

MAPPING IDEA & LITERATURE FORMAT | RESEARCH ARTICLE

The Effect of E-commerce Innovation and E-service Quality on Customer Loyalty with Customer Satisfaction as A Mediation for Shopee User in Soloraya

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ABSTRACT

This study aims to examine the influence of e-commerce innovation and e-service quality on customer loyalty, with customer satisfaction as an intermediary or mediating variable for users of the Shopee application platform in Soloraya. The increasing competition between e-commerce platform requires companies to continue to innovate and improve the quality of digital service to maintain customer loyalty. This study uses a quantitative approach. The population of this study is all shopee users in Soloraya with an unknown number of samples, so the sample determination uses the Cochran formula. The sampling technique was carried out using a purposive sampling method on active shopee users, with a total of 334 respondents. Primary data was collected through an online questionnaire using a five-point likert scale. PLS-SEM was used to analyse data with SmartPLS 3.0 software. The research findings illustrate that e-commerce innovation and e-service quality have a positive or significant impact and influence on customer satisfaction and customer loyalty. In addition, customer satisfaction is proven to have a positive and significant effect on customer loyalty. The result of the mediation test indicate that customer satisfaction acts a a pariyal mediator in the relationship between e-commerce innovation and e-service quality on customer loyalty. This finding confirms that platform innovation and optimally managed digital service quality play a significant role in increasing satisfaction and building sustainable loyalty among shopee users.

Keywords: E-Commerce Innovation, E-Service Quality, Customer Satisfaction, Customer Loyalty, Shopee.

I. Introduction

In the growth and development of technological system which are increasing all the time rapidly and progressing has had a very big impact on a business to all aspects of people's lives, one of which is the shopping and business system. The phenomom that is currently occurring in the field shows that more and more people who carry out online shopping activites through digital transactions (Apjii, 2025). Therefore, the relationship between innovation, quality of electronic services, and customer satisfaction customer need to



be understood in an integrative manner. E-commerce is seen as one of the models future business that can provide benefits for both companies and consumers (Barona *et al.*, 2023). Through this system, buying, selling and exchanging processes are carried out information can be done electronically without limitations of space and times as well as shopping behavior consumers. E-commerce has grown rapidly in recent decades, transforming how business operate and consumers shop. One of them is shopee. Based on some existing data, Shopee has consistently been a platform with the largest number of users and the highest number of site visits in the last five years. In 2020, the number of visits Shopee increased from 96,5 million in the third quarter to 129.3 million in the fourth quarter (Setyowati, 2021). In the following year, Shopee successfully expanded its dominance in the Asian region. Southeast with a very high average monthly visitor number (Jayani, 2021). Trends this growth continued in the following years. In 2022, Shopee recorder increasing number of downloads and visits globally (Sari *et al.*, 2025). The growth trend which continued in 2023, when the Shopee application had reached a figure of around 2.3 billion in cumulative site visits, even reaching 237 million visits in the month of September and 242.2 million in December (Yonatan, 2025). In 2024, Shopee dominated remained strong with 134.3 million visits in September and increasing to 144.8 million in November at the global level, Shopee also recorded 10.9 billion in gross orders through 2024 and up from 8.2 billion in 2023 (Ahdiat, 2024). Overall, the data also maintains its position with the highest number of visits. Indonesia, but also continues to strengthen its position in the global market. Shopee also occupies a position in top position as the e-commerce with the most site visits in Indonesia. In October 2025, the Indonesian Shopee site also achieved 145.6 million visits, up 17% compared to the previous month. This figure increased from 137 million visits in the previous month. August 2025 and 133.1 million in July 2025. In June 2025, visits reached 126 million, although it decreased by 9.1% from the previous month, Shopee remained higher compared to May 2025 which recorded 138.6 million visits. Therefore, in general Overall, total shopee Indonesian visits in the first quarter of 2025 reached 470.1 million. or an increase of 12% compared to the fourth quarter of 2024. Globally, shopee also occupies second place in the most monthly active detected section with an average of 392.8 million users per month in the period July 2023 to June 2025.

Based on the survey result, Shopee has become one of the platforms that has many users. Users and enthusiasts are especially widely used by generation Z and millennials in Indonesian (Ahdiat, 2026). Shopee has developed into one of the internet companies the largest in the ASEAN region. Shopee offers a variety of product categories that have been covers both primary and secondary needs. In terms of product completeness, ease of navigation applications, as well as integrated payment systems are supporting factors in increasing the number of users. Transaction activities conducted via smartphone further strengthen the position of e-commerce as the main means of shopping, e-commerce is trade electronic systems that rely on the internet system as the main media (Feriyanto *et al.*, 2024). E-commerce has transformed the way business is conducted, by providing competitive prices. Which is more competitive due to the wider range of offers, a wider variety of products good, and marketing strategies are increasingly innovative, thus encouraging customers to become more critical and have high expectations. Electronic payments refer to the process electronic payments without involving cash or physical checks. In this method electronic payments have also developed along with this to meet the needs online transactions and increase user convenience. Utilization of technology information by users, the greater the role of technology in supporting brand activity. On the intensity of use and on going interaction between users of the system being used routinely it shows that the systems is increasingly known and understood by its users, simpler to run, and easier for users to understand. Behind the various conveniences that have been offered, e-commerce also has the risk of cyber crime, such as fraud. through identity theft, credit card misuse, customer deception, phishing, spam, and other forms of crime. This condition can cause concern for consumers and has the potential to make them choose online transaction methods again conventional. Security dimensions in E-commerce: 1) Authentication: Ensuring identity buyers, sellers, and payment parties involved in the transaction. 2) Integrity: Maintaining the data and information transferred remain intact and are not manipulated. 3) Non-Repudiation: protect customers from denial of transactions by sellers, with proof of delivery or legitimate payments. 4) Privacy: Maintaining the

