



Measuring E-Commerce Customer Satisfaction and Loyalty in Jakarta Using E-SERVQUAL and IPA: Case Study JD.ID

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ABSTRACT

In order to improve customer satisfaction and loyalty to e-commerce, certain aspects of e-service quality need to be emphasized. The study employs Electronic Service Quality (E-SERVQUAL) and Importance Performance Map Analysis (IPA) to evaluate the collected data. Data Processing use SEM-PLS to analyze relationships between latent variables. The findings show that website reliability, security, compensation, responsiveness, personalization, and assurance significantly affect consumer satisfaction, positively influencing customer loyalty. According to the results of the IPA research, e-commerce must concentrate on security factors with 0.086 importance to strengthen its security controls and increase customer loyalty and trust. Hence, e-commerce should also maintain website design variables and customer satisfaction to maintain high-priority variables.

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1. INTRODUCTION

The rapid development of technology is driven by creativity and innovation, aiming to enhance convenience in everyday life. Technological advancements have led to modernity, characterized by cultural expansion, increased social mobility, and economic growth. As people's lifestyles evolve and mobility

increases, there is a growing preference for practical and efficient solutions to meet their needs. This demand has fueled the rise of various digital services, including in the business and economic sectors. To remain competitive, businesses must continuously improve their services and offer added value to customers.

E-commerce has revolutionized how businesses operate by utilizing information and communication technology and the Internet to facilitate virtual transactions. The emergence of online marketplaces has significantly impacted consumer behavior, making service quality a crucial factor in attracting and retaining customers (Do et al., 2023). In Indonesia, e-commerce has experienced exponential growth, with a large percentage of the population relying on online platforms for shopping. A survey conducted in October 2021 revealed that out of 10,000 respondents across Indonesia, only 26.3% did not use any online shopping services, indicating a strong consumer shift toward e-commerce (Mofokeng, 2021). As more businesses enter the online marketplace, competition intensifies, and maintaining high service quality becomes essential.

Despite the growth of e-commerce, challenges remain in ensuring customer satisfaction and loyalty. According to a Director General of Consumer Protection and Orderly Commerce report, 9,393 consumer complaints were recorded in 2021, a tenfold increase from the previous year. Many of these complaints were related to delivery delays, product mismatches, and inadequate customer service, highlighting the need for continuous service quality improvement in Indonesia's e-commerce sector. Poor service quality can lead to customer dissatisfaction, negative reviews, and, ultimately, loss of business competitiveness (Ashiq and Hussain, 2024).

Service quality plays a pivotal role in shaping customer satisfaction and fostering long-term loyalty. Businesses prioritizing service excellence gain a competitive edge and improve customer retention (Mamakou et al., 2024). E-SERVQUAL (Electronic Service Quality) is

widely used to assess how effectively e-commerce platforms meet customer expectations across multiple dimensions, such as efficiency, reliability, responsiveness, privacy, and customer support. However, while E-SERVQUAL effectively identifies service deficiencies, it does not indicate which aspects should be prioritized for improvement (Humaidi et al., 2020). In highly competitive online markets, businesses require a strategic approach to allocate resources efficiently and enhance the most critical aspects of service.

This study integrates E-SERVQUAL with Importance-Performance Analysis (IPA) to address this challenge. While E-SERVQUAL identifies service gaps, IPA helps businesses prioritize improvements by mapping service attributes based on their importance to customers and current performance levels (Martilla and James, 2025). By combining these two methods, this study provides a comprehensive evaluation of e-commerce service quality in Jakarta, allowing businesses to implement data-driven strategies for enhancing customer experience. The case of JD.ID, an Indonesian e-commerce platform that ceased operations due to declining customer satisfaction, further illustrates the importance of service quality management. Issues such as slow delivery, product discrepancies, and inadequate customer service contributed to its downfall, demonstrating that without continuous improvement, even well-established e-commerce brands can fail (Sundaram et al., 2017).

This study evaluates customer satisfaction and loyalty in Jakarta's e-commerce sector using E-SERVQUAL and IPA, providing practical recommendations for businesses to enhance service quality. This research contributes to developing more effective customer experience

strategies in digital commerce by identifying critical service attributes and prioritizing improvements.

2. LITERATURE REVIEW

Service quality is a critical factor determining any business's success in the service sector, including e-commerce. Grönroos (Grönroos, 1984) introduced the concept of service quality as the customer's perception of the difference between expected and perceived service. Rita et al. (Rita et al., 2019) emphasized that service quality is essential for e-commerce services, as online customers expect a quality comparable to or exceeding that of traditional businesses. Siadat et al. (Siadat et al., 2008) stated that service quality ensures that internal and external customers receive the expected value. Despite extensive research on service quality over the past two decades, only a limited number of studies have specifically adapted these findings to e-commerce, creating a need for further exploration in this domain.

E-service quality is a concept that evolved from traditional service quality models tailored explicitly for electronic business transactions. Parasuraman et al. (Parasuraman et al., 2005) defined e-service quality as the extent to which an e-commerce platform enables efficient and successful shopping, purchasing, and delivery experiences. While early studies focused on website usability and interaction, later research expanded the definition to include pre- and post-purchase experiences (Belanche et al., 2012; Bucko and Kakalejčík, 2018; Lewis and Sauro, 2021). Collier and Bienstock (Collier and Bienstock, 2006) argued that many early e-service quality studies did not fully capture the entire service delivery process, leading to gaps in evaluating the overall e-commerce experience. Several

studies have analyzed service quality in e-commerce, focusing on different platforms and dimensions, as shown in **Table 1**.

