8	0.627		Valid			
I_1	0.638	0.3	Valid	0.857	0.6	Reliable
I_2	0.681		Valid			
I_3	0.621		Valid			
I_4	0.707		Valid			
I_5	0.615		Valid			
I_6	0.619		Valid			
KP_1	0.616		Valid	0.835		Reliable
KP_2	0.684		Valid			
KP_3	0.741		Valid			
KP_4	0.624		Valid			
LP_1	0.650		Valid	0.783		Reliable
LP_2	0.537		Valid			
LP_3	0.580		Valid			
LP_4	0.596		Valid			

Source: Processed Data, 2022

Based on the validity results in Table 3, it can be seen that all question items for the Information System Quality, Innovation, Customer Satisfaction and Customer Loyalty variables have a CITC (Corrected Item Total Correlation) value greater than 0.3, so it can be concluded that all question items in each variable are considered valid and can be used for further data analysis.

Then it can also be seen in Table 3 that each variable has a Cronbach's alpha (α) value greater than 0.60, so it can be concluded that all variables used in this study have a value that can be trusted or reliable. Thus, the preliminary test in this study to test the reliability and validity of the variables was found no problem, so the next stage of testing could be carried out.

Structural Equation Modeling (SEM)

Analysis Outer Model Analysis (Measurement Model)

Convergent Validity

Based on the results of data processing, it can be seen that the majority of indicators in each variable in this study have a factor loading value greater than 0.7. However, there are 2 statements from the Innovation variable that have a loading factor value of less than 0.7, namely statements I_5 (Improvement is always carried out by Tokopedia to improve its quality) and I_6 (Improvement made by Tokopedia can provide a better value than previous products) so these indicators must be removed from the study and reprocessed using PLS.

Based on the results of data processing after removing the factor loading values that are smaller than 0.7, it was obtained that all indicators in each variable in this study have a factor loading value greater than 0.7. So that it can be continued to the convergent validity test which could be done by looking at the Average Variance Extracted (AVE) value for each

construct or latent variable. Then seen from the AVE value, each construct or latent variable has a value greater than 0.50, with the smallest value being 0.535 for the Information Quality variable, 0.675 for the Innovation variable, 0.668 for the Customer satisfaction and 0.607 for the Customer loyalty variable.

Table 4. Results of Discriminant Validity

	Information System Quality	Innovation	Customer satisfaction	Customer loyalty
Information Quality	0.732			
Innovation	0.524	0.822		
Customer satisfaction	0.421	0.467	0.817	
Customer loyalty	0.498	0.552	0.605	0.779

Source: Processed Data, 2022

Based on Table 4, it can be seen that the AVE root value for each construct is greater than the correlation value with other constructs or variables so that the variables in this study can be said to have good discriminant validity.

Reliability Test

Table 5. Results of Composite Reliability and Cronbach's Alpha

Variable	Cronbach's Alpha	Composite Reliability	Standard	Information
Information Quality	0.876	0.902	0.7	Reliable
Innovation	0.838	0.847		Reliable
Customer satisfaction	0.836	0.889		Reliable
Customer loyalty	0.784	0.861		Reliable

Source: Processed Data, 2022

Based on Table 5, it can be seen that composite reliability and Cronbach's alpha owned by all research variables have values greater than 0.70. With the resulting value, it can be concluded that all the variables used in this study are reliable or have good reliability in accordance with the required limits.

Multicollinearity Test

Table 6. Results of Variance Inflation Factor (VIF)

Variable	VIF	Standard	Information
X1 – Y1	1.378	< 10	Multicollinearity does not occur
X2 – Y1	1.378		Multicollinearity does not occur
X1 – Y2	1,458		Multicollinearity does not occur
X2 – Y2	1.535		Multicollinearity does not occur
Y1 – Y2	1.354		Multicollinearity does not occur

Source: Processed Data, 2022

Based on Table 6, it can be seen that the value of VIF (Variance Inflation Factor) in each exogenous and endogenous variable has a value that is less than 10. Therefore, it can be concluded that there is no symptom of multicollinearity in each research variable.

Inner Model Analysis (Structural Model)

R-Square

Table 7. R-Square

Variable	R-Square	R-Square Adjusted
Customer satisfaction	0.261	0.254
Customer loyalty	0.483	0.475

Source: Processed Data, 2022

Based on Table 7, it can be seen the results of the R-Square calculation for each endogenous latent variable. The Customer Satisfaction variable (Y1) has an Adjusted R-Square value of 0.254 so it can be said that the research model is weak. This value can explain that the variables that affect 25.4% of customer satisfaction are Information Quality and Innovation, while the remaining 74.6% are affected by other variables outside this research model. Meanwhile, the Customer Loyalty variable (Y2) has an Adjusted R-Square value of 0.475 so it can be said that the research model is moderate. This value can explain that the variables that affect 47.5% of customer satisfaction are Information Quality, Innovation and Consumer Satisfaction, while the remaining 52, 5% are affected by other variables outside this research model. The two R-Square values referring to the criteria can be categorized as moderate models, meaning that the variables in the model have a moderate effect on the affected variables than other factors originating from outside this study.