confidentiality of customer identities and purchases. 5) Security: Ensure the security of credit card information when making online transactions (Wajong & Putri, 2010).

E-service quality plays a role in shaping user experiences during using the platform. Based on a survey by the Indonesian Internet Service Providers Association (APJII) in 2025, Shopee has occupied the first position as the most popular e-commerce frequently accessed by Indonesian people, the survey shows that shopee is far in the top position with a percentage of use 53.22%, and increasing steadily significantly from 41.65% in the previous year. With shopee's superiority influenced by simple application interface, wide selection of product, especially in the fashion category and in terms of its popularity among various user groups. Below shopee provides TikTok Shop which achieved a percentage of 27.37%, a rapid increase from 12.20%, in the next position is Tokopedia with a weight of 9.57%, Blibli with a value of 0.29%, Facebook Marketplace with a value of 0.25%, and Lazada which has fallen to 9.09% from 17.54%. This figure shows that shopee dominance is growing stronger amidst competition. Increasingly competitive online shopping platforms. The combination of these various factor making shopee the main choice for consumers in Indonesia, especially in the Soloraya area. E-commerce competition in Indonesian in 2025 shows that only a few platforms that is able to maintain its top programs, convenience of digital payment methods, as well as fast and reliable logistic services (Lestari, 2025). Shopee is increasingly becoming the platform of choice people across all walks of life driven by superior features, such as free programs shipping costs that are highly sought after by users (Susanti *et al.*, 2025). The high number of e-commerce users commerce in Indonesia is a target market that has potential as shown by there are more and more online stores that are currently emerging in society. In this condition causes very tight competition between them to get customers so that in this condition it also shows great potential for online business actors, and innovations such as live chat service, personalized recommendations, mobile payment, and flash sale which can improve the shopping experience. With the existence of the internet also makes it eaiser for someone to make a purchase or (Rachmawati *et al.*, 2019)Ease of obtaining information before making decision allows the public to find out various information before make purchase (Mita *et al.*, 2021). In e-commerce, buyers and sellers do not have to occurs face to face, but can be done through a digital system, so that dimensions such as empathy and immediate responsiveness becomes less relvnt. Therefore, customers also assess electronic service quality (E-Service Quality) through several factor such as efficiency, system reliability, data security, and ease of use of the platform (Parasuraman *et al.*, 2005).E-service quality is also an extension of the website's ability to provide customer loyalty purchasing and distribution services and also as capability development somewhere to achieve effectiveness (Ningsih *et al.*, 2022). E-commerce platform, then there will also be a greater likelihood that consumers will make repeat transaction. In this case satisfaction also plays a role as an important link that has explained how service quality can influence loyalty (Bonato, 2013). On user satisfaction which has a role as a mediating variable to get customers (Tedjokusumo *et al.*, 2023).

In this analysis, the intention to continue using the shopee application users has been become an interesting topic to research by linking specific fators from continued use in the ECT model which places more emphasis on how positive user experiences after intial use can from long-term intentions. In this case, the context of e-commerce which is increasingly oriented towards sustainability can intergrating the carachteristic of the three model which can provide brightness to consumers. Therefore, this study will analyze the main aspects that influence the intention of shopee users to continue using this platform, especially those who in relation to sustainability. The findings of this study are expected to help platform integrates marketing to increase user awareness of sustainable business practices, besides that this research also aims to fill the gap empirically in the academic literature and makes new contributors to the understanding related to the intention to continue using marketplace application in Indonesia. This research will focus on the analysis and factors that can shape the use of sustainable on the shopee e-commerce platform.

II. Literature Review and Hypothesis Development

2.1 Expectation Confirmation Theory

Expectation Confirmation Theory (ECT), which was introduced by (Oliver) and further developed by (Bhattacharjee, 2011), is a theoretical model that examines continuance intention in using information systems. ECT focuses on factors that form the user's intention to continue using the technology, with main dimensions such as perceived performance, confirmation, expectations, satisfaction, and continuance purchase. In ECT model, user satisfaction is formed through the evaluation process of system performance, level of information, as well as initial expectations. If the user experience exceeds, then the sense of satisfaction continues to increase as well as the intention of long-term use. Therefore, ECT become a relevant conceptual framework in understanding the behavior of digital platform users sustainability (Huang *et al.*, 2019). In the digital environment, customer expectations are very often formed from previous experiences, marketing communications, recommendations social. When actual experiences can and are able to meet or exceed expectations this result in positive confirmation which can strengthen satisfaction.