Arilaha et al. (Arilaha et al., 2021) examined service quality in Tokopedia and Bukalapak using the traditional SERVQUAL and IPA methods, emphasizing reliability and responsiveness as the most critical dimensions. Wisnel et al. (Wisnel et al., 2022) expanded the focus to include general e-commerce platforms, integrating E-SERVQUAL with additional dimensions such as website design, information accuracy, security/privacy, and personalization. Meanwhile, Putri et al. (Putri et al., 2022) specifically investigated JD.ID using E-SERVQUAL, highlighting security, efficiency, fulfillment, and customer support issues. The key distinction between these studies and the current research (2025) is the inclusion of a broader range of e-service quality dimensions. While past studies focused primarily on a few critical dimensions, this study incorporates compensation, efficiency, fulfillment, and contact options, which have been identified as emerging concerns in e-commerce service quality.

Additionally, data processing methods differ significantly across studies. Arilaha et al. (Arilaha et al., 2021) used SEM-PLS, which is also applied in this study to improve the accuracy of data interpretation. Putri et al. (Putri et al., 2022) relied on multiple linear regression, limiting the depth of structural analysis in understanding how different service quality dimensions interact. The current research strengthens this approach by combining E-SERVQUAL with IPA, ensuring service gap identification and strategic prioritization of service improvements.

Table 1. Research Position

Author		Wilujeng, et al (2019)	Cantika, T., & Wirdianto, E. (2022)	Putri, R. S., Astiti, S., & Amriza, R. N. S. (2022)	Current Research (2025)
Object	Tokopedia	✓	-	-	-
	Bukalapak	✓	-	-	-
	JD.ID	-	-	✓	✓
	e-commerce	-	✓	-	-
E-service Dimension	Reliability	✓	✓	-	✓
	Responsiveness	✓	✓	✓	✓
	Assurance	✓	-	-	✓
	Website design	-	✓	-	✓
	Information	-	✓	-	✓
	Security/Privacy	-	✓	✓	✓
	Personalization	-	✓	-	✓
	Compensation	-	-	✓	✓
	Efficiency	-	-	✓	✓
	Fulfillment	-	-	✓	✓
	Contact	-	-	✓	✓
Method	SERVQUAL	✓	-	-	-
	E-SERVQUAL	-	✓	✓	✓
	IPA	✓	-	-	✓
Data Processing	SEM-PLS	-	✓	-	✓
	Multiple Linear Regression	-	-	✓	-
Variable Used	Service Quality	✓	-	-	-
	E-service quality	-	✓	✓	✓
	Customer Satisfaction	✓	✓	✓	✓
	Customer Loyalty	-	✓	-	✓

Despite the valuable insights provided by previous research, there are still key gaps that need to be addressed:

1. **Limited Focus on JD.ID:** While Putri et al. (Putri et al., 2022) analyzed JD.ID, their study did not integrate importance-performance analysis (IPA), which is crucial for prioritizing service improvements. The current study bridges this gap by combining E-SERVQUAL and IPA to provide a more actionable framework for service enhancement.

2. Lack of Comprehensive E-Service Dimensions: Prior studies emphasized reliability, responsiveness, and security, but few addressed compensation, efficiency, and fulfillment. This study fills this gap by examining these dimensions and their impact on customer satisfaction and loyalty.
3. Customer Loyalty Considerations: Many existing studies, including (Arilaha et al., 2021), primarily focused on service quality without deeply exploring its direct relationship with customer loyalty. This study explicitly evaluates how e-service quality influences loyalty, helping businesses formulate retention strategies.
4. Integration of IPA and SEM-PLS: Previous studies either applied IPA or SEM-PLS. However, this research uniquely integrates both to enhance predictive accuracy and provide a strategic action framework for e-commerce businesses.

In summary, by synthesizing previous findings and identifying gaps, this study enhances the existing knowledge on e-commerce service quality in Indonesia, particularly for JD.ID. Through a combined E-SERVQUAL and IPA approach, this research aims to provide practical insights for improving customer satisfaction and fostering long-term loyalty in e-commerce businesses.

3. RESEARCH METHODOLOGY

This study begins with a preliminary analysis to identify key issues in e-commerce service quality. A questionnaire is distributed via social media to gather user insights. A literature review is conducted to assess existing studies and identify gaps, such as unexplored variables, service quality dimensions, or research contexts.

After defining the problem and objectives, the study framework is developed, and E-SERVQUAL, hypothesis testing, and IPA analysis are selected as the analytical methods. Data collection follows, with responses analyzed to evaluate e-service quality. Finally, the study presents findings, recommendations, and conclusions based on the results.

3.1. Proposed Research Model

This study employs structural equation modeling least squares (SEM-PLS), as shown in **Figure 1**, to analyze the impact of e-service quality dimensions on customer satisfaction and loyalty. The proposed model represents the relationships between key constructions, including service quality factors, customer satisfaction, and customer loyalty. Some correlation between variables & hypothesis development are considered, such as:

a) Effect of E-Service Quality on Customer Loyalty

Research by (Kabir et al., 2009) and (Sheng and Liu, 2010) confirms that e-service quality significantly influences customer loyalty, indicating that better service quality enhances customer retention.

b) Influence of E-Service Quality on Customer Satisfaction

(Swaid and Wigand, n.d.) identified e-service quality as a key driver of customer satisfaction and loyalty. Recent findings by Wisnel et al. (Wisnel et al., 2022) further support that higher satisfaction leads to greater loyalty.

c) Impact of E-Service Quality on Customer Loyalty through Customer Satisfaction

(Kassim and Asiah Abdullah, 2010) found that satisfied customers are more loyal and engage in positive word-of-

mouth marketing. (Wisnel et al., 2022) also emphasize that customer satisfaction directly enhances loyalty, reinforcing its role as a mediator in the e-service quality-loyalty relationship.

3.2. Sampling Design

Population is the entire research object consisting of humans, objects, animals, plants, symptoms, test scores, or events as data sources with specific characteristics (Hardani, 2020). The people of Jakarta familiar with e-commerce transactions comprise the study's population. The city was selected since it is the representative region where the population is educated about e-commerce services.