Effect Size f^2 Test

Table 8. Results of Effect Size F-Square

Variable	F-Square	Category
X1 – Y1	0.058	Weak
X2 – Y1	0.114	Weak
X1 – Y2	0.048	Weak
X2 – Y2	0.089	Weak
Y1 – Y2	0.230	Moderate

Source: Processed Data, 2022

Based on Table 8, it can be seen the results of testing the F-square value with smart PLS. Based on the criteria, the result from the F-square value of the Information Quality variable on Customer Satisfaction is 0.058—and included in the weak effect category, the Innovation variable on Customer Satisfaction has an F-square value of 0.114 and included in the weak effect category, the Information Quality variable on Customer Loyalty has an F-square value of 0.048 and included in the weak effect category, the Innovation variable on Customer Loyalty has an F-square value of 0.089 and included in the weak effect category, and the Customer Satisfaction variable on Customer Loyalty has an F-square value of 0.230 and included in the moderate effect category.

Hypothesis testing

The results of hypothesis testing from this study can be seen in Table 14 and Figure 2

Table 9. Result of Hypothesis Testing

Hypothesis	Origin Sample	P Values	Condition	Conclusion
X1 → Y1	0,243	0,004	< 0,05	Have a significant positive effect
X2 → Y1	0,340	0,000	< 0,05	Have a significant positive effect
X1 → Y2	0,190	0,003	< 0,05	Have a significant positive effect

Hypothesis	Origin Sample	P Values	Condition	Conclusion
X2 → Y2	0,265	0,000	< 0,05	Have a significant positive effect
Y1 → Y2	0,401	0,000	< 0,05	Have a significant positive effect

Source: Processed Data, 2022

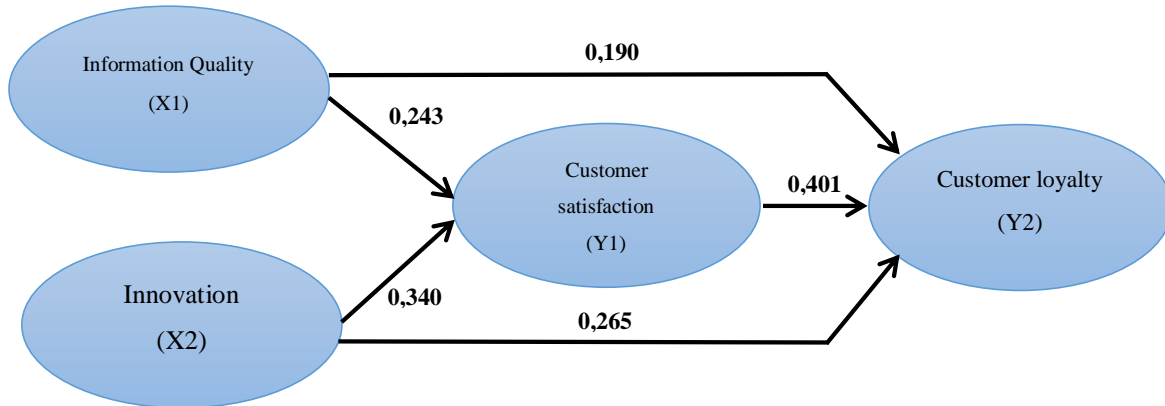


Figure 2: Results of Model Test

Source: Processed Data, 2022

Based on Table 9 and Figure 2 above, it can be seen the results of calculations using smart PLS by looking at the Path Coefficients value which states the direct effect between variables where Information Quality has a positive effect on Customer Satisfaction so that when Information Quality increases it will increase Customer Satisfaction and from the significance value obtained it proves that the Information Quality variable has a significant effect on Customer Satisfaction ofmTokopedia users in Pekanbaru. This means that the first hypothesis is accepted. Furthermore, in the second hypothesis where Innovation has a positive effect on Customer Satisfaction so that when Innovation increases it will increase Customer Satisfaction and then the significance value obtained proves that the Innovation variable has a significant effect on Customer Satisfaction of Tokopedia users in Pekanbaru. This means that the second hypothesis is accepted. The test results also show that Information Quality has a positive effect on Customer Loyalty so that when Information Quality increases it will increase Customer Loyalty and the significance value obtained proves that Information Quality variable has a significant effect on Customer Loyalty of Tokopedia users in Pekanbaru. This means that the third hypothesis is accepted. Then the test results on the fourth hypothesis show that Innovation has a positive effect on Customer Loyalty so that when Innovation increases it will increase Customer Loyalty and the significance value obtained proves that the Innovation variable has a significant effect on Customer Loyalty of Tokopedia users in Pekanbaru. This means that the fourth hypothesis is also accepted. .