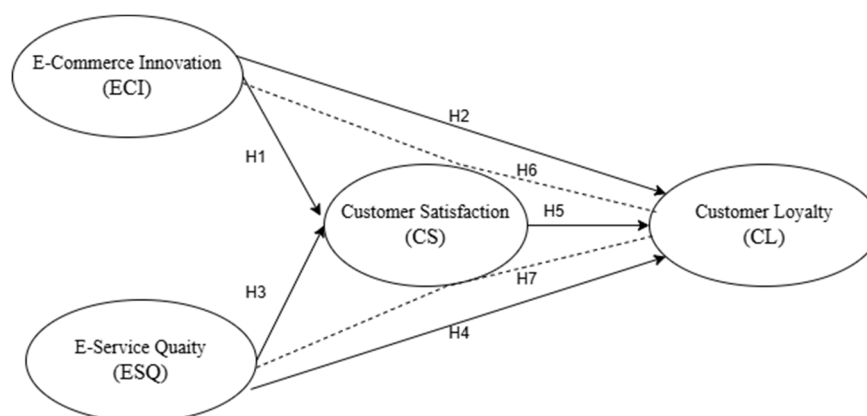


Figure 1. Research Framework

Source: (Rahman *et al.*, 2022)

2.2 E-Commerce Innovation

E-commerce innovation reflects the ability of a digital platform to develop features, technologies, and service systems that can improve the experience users. On the shopee platform, innovation can be seen through the implementation of the live shopping feature, gamification systems, personalized recommendation based on artificial intelligence, and integration digital payments. Continuous innovation can increase functional value and emotional for users, thus encouraging interest in continuing to use the service long term (Liao *et al.*, 2024). E-Commerce Innovation Indicator (Rogers, 2024):

- a. New feature innovation that increase comfort
- b. Ease of application navigation
- c. Personalize product recommendations
- d. More innovative and flexible payment methods

2.3 E-Service Quality

E-service quality is a user assessment given through a digital system, starting from information search to after-sales service (Blut, 2016). The quality of electronic services also reflects the company's ability to handle customer problem and complaints online (Saadah & Ying, 2020). The E-Service Quality dimension also consist

of several the main aspect is the quality of information related to the presentation of information that is very accurate and relevant to help consumers or customers when making decision suddenly. Efficiency refers to the ease and speed of access when using the site. Privacy has emphasized the stage of protecting personal data as well as security during transactions by customers. Reliability describes the ability to the company in fulfilling its service promise to handle complaints properly and comfortable. Site aesthetics shows that an attractive and good visual appearance can presenting the company's image. Responsive with accuracy and speed in respond to customers. Then, ease of use can refer to ease of use interface comfortable (De Fritz, 2020). E-service Quality indicators ((Parasuraman *et al.*, 2005) namely:

- a. Complete and accurate product information
- b. Fast and easy checkout process
- c. Payment system security
- d. Effective customer service response

2.4 Customer Satisfaction

Customer satisfaction is a user's overall evaluation of the experience for using a platform compared to initial expectations. Satisfied users after making a transaction on shopee, both in terms of delivery, security, and customer service, tend to exhibit positive behavior such as repeat purchases and recommendations. In this case, customer satisfaction plays a role as an important mediator in the relationship between service quality, innovation, and user loyalty. In this case, satisfaction has become benchmark on the main link that can strengthen the influence on another variable to loyalty variable (Otterbring, 2021). Customer satisfaction indicators according to (Kotler & Keller, 2022)are:

- a. Satisfying shopping experience
- b. Service meets expectations
- c. Overall positive experience
- d. Service quality as expected

2.5 Customer Loyalty

Customer loyalty describe a consumer's sommitment to continue using a product. Platform in the long term even through it is available in various other alternatives. For users shopee generation Z, loyalty is not only shown through repeat purchases, but also through the willingness to provide positive reviews, recommend to others, and maintaining platform usage amidst competition with Tokpedia and TikTok Shop. Research shows that customer loyalty in the digital era is greatly influenced by consistency of user experience, service innovation, and stable levels of satisfaction (Mouzas *et al.*, 2022). Loyalty can be defined as a strong commitment to consumers. In making repeat purchases in the future (Kotler & Keller, 2022). Factor which influence loyalty in the book (Kotler & Keller, 2022). states that loyalty influenced by five factors, namely:

- a. Satisfaction is a level of comparison between a customer expectations with the actual performance or result they receive.
- b. Emotional bonding is useful if you have emotional closeness to someone, brand so that they identify themselves through the brand because it is considered reflect their character or personality.
- c. Trust, namely the individual's willingness to fulfill promises that have been ginven in a specific manner consistent.