A purposive sampling method was used to consciously select customers who meet the criteria of having used e-commerce services for the past twelve months. The criteria for determining the respondents in this study include: (1) The participants in this study are customers of observed e-commerce that live in Jakarta temporarily or permanently, (2) customers already 18 or older, (3) customers who have made transactions or product searches through e-commerce minimum two times. In studies where it is impossible to know the population with certainty (Bartlett et al., n.d.) (Fernanda et al., 2022), the Cochran formula. The equation reads as follows.

$$n = \frac{Z^2(1-p)}{e^2}, \quad (1)$$

where n is the number of samples needed, Z is the z-value extracted from a z-table with a confidence level of 95 %, p is the fraction of the population (as a percentage) that displays the attribute, and e is the desired level of precision with a margin of error 5%.

3.3. Hypotheses

Furthermore, the hypotheses in this study were determined as follows.

1. H_0 : Website design does not impact customer satisfaction.
 H_a : Website design positively impacts customer satisfaction.
2. H_0 : Reliability does not impact customer satisfaction.
 H_a : Reliability positively impacts customer satisfaction.
3. H_0 : Security does not impact customer satisfaction.
 H_a : Security positively impacts customer satisfaction.
4. H_0 : Compensation does not impact on customer satisfaction.
 H_a : Compensation positively impacts customer satisfaction.
5. H_0 : Responsiveness does not impact customer satisfaction.
 H_a : Responsiveness positively impacts customer satisfaction.
6. H_0 : Personalization does not impact customer satisfaction.
 H_a : Personalization positively impacts customer satisfaction.
7. H_0 : Assurance does not impact customer satisfaction.
 H_a : Assurance positively impacts customer satisfaction.
8. H_0 : Efficiency does not impact customer satisfaction.
 H_a : Efficiency positively impacts customer satisfaction.
9. H_0 : Fulfillment does not impact customer satisfaction.
 H_a : Fulfillment positively impacts customer satisfaction.
10. H_0 : Information does not impact on customer satisfaction.
 H_a : Information positively impacts customer satisfaction.
11. H_0 : Contact does not impact customer satisfaction.
 H_a : Contact positively impacts customer satisfaction.

12. H_0 : Customer satisfaction does not impact on customer loyalty.

H_a : Customer satisfaction positively impacts customer loyalty

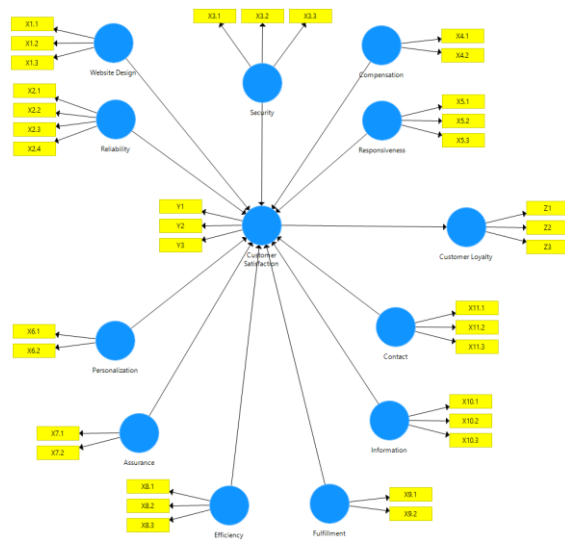


Figure 1. Conceptual Model

These hypotheses form the foundation for the research study, aiming to validate the effectiveness of integrating e-SERVQUAL and IPA in understanding and improving customer satisfaction and loyalty in e-commerce.

3.4. Research Variable & Attribute

This research uses independent variables and dependent variables. The variables used in this study are E-service Quality (X), Customer Satisfaction (Z), and Customer Loyalty (Y). The research objective is to determine which e-service quality dimensions affect customer satisfaction with the observed e-commerce. The variable E-service quality (X) is considered a latent variable. Meanwhile, customer satisfaction and customer loyalty are the dependent variables. To obtain the required data, researchers need question items for each variable submitted to respondents in this study. Question items for each e-service quality dimension are shown in **Table 2,3 and 4.**

Table 2. e-SERVQUAL dimension attribute items

No.	Dimension	Indicator	Code
1	Website design or website usability	e-commerce makes it easy to find what user needs (e.g., products, payment methods, complaint assistance)	X1.1
		Graphics and animation on e-commerce websites do not bother users when using the website (For example, e-commerce websites do not lag when used)	X1.2
		The transaction on this website take place quickly and easily	X1.3
2	Reliability	e-commerce always sends detailed information	X2.1
		The product is shown and reviewed in detail on the website	X2.2
		Customers can access the e-commerce website at any time	X2.3
		E-commerce provides the same service to existing and new customers	X2.4
3	Security	e-commerce websites protect customers' data (personal data such as KTP)	X3.1

		The website has adequate security features (payment code, login authentication)	X3.2			according to customer desires.	
		E-commerce Website protects customer data related to credit and debit cards.	X3.3	7	Assurance	Security policy in e-commerce is accessible	X7.1
						Privacy policy in e-commerce is accessible.	X7.2
				8	Efficiency	Information on e-commerce is well organized.	X8.1
						E-commerce loads its pages quickly.	X8.2
4	Compensation	e-commerce compensates me for the trouble it creates	X4.1			E-commerce is easy to use.	X8.3
		E-commerce compensates me when what I ordered doesn't arrive on time.	X4.2	9	Fulfillment	E-commerce is honest about the offers given.	X9.1
						E-commerce makes accurate promises regarding product delivery.	X9.2
5	Responsiveness	Transactions that customers make on e-commerce websites are processed quickly	X5.1	10	Information	E-commerce always provides the latest information regularly.	X10.1
		Email confirmation of the purchase of goods from e-commerce was received quickly;	X5.2			E-commerce provides accurate information and what I need	X10.2
		Customers' goods at e-commerce are received according to the estimated delivery time.	X5.3			E-commerce displays detailed information	X10.3
6	Personalization	e-commerce understands the specific needs of customers,	X6.1	11	Contact	E-commerce provides a company telephone number that can be contacted.	X11.1
		E-commerce provides orders	X6.2			E-commerce has customer service	X11.2

		available online.	
	E-commerce	X11.3	
	offers the ability to speak directly to customer service when a problem occurs.		