Then if we want to do an indirect test between Information Quality and Customer Loyalty through Customer Satisfaction, the results show that Information Quality has a positive effect on Customer Loyalty through Customer Satisfaction thus when Information Quality increases it will increase Customer Loyalty which is of course preceded by Customer Satisfaction as the mediating variable. In addition, the significance value obtained also proves that the Information Quality variable has a significant indirect effect on Customer Loyalty through Customer Satisfaction as a mediating factor for Tokopedia users in Pekanbaru. Likewise with Innovation on Customer Loyalty through Customer Satisfaction, the results show that Innovation has a positive effect on Customer Loyalty through Customer Satisfaction so that when innovation increases it will increase Customer Loyalty which is of course preceded by Customer Satisfaction as the mediating variable. And the significance value obtained also

proves that the Innovation variable has a significant indirect effect on Customer Loyalty through Customer Satisfaction as a mediating factor for Tokopedia users in Pekanbaru.

Discussion

The Effect of Information Quality on Customer Satisfaction

The rise of online shops among the public requires e-commerce companies to further develop information systems effectively and efficiently for customers or consumers to be interested in buying or using the same e-commerce. A quality information system will lead to satisfaction of its users. In this concept, an effective and efficient information system is one indicator to achieve customer satisfaction. The more effective and the better the information provided by an e-commerce, the better the level of customer satisfaction.

The results of data analysis indicate that the respondents' responses to the Information Quality variable are good. This is supported by the results of hypothesis testing which states that the Information Quality variable has a significant positive effect on Customer Satisfaction of Tokopedia Users. The results of this study indicate that Tokopedia has provided a good quality information system for customers, such as the information about the products listed on Tokopedia website is detailed enough and easily understood by users. Based on the results of descriptive statistical analysis, it is shown that the success of an information system is affected by the quality of the information. The information quality can have significant effects on individuals. The expected positive effects include increasing decision-making abilities, increasing work effectiveness and improving work quality. At the level of learnability, memorability, errors and satisfaction, Tokopedia is superior to other e-commerce (Akbar, 2017). From these data, it has been proven that Tokopedia has a good and superior level of ease of use, memory in application reuse, customer complaint and application assessment. With the good quality of Tokopedia's information system, customers will feel satisfied in using Tokopedia's e-commerce.

The results of this study are in line with those of Amarin and Wijaksana (2021), Patma et al. (2021), Rakhmadian et al. (2017) and Wahyudi et al. (2015) which state that Information Quality has a significant positive effect on Customer Satisfaction.

The Effect of Innovation on Customer Satisfaction

Innovation is a new idea designed by a company to form a new concept that is better than before, whether new innovation for the company or for the market—or for both. Innovation that satisfies and helps customers in the use [of the e-commerce] will form customer satisfaction.

The results of data analysis show that the respondents' responses to the Innovation variable are good. This is supported by the results of hypothesis testing which states that the Innovation variable has a significant positive effect on Customer Satisfaction of Tokopedia Users. The results of this study indicate that Tokopedia has provided good innovation for customers, such as Tokopedia always providing new or additional features for every application update. Innovation is one of the factors to achieve customer satisfaction because a new innovation that is not owned by other e-commerce becomes a separate additional point for an e-commerce. In addition, these results are in line with the theory which states that customer needs, desires and demands are always changing. Customers will not always consume the same product. Customers will look for other products from other companies that are felt to satisfy their needs. So that innovation is not only limited to the development of new products or services. However, innovation also includes new business thinking and new processes.

The results of this study are in line with those of Antanegoro et al. (2017), Diawati et al. (2020), Sukarmen et al. (2013) and Winarti et al. (2021) which state that innovation has a significant positive effect on Customer Satisfaction.

The Effect of Information Quality on Customer Loyalty

Information system is a combination of system and quality of information. The system that is easier to use and remember by customers or consumers will attract them to use the same e-commerce. The repeat use of e-commerce within a certain period of time—is one of the characteristics of loyal customers.

The results of data analysis indicate that the respondents' responses to the Information Quality variable are good. This is supported by the results of hypothesis testing which states that the Information Quality variable has a significant positive effect on Customer Loyalty of Tokopedia Users. The results of this study indicate that Tokopedia has provided good quality information for customers, such as the information about products provided on the Tokopedia website is always timely so that users find it easy to use the Tokopedia website. Based on the results of descriptive statistical analysis, the success of an information system is affected by the quality of the information. This is because if the information conveyed clearly it will provide customer satisfaction. On the other hand, a marketing information system can also lead to failure in the implementation and completion of work, as well as unsatisfied customers. Thus, when customers are dissatisfied with the information system provided, they are likely to think again and again to return and make other purchases at the company. Thus it would be wise for a company to measure customer satisfaction and loyalty on a regular basis. The ultimate goal of the company's success in establishing relationships with its customers is to form strong loyalty. In this case, good Information Quality will lead to Customer Loyalty. The results of this study are in line with those of Amarin and Wijaksana (2021) and Kartikasari (2017) which state that Information Quality has a significant positive effect on Customer Satisfaction of Tokopedia Users.