Customer Loyalty indicators according to (Griffin, 1997). namely:

- a. Intention to shop again
- b. Preference in choosing a platform over competitors
- c. Willingness to recommend to others
- d. Attachment to the platform

Based on the developed conceptual framework, the research hypotheses are formulated as follows:

H1: E-Commerce Innovation has a positive and significant impact and influence on Customer Satisfaction

H2: E-Commerce Innovation has a positive and significant impact or influence on Customer Loyalty

H3: E-Service Quality has a positive and significant impact and influence on Customer Satisfaction

H4: E-Service Quality has a positive and significant impact and influence on Customer Loyalty

H5: Customer Satisfaction has a positive and significant impact and influence on Customer Loyalty

H6: E-Commerce Innovation has an influence on Customer Satisfaction other than directly but it can also be done through Customer Loyalty.

H7: E-Service Quality has an influence on Customer Satisfaction not only directly but also indirectly can also be through Customer Loyalty.

III. Research Method

This research uses a quantitative approach with an associative research type. Always aims to analyze the relationship and influence between the variables studied. This approach is used to test the influence of ECI and ESQ on CS and its implication for the CL of the Shopee application. The object of this research is one of the users of the application Shopee in terms of the general public residing in the Soloraya region. Population in this case, namely the Shopee user community, especially users in Soloraya, considering the number a very large population, so that in or when determining the number of sample is carried out by using the Chocran formula for an unknown or unknown population. Sample the research was determined using non-probability sampling techniques using the purposive method. Sampling, by selecting according to request such as active users of the shopee application. Then, in the data in this study, the primary data obtained through a process. Data collection by distributing questionnaires using the Google Form being researched based on the statements that have been designed. Each respondent is then asked can provide or state the level of agreement with each statement that has been given (Anshori). Data analysis was carried out using the method Structural Equation Modeling based on Partial Least Square (PLS-SEM) with the help of SmartPLS 3.0 software, because this method is able to analyze model that complex and involves mediating variables with multiple relationship between variables on the size a sufficiently strong sample, so that it is in accordance with the characteristic of this study.

IV. Result and Discussion

4.1. Research Result

To further analyze the relationship of study, the result of Partial Least Squares Structural Equation Modeling (PLS-SEM) can be presented in Figure 2. The figure explains both the measurement model and the structural model, including the outer loading of each indicator and the path coefficient between constructs, so it can provide a visual representation of how customer characteristic can contribute to the Shopee platform and can influence user loyalty.

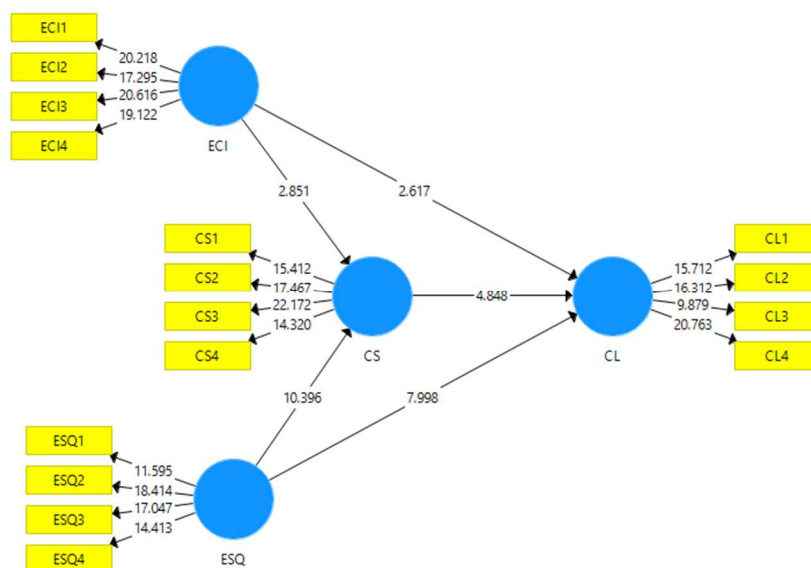


Figure 2. Output PLS-SEM

Table 1. Demographic Characteristics of Respondents

Characteristic	Category	Frequency	%
Gender	Male	94	28.1%
	Female	240	71.9%
Education	SD	7	2.1%
	SMP	6	1.8%
	SMA/SMK/MA	228	68.3%
	Higher education (Diploma, S1, S2, S3)	93	27.8%
Age	15 – 20 Year	45	13.5%
	21 – 26 Year	199	59.6%
	27 – 30 Year	29	8.7%
	31 – 40 Year	21	6.3%
	>40 Year	40	12.0%
Occupation	Student	206	61.7%
	Privat employee	68	20.4%
	Entrepreneur	26	7.8%
	Civil servant/State-Owned Enterprise	21	6.3%
	Other	13	3.9%
Duration of use	<1 Year	49	14.7%
	>1 Year	285	85.3%
Total	334	334	100