Table 3. Customer satisfaction questions item

No.	Dimension	Indicator	Code
1.	Customer Satisfaction	The quality of e-commerce services is good	Y1
		The quality of the e-commerce service is better than the user expected	Y2
		It is a wise choice to buy from e-commerce	Y3

Table 4. Customer Loyalty questions item

No.	Dimension	Indicator	Code
1.	Customer Loyalty	When needed a product, e-commerce will be the first choice	Z1
		user would recommend the e-commerce website to someone asking for advice	Z2
		Users will shop with the website more often in the next few years	Z3

3.5. Structural Equation Modeling – Partial Least Square (SEM-PLS)

The SEM-PLS method is used because this method can be applied to all data scales and does not require assumptions (Fernanda et al., 2022). Considerations for using applications and data processing methods using PLS-SEM. There are several assumptions in PLS-SEM. PLS-SEM can use a small sample size, unlike covariance-

based SEM, which requires researchers to use a large sample size because SEM is a procedure that is categorized as a multivariate procedure requiring large amounts of data, for example, at least 400. On the other hand, PLS-SEM does not require much data, making it useful for researchers when it is hard to collect large datasets.

- a) PLS-SEM does not require randomized samples so researchers can use non-probability sampling methods such as accidental or purposive sampling for their analysis.
- b) Only recursive (causal) models are allowed in PLS-SEM, and no recursive (reciprocal) models are allowed, as in covariance-based SEM.
- c) PLS-SEM allows very complex models with many latent variables and indicators.

In conducting an analysis using the PLS-SEM, the PLS-SEM consists of 2 components: the measurement model (outer model) and the structural model (inner model). The measurement model (outer model), also called the outer model, relates all manifest variables or indicators with their latent variables. The outer model is evaluated using the following parameters.

a) Convergent Validity

Convergent validity measures the correlation between latent variables and reflective indicators and whether they are valid. If the research is still in its early stages and necessary development, a value of 0.5 is considered sufficient. An indicator is valid if the outer loading is greater than 0.5.

b) Composite reliability, dan Cronbach alpha

Composite reliability is a measure of internal consistency with a value greater

than 0.7. At the same time, Cronbach Alpha will be considered good model reliability if the Cronbach alpha is greater than 0.7. If both values are greater than 0.7, this model is rated Reliable. If there are unreliable attributes, these attributes will be sorted, or other considerations will be carried out.

c) Discriminant validity

To assess the discriminant validity of reflective indicator variables, the cross-loading values for each variable should be >0.7 (Ghozali & Latan, 2015). Comparing the square root of the average variance extracted (AVE) for each construct with the correlation between other constructs in the model is another technique to verify discriminant validity.

The inner model test aims to determine the correlation of website design or usability, reliability, responsiveness, security, compensation, and personalization on customer satisfaction and loyalty and to see the correlation between customer satisfaction and loyalty variables. The inner model test can be identified through the R Square value contained in the Smart-PLS output.

3.6. Research Hypothesis Testing

The hypothesis can be examined in PLS-SEM by comparing the estimated t value (t_o) to the t table (t). Suppose the value of the t statistic is greater than the t table (1.96, for $\alpha = 5\%$). In that case, it is concluded that exogenous variables significantly influence endogenous variables. In contrast, if it is smaller than the t table, it is said that exogenous variables do not considerably affect endogenous variables.

3.7. Importance Performance Analysis

Another method used in this study is importance-performance analysis (IPA).

IPA is a graphic method shown in a two-dimensional coordinate system, where the average values of importance and performance of different services/product elements are calculated concerning one another, mainly in the area divided into four quadrants. In this method, it is necessary to measure the level of suitability to find out how many customers are satisfied with e-commerce's performance.

Performance analysis is crucial because it helps translate the e-SERVQUAL variables that must be prioritized for improvements. In the Importance-Performance Analysis, mapping is carried out into four quadrants for all variables that affect service quality. The division of quadrants in the Importance-Performance Analysis can be seen in **Figure 2**.

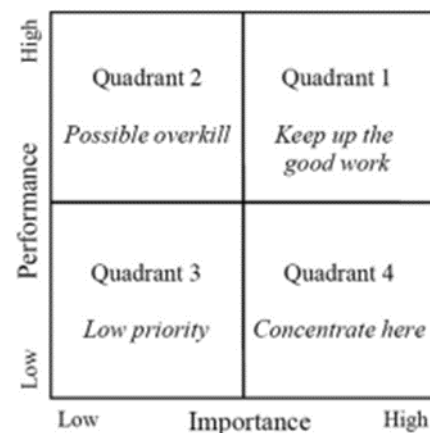


Figure 2. Division of Quadrants in the Importance-Performance Analysis

Strategies that can be done concerning the position of each variable on the four quadrants can be explained as follows:

1. Quadrant I (Keep Up the Good Work)

This area contains the factors considered necessary by the customer, and the factors that the customer finds follow what customers feel, so the level of satisfaction is relatively higher. The variables in this quadrant must be

maintained because all these variables make a product or superior service from the customers' point of view.

2. Quadrant II (Possible Overkill)

Quadrant II is an area that contains factors that are considered less critical by customers and are felt to be too excessive. The variables included in this quadrant can be reduced so that the company can save costs.

3. Quadrant III (Low Priority)

This area contains factors considered less critical by customers, and the performance is not outstanding. Increasing the variables included in this quadrant can be reconsidered because the effect on the benefits felt by customers is minimal.