The Effect of Innovation on Customer Loyalty

The tight business competition nowadays, makes e-commerce companies launch various innovations that attract the attention of consumers to use their e-commerce. Thus in the era of intense business competition, company innovation is needed, especially in information systems to achieve customer satisfaction and loyalty. The results of data analysis show that the respondents' responses to the Innovation variable are good. This is supported by the results of hypothesis testing which states that the Innovation variable has a significant positive effect on Customer Loyalty of Tokopedia Users.

The results of this study indicate that Tokopedia has provided good innovations for customers, such as Tokopedia being always innovative in every update in order to give a more sophisticated impression—when compared to previous products. From the results of this study, it is explained that the effect innovation on customer loyalty lies in the level of product innovation such as the level of diversity and uniqueness of the features offered so that the desires and/or needs of customers can be met—and if customer needs are met then the competition can be won. In general, companies who want to have long-term plans in retaining customers should be paying attention to what things will increase customer loyalty. Companies must also have their own differences in their products from competitors, so that customers have reasons to make choices in choosing a product. When the company has a difference from competitors and the difference is better than competitors, the customer will be loyal to the product.

The results of this study are in line with those of Antanegoro et al. (2017), Utami and Wartini (2015) and Winarti et al. (2021) which state that Innovation has a significant positive effect on Customer Loyalty.

The Effect of Customer Satisfaction on Customer Loyalty

Satisfaction is a picture of a person's feelings in assessing an expected performance. Customer satisfaction can be shown in the form of comments, assessments of an e-commerce. Satisfaction is an evaluation for companies to improve or increase the performance of a system that is considered less effective and less attractive to consumers. If someone is satisfied in using e-commerce, loyalty will be formed, because satisfied customers will make repeat purchases or recommendations to others to use e-commerce.

The results of data analysis show that the respondents' responses to the Customer Satisfaction variable are good. This is supported by the results of hypothesis testing which states that the Customer Satisfaction variable has a significant positive effect on Customer Loyalty of Tokopedia Users. The results of this study indicate that the majority of users feel happy in shopping on the Tokopedia website. The company should act wisely by measuring customer satisfaction regularly, because one of the keys to maintaining customer loyalty is customer satisfaction. Highly satisfied customers usually stay loyal for a longer time, repurchase when the company introduces new products and renews old products, talk good things about the company and its products to others, pay less attention to competing brands and are not too sensitive to service quality, offer product or service ideas to the company—and their service costs are cheaper than new customers because transactions can become routine.

The results of this study are in line with those of Bahri et al. (2017), Banahene (2018), Fida et al. (2020), Kartikasari (2017, Keshavarz and Jamshidi (2018), Lie et al. (2019) Mahsyar and Surapati (2020), Nursaid et al. (2020), Nyan et al. (2020), Osman and Sentosa (2013), zkan et al. (2020), Perwira et al. (2016), Putri and Telagawathi (2021), Qomariah (2018) and Utami and Wartini (2015) which state that Customer Satisfaction has a significant positive effect on Customer Loyalty.

5. Conclusion

This study aimed to analyze the effect of information quality and innovation on customer loyalty through customer satisfaction as a mediating variable for Tokopedia users in Pekanbaru. Based on the results and discussions that have been carried out, it can be concluded that Information Quality has a significant effect on Customer Satisfaction of Tokopedia User, Information Quality has a significant effect on Customer Satisfaction of Tokopedia User, Innovation has a significant effect on Customer Satisfaction of Tokopedia User, Innovation has a significant effect on Customer Loyalty of Tokopedia Users and Customer Satisfaction have a significant effect Customer Loyalty of Tokopedia Users in Pekanbaru.

Based on the results of the research and the conclusions above, the researchers provide suggestions that can be taken into consideration, namely Tokopedia must improve the speed of the service system on Tokopedia website, so that the service system can provide a fast response if there are customers who need help when using the website. Then, Tokopedia must also pay attention to the diversity of products and services offered by online shops, so that the products and services offered by Tokopedia appear different from other brand products. This research is expected to provide additional knowledge about management and marketing theory, be a source of information and be a contribution to ideas in developing business management disciplines. For further research, it is expected to use more samples or different

research objects as comparisons. In addition, further research can also add other variables that can affect customer satisfaction and loyalty.

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