Based on Table 1, the respondent profile table, it is known that in these result stated that the majority of the gender was female, amounting to 240 respondent, amounting to 71.9%, while the total number of male respondent was 94 people or 28.1%. This is seen from Education level, most of the respondent were high school/vocational school/Islamic high school graduates, as many as 228 people or 68.3%, Followed by higher education (Diploma, Bachelor, Master, and Doctoral) as many as 93 respondent or 27.9%. Meanwhile, the rest came from elementary school level, as many as 7 respondent or 2.1% and junior high school as many as 6 respondent or 1.8%. Based on age characteristics respondent were dominated by the 21-26 year old age group, totalling 199 people. 59.6%, then followed by 45 respondent aged 15-20 years or 13.5%, aged over 40 years old as many as 40 respondent or 12.0%, aged 27-30 years as many as 29 respondent or 8.7%, while respondent aged 31-40 years numbered 21 people or 6.3%. In terms of occupation, the majority of respondents were students or college students as many as 206 people or 61.7%, followed by private employees as many as 68 responden or amounting to 20.4%, entrepreneurs as many as 26 respondents or 7.8%, civil servant/state owned enterprises as many as 21 respondent or 6.3%, and other job categories as many as 13 respondents or 3.9%. Meanwhile, based on the length of use of more than 1 year, namely 285 or 85.3%, while respondents with a period of use of less than one year numbered 49 people or 14.7%.

Table 2. Domicile Identity

Domicile	Frequency	%
Surakarta	61	18.3%
Sukoharjo	42	12.6%
Karanganyar	87	26.0%
Boyolali	41	12.3%
Sragen	49	14.7%
Klaten	22	6.6%
Wonogiri	24	7.2%
Lainnya	8	2.4%
Total	334	100

Based on table 2, In terms of domicile, the majority of respondent came from Karanganyar district with a total 87 people or 26.0%, and followed by the city of Surakarta as many as 61 respondent or 18.3%, Sragen district as many as 49 respondents or 14.7%, Sukoharjo district as many as 42 respondents or 12.6%, Boyolali district as many as 41 respondent or 12.3%, Wonogiri district as many as 24 respondents or 7.2%, Klaten district is many as 22 respondent or 6.6%, as well as those who chose other domiciles as many as 8 respondent or 2.4%. The distribution of domiciles shows that the research respondent were spread evenly across the Soloraya region.

Table 3. Outer Model Test Result

Variable	ECI	ESQ	CS	CL
ECI	0.753			
	0.769			
	0.721			
	0.785			
ESQ		0.696		
		0.749		
		0.710		
		0.702		
CS			0.768	
			0.739	
			0.736	
			0.731	
CL				0.785
				0.674
				0.764
				0.725

Based on the result of the convergent validity test above 0.60. The final result in the value the highest outr loading is found in the ECI 4 indicator at 0.785, however, in value the lowest value is also found in the CL2 indicator, which is 0.647. Although there are several indicators with values below 0.70, but these values are still above the minimum limit 0.60 so it still acceptable and is declared valid by convergent validity. This in line with the opinion (Hair *et al.*, 2022). Which states that indicators with outer values loading between 0.60 – 0.70 is still suitable for use and acceptance, especially when conducting research is of a model development nature. All indicators have met the validity criteria convergent and accepted for the next stage.

Table 4. Composite Reliability Test Result

Variable	Composite Reliability Value	Criteria	Information
ECI	0.843	0.70	Reliable
ESQ	0.807	0.70	Reliable
CS	0.832	0.70	Reliable
CL	0.827	0.70	Reliable

Based on the composite reliability result, it shows that all variables has a composite reliability above 0.70. The composite reliability value for the E-Commerce variable Innovation was 0.843, E-Service Quality 0.807, Customer Satisfaction 0.832, and Customer Loyalty 0.827. These result explain that all the constructs in this study have been meets the reliability criteria. The recommended composite reliability value is at range from 0.70 to 0.95 (Hair *et al.*, 2022) While values above 0.95 indicate that the possibility of redundancy in the indicators. In this study, all composite values reliability has been in the range suggested by (Hair *et al.*, 2022), thus, it can it was concluded that each indicator had a good level of internal consistency, in measuring its constucts. Thus, based on the criteria that have been put forward by (Hair *et al.*, 2022), all variables were assessed as reliable, the research instrument was meets the composite reliability requirements, so it is suitable and acceptable for use in next stage analyze.

Table 5. Discriminant Validity Test Result

Variable	CL	CS	ECI	ESQ
CL	0.738			
CS	0.784	0.744		
ECI	0.671	0.680	0.758	
ESQ	0.805	0.825	0.688	0.715

Based on the result of the Fornell-Larcker Criterion test, the square root value of AVE at CL (Customer loyalty) variable is 0.738, CS (customer satisfaction) is 0.744, ECI (e-commerce innovation) of 0.758, and ESQ (e-service quality) of 0.715. Theses values higher than the correlation value in terms of variables. These result indicate that each construct has a stronger relationship with its constituent indicators if compared to other constucts in the research model (Hair *et al.*, 2022).