4. Quadrant IV (Concentrate There)

This area contains the factors considered necessary by the customer, but in reality, these factors do not meet customer expectations (the level of satisfaction obtained is still low). The variables that go in this quadrant should be improved.

4. RESULTS AND DISCUSSION

As mentioned earlier, SEM-PLS (Structural Equation Modeling-Partial Least Squares) analysis was used to determine the structural relationship between E-service Quality variables, namely website design, reliability, security, compensation, responsiveness, personalization, assurance, efficiency, fulfillment, information, and contact, on customer satisfaction and customer loyalty among e-commerce users in Jakarta. Additionally, data analysis using Important Performance Analysis was conducted to rank various service attributes and identify actions that need to be taken by the company. Service attributes will be ranked

based on customer importance and company performance.

This study initially targeted 385 respondents, as determined by the Cochran Formula for an appropriate sample size. However, the final dataset included 390 respondents, indicating a surplus of 5 respondents rather than missing data.

The demographic characteristics of the respondents are as follows:

1. Gender:
 - Male: 210 (53.8%)
 - Female: 178 (45.6%)
 - Prefer not to answer: 2 (0.5%)
2. Age Distribution:
 - <20 years: 7 (1.8%)
 - 20-24 years: 84 (21.5%)
 - 25-29 years: 256 (65.6%)
 - 30-34 years: 32 (8.2%)
 - 35 years: 11 (2.8%)
3. Occupation:
 - Student: 80 (20.5%)
 - Civil servant: 126 (32.3%)
 - Private sector employees: 182 (46.7%)
 - Entrepreneur: 1 (0.3%).

Descriptive Analysis for the SEM Model Measurement Model Evaluation (Outer Model) Before hypothesis testing, a measurement model evaluation was conducted to ensure the validity and reliability of the research constructs.

4.1. SEM-PLS Model Evaluation

Before conducting hypothesis testing to predict the relationships between latent variables in the structural model, a measurement model evaluation was performed to verify the indicators and latent variables that can be tested further. Measurement model testing will be performed to show the results of the validity and reliability tests.

The validity test was carried out to determine whether the construction was eligible to continue as research. Model measurement can be evaluated by deciding on convergent validity, discriminant validity, and composite reliability tests. Below is the evaluation result of these measurement models.

1. Convergent Validity

The amount of indicator variance that latent variables can explain is displayed by indicator reliability. When the loading value (λ) is less than 0.6, a reflective indicator must be removed from the measurement model according to indicator reliability. The results of the loading (λ) value obtained are as follows.

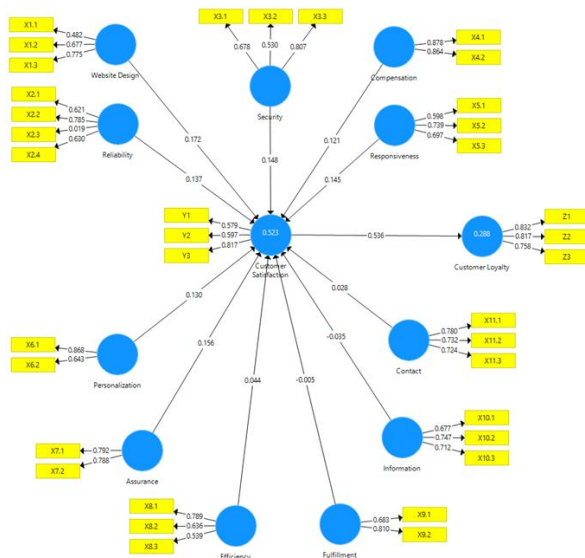


Figure 3. Path Diagram with Loading Factor Values

Based on **Figure 3**, some reflective indicators must be eliminated from the model due to a loading factor of less than 0.6. Some eliminated reflective indicators are: X1.1, X2.3, X2.4, X3.2, X5.1, X8.3, and Y1. Thus, a new diagram is designed, as shown in **Figure 4**.

Based on **Figure 4**, It can be seen that more than 60% of the variance in each of the two indicators, namely X1.2, X1.3 can be explained by the latent variable website design, indicators X2.1, X2.2 can explain

the latent variable reliability, indicators X3.1, X3.3 can explain the latent variable security, indicators X4.1 and X4.2 explain the latent variable compensation, indicators X5. 2 and X5.3 explain the latent variable responsiveness, indicators X6.1 and X6.2 can explain personalization, indicators X7.1 and X7.2 can explain the assurance variable, indicators X8.1 and X8.2 can explain the efficiency variable, indicators X9.1 and X9.2 can explain the fulfillment variable and Y2 and Y3 can explain the customer satisfaction variable. Thus, each latent variable can explain the variance of each indicator that measures above 60%.

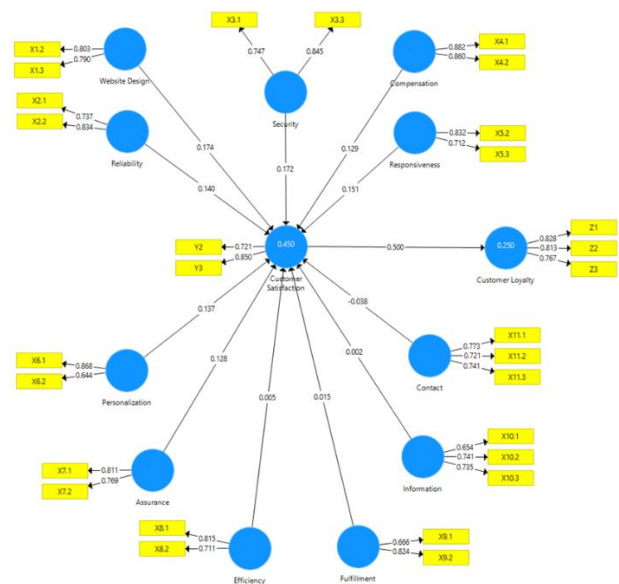


Figure 4. Path Diagram with Loading Factor Value after Elimination Indicator

2. Discriminant Validity

Discriminant validity testing in this study uses the Fornell-Lacker criteria and square root of average (AVE) to test whether the indicators in the survey represent latent variables well. A model can be said to have good discriminant validity if each loading value of a latent variable is greater than the loading values of other latent variables.