Table 6. Cronbach Alpha Test Result

Variable	Cronbach Alpha	Criteria	Information
ECI	0.752	0.60	Reliable
ESQ	0.680	0.60	Reliable
CS	0.731	0.60	Reliable
CL	0.720	0.60	Reliabel

Based on the result of the Cronbach Alpha reliability test, it is known that all variables research covering E-Commerce Innovation, E-Service Quality, Customer Satisfaction, and Customer Loyalty has a figure above 0.60. The Cronbach Alpha value for each variable shows that all the research variables meet the reliability criteria. According to (Hair *et al.*, 2022), the value of the Cronbach Alpha result is 0.70 to indicate the level of strong reliability. However, in social and behavior research, the Cronbach Alpha value is 0.60 still accepted especially for exploratory research. In a construct that can be explained reliably if it meets two main criteria, namely the number of values Cronbach Alpha 0.60 and Composite Reliability value 0.70 (Hair *et al.*, 2022).

Table 7. AVE Test Result

Variable	AVE	Criteria	Information
ECI	0.574	0.70	Valid
ESQ	0.511	0.70	Valid
CS	0.553	0.70	Valid
CL	0.545	0.70	Valid

The AVE test can be used for a construct's ability to explain variance the indicators. Then in a constructs it can be explained that it has validity converges well and is valid if the AVE value is 0.50 (Hair *et al.*, 2022). Results on testing shows that the E-Commerce Innovation variable has an AVE value of 0.574, E-Service Quality is 0.511, Customer Satisfaction is 0.553, and Customer Loyalty is 0.511 of 0.545. All AVE values are above the minimum limit of 0.50, this indicates tht construct is able to explain more than 50% of the variation in the indicator. Thus, all this research construct has fulfilled the AVE criteria and is stated to have convergent validity good (Hair *et al.*, 2022).

Table 8. Path Coefficient Test Result

Relationship Between Variable	Path Coefficient	Direction of Influence
ECI → CS	0.213	Positive
ECI → CL	0.154	Positive
ESQ → CS	0.679	Positive
ESQ → CL	0.435	Positive
CS → CL	0.321	Positive

Based on the result of the path coefficient test using the PLS method the algorithm in the SmartPLS 3 application, which shows all the relationship between variables direction of positive influence. The path coefficient value can indicate the direction between constructs, which the greater the coefficient value, the stronger the influence (Hair *et al.*, 2022). The highest coefficient value is found in the relationship between E-Service Quality and Customer Satisfaction is 0.679, which shows that the quality of electronic services has the strongest influence in increasing customer satisfaction. Then, E-Service Quality towards Customer Loyalty has a value of 0.435, which means that the quality of services also play a direct role in forming customer loyalty. Meanwhile, E-Commerce Innovation has a positive effect on Customer Satisfaction of 0.213 and on Customer Loyalty of 0.154, but with a relatively strong influence low, customer satisfaction has also been shown to have a positive effect on customer loyalty wwith a coefficient value of 0.321.

Table 9. Result of the Coefficient of Determination (R²) Test

Variable	R ² Value
CS	0.705
CL	0.704

The R-Square (R²) test is used to determine the independent variables in explains the dependent variable in the structural model (inner model). The R² value is 0.75 can describe the model as strong, 0.50 also describe if the model is strong is moderate, and a value of 0.25 has produced a low model. So based on the result of the determination coefficient test in the table show that customer satisfaction variable has an R² value of 0.75, which is considered strong. In this case, has shown that 70.5% is the variation in the customer satisfaction variable which can be explained by the independent variables in the research model, then 29.5% of which the remainder can be influenced by other factor outside the model that are not not studied. With thus, the customer loyalty variable has an R² value of 0.704 which has been is included in the strong variable category. This value already illustrates that 70.4% of the variation in the customer loyalty variable can be explained through the variables that have been used in the research model, meanwhile, 29.6% were not included into the analysis (Hair *et al.*, 2022).

Table 10. Q-Square Test Results

Variable	Q ²
CL	0.368
CS	0.378

Q-square test (Q²) has been studied to be able to assess and integrate an ability predictively the structural model against the research variable. The Q-Square value obtained result Blindfolding can be used to determine how well and accurately a research model can predict observational data. If the Q-Square value is 0.25, then the value is above 0.25. Indicates strong predictive ability, values between 0.15 and 0.25 indicate moderate predictive ability, while a Q² value < 0.15 indicates that the model predictive ability is classified as low or weak (Hair *et al.*, 2022). Meanwhile, the value q-square predictive relevance is used to evaluate the extent to which a model has the ability to predict data. A value of 0.02 indicates a moderate prediction, and 0.35 indicates a strong model (Hair *et al.*, 2022). Based on the result of the Q² calculation, the q-square value for the Customer Loyalty variable was obtained with a value of 0.368, which is included in the strong and good category. This value also indicates that the variable Customer Loyalty can be predicted by the variables E-Commerce Innovation, E-Service Quality, and Customer Satisfaction, which is 36.8%, while the remainder is 63.2% which can be explained by other variables outside this research model. Meanwhile, the result of the Q² test on the variable CS 0.378, is included in the high level. The Customer Satisfaction can be predicted by E-Commerce Innovation and E-Service Quality variables 37.8%, and others 62.2% which describe other variables outside the variables not examined in this study. Therefore, based on the criteria it can be explained that the research model has very good predictions strong (Hair *et al.*, 2022).

Table 11. F-Square Test Evaluation Results

Relationship Between Variable	f ² Value	Category
CS → CL	0.102	Small-Medium
ECI → CL	0.039	Small
ESQ → CL	0.184	Medium
ESQ → CS	0.822	Large

In testing the effect size (f-square), the aim is to see the magnitude of the influence of each variable and explains the variables in the structural model. The fsquare value shows how much the F-Square value changes if a constructs is eliminated from the research model (Hair *et al.*, 2022). Based on the test result in the table, it can be seen that E-Service Quality has the most dominant influence on Customer Satisfaction with an f-square value of 0.822 which is included in the large category. In this case, it shows that the quality of electronic services is the main factor for customer. Thus, E-Service Quality also has a moderate effect on Customer Loyalty with an f-square value of 0.184. Customer Satisfaction has a small to medium influence on Customer Loyalty with a value of f-square of 0.102, while E-commerce Innovation shows a small impact on Customer Loyalty at 0.039. Criteria for grouping effect size values in this study shows that 0.02 indicates a low influence, 0.15 indicates a medium influence, and 0.35 indicates high influence (Hair *et al.*, 2022).

Table 12. Hypothesis Test Result

Variable Relationship	Original Sample (o)	T Stat	P Value	Information
ECI → CS	0.213	3.132	0.002	H1 Accepted
ECI → CL	0.154	2.839	0.005	H2 Accepted
ESQ → CS	0.679	11.118	0.000	H3 Accepted
ESQ → CL	0.435	7.989	0.000	H4 Accepted
CS → CL	0.321	4.855	0.000	H5 Accepted
ECI → CS → CL	0.068	2.762	0.006	H6 Accepted
ESQ → CS → CL	0.218	4.186	0.000	H7 Diterima

Based on the result of hypothesis testing using the bootstrapping method in the application SmartPLS 3.0, in the research model, is stated to be significant because it meets the t-test criteria, statistic 1.96, P-Value 0.05 as stated by (Hair *et al.*, 2022). The result have shown that customer satisfaction has an impact and has a positive and significant effect on customer loyalty on the path coefficient value, namely 0.321, t-

statistic 4.855, P-Value 0.000, which has illustrated that the increase in satisfaction to customer will encourage the formation of customer loyalty, in line with the findings (Rather, 2020). Furthermore, E-Commerce Innovation has a positive impact and influence significant effect on Customer Loyalty with a coefficient value of 0.154, and a t-statistic value of 2.839, P-Value 0.005, and has a positive and significant effect on Customer Satisfaction has a coefficient value of 0.213, t-statistic 3.1322, P-Value 0.002. The test also indicates if the e-service quality variable has a positive and significant impact and influence on customer loyalty with a coefficient value of 0.435, t-statistic of 7.989, and P-Value of the value of the number is 0.000, and has a positive and significant impact or influence on Customer Satisfaction coefficient figure is 0.679, t-statistic is 11.118, and p-value is shows a strong level significance. In addition, Customer Satisfaction has been proven able to significantly mediate the relationship between variables. Thus, all hypotheses research from Hypoteses 1 Hypotese 7 is declared accepted.

4.2. Discussion

a. The Influence of E-Commerce Innovation on Customer Satisfaction

The result of the analysis show that E-Commerce Innovation has a significant impact on CS (Customer Satisfaction). The analysis obtained a path coefficient value of 0.213, p-value of $0.002 < 0.05$. E-commerce innovation make it easier to search for product, From payment transaction to after sales service. Innovation tailored to needs customer can improve their convenience and overall shopping experience. Innovation that can provide real benefits to users will improve a level of consumer acceptance and satisfaction (Rogers, 2024). From a behavioral perspective digital consumers, relevant innovation will narrow the gap between expectations and actual experience. When the innovation is able to answer user needs effectively effective, then positive confirmation will occur and result in satisfaction. Therefore, the findings are in line with previous research which discussed and states that a shopee innovation is able to improve the user experience in general overall (Liao *et al.*, 2024).

H1: E-Commerce Innovation has a positive and significant impact and influence on Customer Satisfaction.

b. The Influence of E-Commerce Innovation on Customer Loyalty

E-commerce innovation in the form of developing interactive features, personalization based on artificial intelligence, increasingly efficient payment system, digital security improved, and the increasingly intuitive interface has been proven to create a better experience. More convenient and valuable shopping for users. Continuous innovation make consumers feel that the platform is relevant and able to meet their needs their digital, thus encouraging the emergence of long-term loyalty. When users experience immediate benefits such as ease of navigation, speed of transaction, and features that facilitate the purchasing process by customer in the context of modern e-commerce (Liao *et al.*, 2024). The result show that Customer Satisfaction has an impact or influence on significant impact on Customer Loyalty. The test result obtained a path coefficient value of 0.321 and p-value $0.000 < 0.05$. Customer Satisfaction has a positive and significant effect on Costumer Loyalty among e-commerce users. To make a purchase repeat, recommend to other and maintain long-term relationships with e-commerce platform. This finding is the same as previous research which indicates that customer satisfaction is formed a comparison between expectations consumer with the actual performance they perceive (Kotler & Keller, 2022). Then, perception of service quality is very determinant in forming an evaluation to customer. Consistnet system performance and minimal disruption will strengthen customer confidence in the platform, thereby increasing the possibility of forming satisfaction.