3. Composite Reliability

Cronbach's Alpha and Composite reliability are used to test the reliability of a built-in PLS-SEM with the SmartPLS program. However, Cronbach's Alpha assessment offers a lower result. Composite reliability is a more accurate and robust measure of internal consistency (Ghozali, 2016), as it accounts for both common variance and measurement error more nuancedly. **Table 5** shows that all variable values in composite reliability testing are above 0.7, and validity testing using AVE has a value of more than 0.5. Therefore, it can be concluded that the variables tested are valid and reliable, so structural model testing can be carried out.

TABLE 5. Composite Reliability & AVE

Type	Composite Reliability	Average Variance Extracted	Desc
Assurance	0.769	0.625	Reliable
Compensation	0.863	0.759	Reliable
Contact	0.789	0.555	Reliable
Efficiency	0.737	0.585	Reliable
Fulfillment	0.717	0.561	Reliable
Information	0.754	0.506	Reliable
Personalization	0.733	0.584	Reliable
Reliability	0.764	0.619	Reliable
Responsiveness	0.748	0.599	Reliable
Security	0.777	0.636	Reliable
Website Design	0.777	0.635	Reliable
Customer Loyalty	0.845	0.645	Reliable
Customer Satisfaction	0.765	0.621	Reliable

4. R square value

R² is used to evaluate structural models for dependent components. The evaluation of the inner model can be seen from the R² for each latent variable. The estimated result of R² using SmartPLS is in **Table 6**.

TABLE 6. R square value (Goodness of Fit)

Type	R Square
Customer Loyalty	0.25
Customer Satisfaction	0.45

Based on **Table 6**, it shows that the value of R² for Customer Loyalty is 0.25 or

25%. This value means that Customer Loyalty can be explained or represented by the website design, reliability, security, compensation, responsiveness, personalization, assurance, efficiency, fulfillment, information, and contact by 25%. In comparison, the remaining 75% is influenced by variables not included in this study. The R² for Customer Satisfaction is 0.45 or 45%. It means that website design, reliability, security, compensation, responsiveness, personalization, assurance, efficiency, fulfillment, information, and contact variables can explain Customer Satisfaction of 45%, and the rest, which is 55%, is influenced by variables that are not observed in this study.

5. Hypothesis Testing

The significant value between constructs, t-statistics, and p-values can be used to determine whether a hypothesis is accepted or rejected. In this method, statistical assumptions are no longer used to produce the estimated measurements and standard errors; instead, they are based on empirical data. This study's bootstrap resampling approach accepts the hypothesis if the significance levels of the t-values and/or p-values are larger than 1.96 (2-tailed) at the 5% significance level and/or less than 0.05. In this case, H_a is accepted, H₀ is rejected, and vice versa.

The first hypothesis is the relationship between website design and customer satisfaction. Based on the results of hypothesis testing in **Table 7**, a p-value of 0.002 was obtained, which is less than the alpha level (0.05 due to 95% significant levels). Therefore, the null hypothesis is no relationship between website design and customer satisfaction should be rejected. This means a significant relationship exists between website design and customer satisfaction.

TABLE 7. t statistic result

Customer Satisfaction Aspect	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
Website Design	0.174	0.173	0.057	3.068	0.002
Reliability	0.14	0.139	0.047	2.961	0.003
Security	0.172	0.173	0.044	3.889	0
Compensation	0.129	0.127	0.060	2.136	0.033
Responsiveness	0.151	0.144	0.062	2.412	0.016
Personalization	0.137	0.134	0.056	2.43	0.015
Assurance	0.128	0.120	0.050	2.565	0.011
Efficiency	0.005	0.009	0.051	0.108	0.914
Fulfillment	0.015	0.018	0.055	0.273	0.785
Information	0.002	0.005	0.067	0.033	0.974
Contact	-0.038	-0.029	0.069	0.544	0.586

The second hypothesis is the relationship between reliability and customer satisfaction. The results in **Table 7** show a p-value of 0.003, which is less than 0.05, and the t-statistic is more than t-table (1.95 due to 95% significant levels). Therefore, the null hypothesis should be rejected, as it means a significant relationship exists between reliability and customer satisfaction.

The third hypothesis is the relationship between security and customer satisfaction. Based on the results of hypothesis testing, a p-value of 0 is obtained, which is less than the alpha level. Therefore, the null hypothesis stating that there is no relationship between security and customer satisfaction should be rejected. This means that there is a significant relationship between security and customer satisfaction. In addition, the sufficiently large t-statistic value also indicates that the difference between the tested sample and the null hypothesis is significant.

The fourth hypothesis is the relationship between compensation and customer satisfaction. A p-value of 0.033, which is smaller than the alpha level (often 0.05), is obtained based on the findings of

the hypothesis testing. The calculated t-statistic value is 2.136. This number represents the degree to which the tested sample deviates from the null hypothesis. Therefore, it is necessary to reject the null hypothesis that there is no connection between compensation and customer happiness. This indicates that there is a strong link between compensation and customer satisfaction. The large t-statistic value also shows the substantial difference between the tested sample and the null hypothesis.

The next hypothesis is the relationship between responsiveness and customer satisfaction, personalization and customer satisfaction, assurance, and customer satisfaction. The null hypothesis, which states that there is no relationship between responsiveness and customer satisfaction, personalization and customer satisfaction, and assurance and customer satisfaction, must be rejected because all three variables have a p-value of less than 0.05 and a t-statistic value greater than the t-table (1.96).