H2: E-Commerce Innovation has a positive and significant impact or influence on Customer Loyalty.

c. The Influence of E-Service Quality on Customer Satisfaction

That the result of the analysis state that the test result obtained the number of path values coefficient of 0.679 and p-value of $0.000 < 0.5$. Therefore, it is describe that E-service Quality has a positive and significant impact or influence on Customer Satisfaction. E-Service Quality has a strong influence on user satisfaction with digital services (Santos, 2003). Satisfied customer tend to develop attachment or emotional attraction to a platform, which will ultimately strengthen the intention sustainability in use. Previous research that is in line with this is

if service quality also has a large and significant influence and impact towards the satisfaction felt by customers (Rodríguez *et al.*, 2020).

H3: E-Service Quality has a positive and significant impact and influence on Customer Satisfaction.

d. The Influence of E-Service Quality on Customer Loyalty

Testing has been carried out, it is known that E-service Quality has a positive influence on Customer Loyalty. The test result shows that the path value coefficient 0.435 and p-value $0.000 < 0.05$. Thus, it can be concluded that E-Service Quality has a positive and significant impact on Customer Loyalty. High electronics will increase repeat purchase intentions and customer loyalty (Parasuraman *et al.*, 2005). This analysis was driven by a finding that describe that the service quality aspect has a strong direct influence on loyalty user (Antwi *et al.*, 2022).

H4: E-service Quality has a positive and significant impact and influence on Customer Loyalty.

e. The Influence of Customer Satisfactio on Customer Loyalty

Customer Satisfaction is the result of user evaluation of the experience and this satisfaction is an important basis for forming user loyalty. When the platform performance meet or exceed information, as well as a pleasant shopping experience, then customer will show loyal behavior such as repeat purchases and positive recommendation. Research the latest international research shows that satisfaction is the main determining factor. Motivate consumer to remain loyal to e-commerce platform, especially the younger generation digital native (Mouzas *et al.*, 2022). This is in line with the theory put forward by (Oliver, 1999). Which describe that satisfaction is one of the main factors for build loyalty.

H5: Customer Satisfaction has a positive and significant impact and influence on Customer Loyalty.

f. The Influence of E-Commerce Innovartion on Customer Loyalty through Customer Satisfaction

In testing on mediating variables, it can be shown that CL and CS function on intermediary variables in fluncing e-commerce innovation on customer loyalty. The result of the analysis stated that the path coefficient value was 0.068 with a p-value $0.006 < 0.05$, which means the influence is significant. The findings prove that E-Commerce Innovation not only has a direct impact on the CL variable, but also through CS variable. Satisfaction is the most important mechanism that can connect customer experience with long-term loyalty (Oliver, 1999).

H6: E-Commerce Innovation has a influence on Customer Satisfaction other than directly but it can also be done through Customer Loyalty.

g. The Influence of E-Service Quality on Customer Loyalty through Customer Satisfaction

Based on the result the mediation test, it can be seen that Customer Satisfaction mediating the influence of E-Service Quality on Customer Loyalty. From the result of an analysis shows that the path coefficient value is 0.218 with a p-value of 0.000 which explains less of 0.05, so it can be explained that the relationship between the variables is significant. According to loyalty, directly and indirectly through customer satisfaction intermediaries as intervening variables (Parasuraman *et al.*, 2005). Therefore, customer satisfaction has strategic role as a partial mediating variable in the research model.

H7: E-Service Quality has an influence on Customer Satisfaction not only directly but also indirectly can also be through Customer Loyalty.

V. Conclusion

Based on the of the research, namely using the Structural SEM-PLS method Equation Modeling-Partial Least Squares in the SmartPLS 3.0 application, it can be concluded that ESQ plays the most dominant role in e-commerce platform users. In the test result, analysis has indicated that E-Service Quality has an influence

and impact positive and significant and the strongest on Customer Satisfaction, and has a positive influence directly to Customer Loyalty, which can indicate that the quality of electronic services such as ease of use of applications, transaction security, speed system. Then, CS has impact on CL and can indicate that loyalty Customer are formed through experiences with services that can create satisfaction. First meanwhile, E-Commerce Innovation has a positive influence on customer satisfaction and loyalty, however, with a relatively low level of influence compared to the quality of electronic services, limitations on research variables, as well as research design that are not yet able to describe customer behavior in the long term long. Thus, it is recommended for the company to continue to improve the quality electronic services consistently and develop innovations that are in accordance with user needs, while for future researchers it can be suggested that they can expanding the object of appropriate research and using a longitudinal approach and comprehensive.

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