Of the four hypotheses tested, no significant relationship was found between efficiency, fulfillment, information, and contact with customer satisfaction. The

correlation coefficient between efficiency and customer satisfaction is 0.108. The p-value obtained is 0.914, which means it is not significant. Therefore, the null hypothesis of no relationship between efficiency and customer satisfaction cannot be rejected. This means that there is no significant relationship between efficiency and customer satisfaction. Customer satisfaction and fulfillment have a 0.273 connection relationship. With a p-value of 0.785, the result is not significant. Therefore, it is impossible to rule out the null hypothesis, which states no relationship between fulfillment and customer satisfaction. As a result, fulfillment and customer pleasure have little to no relationship.

Information and customer happiness have a 0.033 connection relationship. With a p-value of 0.974, the result is not significant. As a result, it is impossible to rule out the null hypothesis, which states no connection between information and customer satisfaction. Therefore, information and customer happiness have no discernible link. Customer happiness and contact have a 0.544 connection relationship. The obtained p-value of 0.586 indicates that the result is not significant. In conclusion, Efficiency, fulfillment, information, and contact did not significantly influence consumer satisfaction, according to the four hypotheses examined.

The statistical result in **Table 7** shows a positive and significant relationship between customer satisfaction and loyalty, with a correlation coefficient of 0.5 and a p-value of 0. This indicates that as customer satisfaction increases, customer loyalty also increases. The T-statistic value of 8.834 and a p-value of 0 also suggest that the relationship between these two variables is statistically significant. Therefore, it is recommended that e-commerce focus on improving customer

satisfaction as it will lead to an increase in customer loyalty. E-commerce can consider conducting regular surveys to measure customer satisfaction and identify areas for improvement to enhance customer loyalty.

4.2. Signal-to-Noise Ratio Analysis

Businesses can find areas for improvement and learn more about how customers view their goods and services by employing this analysis. Companies can use this data to make data-driven decisions to improve consumer satisfaction and profitability. Below is the Importance Performance Map Analysis of e-commerce on Customer Loyalty.

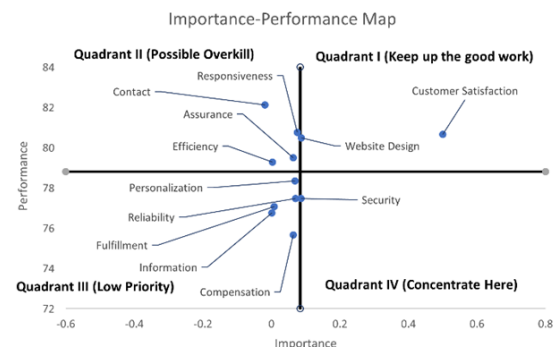


Figure 5. Importance Performance Map Analysis of E-commerce Towards Customer Loyalty

Based on the Importance-Performance Map presented in **Figure 5**, certain key factors significantly impact customer loyalty in e-commerce. The variables in Quadrant 1, namely website design and customer satisfaction, are identified as highly important and performing exceptionally well. These variables include indicators such as user-friendly graphics, smooth website performance, and better-than-expected service, which enhance customer loyalty.

However, the variables in Quadrant 2, namely responsiveness, contact, assurance, and efficiency, are deemed as possible overkill. While e-commerce demonstrates excellent performance in

these aspects, they are comparatively less relevant to customers in influencing their loyalty. Therefore, it is suggested that e-commerce reevaluate its resource allocation in these areas and prioritize the elements that have a stronger impact on customer loyalty, such as website design and customer satisfaction.

Quadrant 3 represents low-priority variables, including personalization, fulfillment, and information. Although e-commerce may not excel in these areas, customers do not perceive them as significant loyalty determinants. Therefore, while it's essential to maintain a satisfactory level of performance in these aspects, they may not demand excessive attention or resources.

The critical area highlighted in Quadrant 4 is security, which customers consider highly important, but e-commerce has not achieved maximum performance. This suggests that improving security measures to safeguard customer data is vital for building trust and enhancing customer loyalty. Protecting sensitive information, such as credit card data and personal details, is crucial in retaining customer trust and loyalty, as a poor security reputation could lead to customers seeking alternatives.

5. CONCLUSION

Integrating the e-SERVQUAL and IPA methods in the e-commerce sector might

give important insights into how customers perceive and expect service quality. While the IPA technique can set priorities for improvement based on importance and performance, the e-SERVQUAL method can help discover the gaps between customer expectations and perceptions. Combining these two approaches will enable e-commerce to create strategies for enhancing service quality, which may raise customer satisfaction and loyalty. Profitability and business performance may increase as a result. Based on the research on e-service quality variables on customer satisfaction using SEM PLS, it can be concluded that e-service quality variables, namely website design, reliability, security, compensation, responsiveness, personalization, and assurance, affect e-commerce users' satisfaction in Jakarta. In addition, hypothesis testing shows that customer satisfaction also positively impacts customer loyalty to e-commerce users in Jakarta. Therefore, e-commerce must consider several aspects of e-service quality to increase customer satisfaction and loyalty. For improvements that need to be made by e-commerce in the future (if the observed e-commerce continues business development in the e-commerce sector, it is necessary to pay attention to several variables that need to be maintained and improve the quality discussed using the Importance Performance Analysis approach.

REFERENCES

- Arilaha, M. A., Fahri, J., & Buamonabot, I. (2021). Customer perception of e-service quality: An empirical study in Indonesia. *Journal of Asian Finance, Economics and Business*, 8(6), 287–295. <https://doi.org/10.13106/JAFEB.2021.VOL8.NO6.0287>
- Ashiq, R., & Hussain, A. (2024). Exploring the effects of e-service quality and e-trust on consumers' e-satisfaction and e-loyalty: Insights from online shoppers in Pakistan. *Journal of Electronic Business & Digital Economics*, 3(2), 117–141. <https://doi.org/10.1108/JEBDE-09-2023-0019>

- Bartlett, J. E., Kotrlik, J. W., & Higgins, C. C. (n.d.). *Organizational research: Determining appropriate sample size in survey research*.
- Belanche, D., Casaló, L. V., & Guinalíu, M. (2012). Website usability, consumer satisfaction and the intention to use a website: The moderating effect of perceived risk. *Journal of Retailing and Consumer Services*, 19(1), 124–132. <https://doi.org/10.1016/j.jretconser.2011.11.001>
- Bucko, J., & Kakalejčík, L. (2018). Website usability and user experience during shopping online from abroad. *EM Ekonomika a Management*, 21(3), 205–219. <https://doi.org/10.15240/tul/001/2018-3-013>
- Collier, J. E., & Bienstock, C. C. (2006). Measuring service quality in E-retailing. *Journal of Service Research*, 8(3), 260–275. <https://doi.org/10.1177/1094670505278867>
- Do, A. D., Ta, V. L., Bui, P. T., Do, N. T., Dong, Q. T., & Lam, H. T. (2023). The impact of the quality of logistics services in e-commerce on the satisfaction and loyalty of generation Z customers. *Sustainability*, 15(21), 15294. <https://doi.org/10.3390/su152115294>
- Fernanda, J. W., Luthifiana, V., & Akhyar, M. K. (2022). Analisis Partial Least Square Structural Equation Model (PLS-SEM) untuk Pemodelan Penerimaan Sistem Jaringan Informasi Bersama Antar Sekolah (JIBAS). *Jurnal Statistika: Jurnal Ilmiah Teori dan Aplikasi Statistika*, 15(2), 292–297. <https://doi.org/10.36456/jstat.vol15.no2.a6436>
- Ghozali, I. (2016). *Aplikasi analisis multivariate dengan program IBM SPSS 23. Edisi 8*. Badan Penerbit Universitas Diponegoro.
- Ghozali, I., & Latan, H. (2015). *Partial least squares: Konsep, teknik dan aplikasi menggunakan program SmartPLS 3.0*.
- Grönroos, C. (1984). A service quality model and its marketing implications. *European Journal of Marketing*, 18(4), 36–44. <https://doi.org/10.1108/EUM00000000004784>
- Hardani, S. P., et al. (2020). *Metode penelitian kualitatif & kuantitatif*. Jakarta.
- Humaidi, H., Rezeki, Y., & Wulandari, D. (2020). Quality of service e-commerce on consumer satisfaction with method e-servqual (studies in student Banjarmasin South Kalimantan). In *Proceedings of the Proceedings of the First National Seminar Universitas Sari Mulia, NS-UNISM 2019* (pp. 1-6). EAI. <https://doi.org/10.4108/eai.23-11-2019.2298324>
- Kabir, R., Alam, M. M. D., & Alam, Z. (2009). Factors determining the customer satisfaction & loyalty: A study of mobile telecommunication industry in Bangladesh.
- Kassim, N., & Asiah Abdullah, N. (2010). The effect of perceived service quality dimensions on customer satisfaction, trust, and loyalty in e-commerce settings: A cross cultural analysis. *Asia Pacific Journal of Marketing and Logistics*, 22(3), 351–371. <https://doi.org/10.1108/13555851011062269>
- Lewis, J. R., & Sauro, J. (2021). Usability and user experience: Design and evaluation. In G. Salvendy & W. Karwowski (Eds.), *Handbook of human factors and ergonomics* (pp. 972–1015). Wiley. <https://doi.org/10.1002/9781119636113.ch38>
- Mamakou, X. J., Zaharias, P., & Milesi, M. (2024). Measuring customer satisfaction in electronic commerce: The impact of e-service quality and user experience. *International*

Journal of Quality & Reliability Management, 41(4), 915–943.
<https://doi.org/10.1108/IJQRM-07-2021-0215>

Martilla, J. A., & James, J. C. (2025). Importance-performance analysis.

Mofokeng, T. E. (2021). The impact of online shopping attributes on customer satisfaction and loyalty: Moderating effects of e-commerce experience. *Cogent Business & Management*, 8(1), 1968206. <https://doi.org/10.1080/23311975.2021.1968206>

Parasuraman, A., Zeithaml, V. A., & Malhotra, A. (2005). E-S-QUAL a multiple-item scale for assessing electronic service quality. *Journal of Service Research*, 7(3), 213–233. <https://doi.org/10.1177/1094670504271156>

Putri, R. S., Astiti, S., & Amriza, R. N. S. (2022). Analisis Kepuasan Konsumen Terhadap Kualitas Pelayanan E-Commerce Jd.Id Menggunakan Metode E-Servqual. *Jurnal MEDIA Informatika BUDIDARMA*, 6(2), 1207. <https://doi.org/10.30865/mib.v6i2.3893>

Rita, P., Oliveira, T., & Farisa, A. (2019). The impact of e-service quality and customer satisfaction on customer behavior in online shopping. *Heliyon*, 5(10), e02690. <https://doi.org/10.1016/j.heliyon.2019.e02690>

Sheng, T., & Liu, C. (2010). An empirical study on the effect of e-service quality on online customer satisfaction and loyalty. *Nankai Business Review International*, 1(3), 273–283. <https://doi.org/10.1108/20408741011069205>

Siadat, S. H., Buyut, V. C., & Rahman, A. A. (2008). Measuring service quality in online shopping: A case study of e-retailing in Iran. In *2008 4th IEEE International Conference on Management of Innovation and Technology* (pp. 646–651). IEEE. <https://doi.org/10.1109/ICMIT.2008.4654441>

Sundaram, V., Ramkumar, D., & Shankar, P. (2017). Impact of E-Service Quality on Customer Satisfaction and Loyalty Empirical Study in India Online Business. *KINERJA*, 21(1), 48–69. <https://doi.org/10.24002/kinerja.v21i1.1034>

Swaid, S. I., & Wigand, R. T. (n.d.). *Key dimensions of E-commerce service quality and its relationships to satisfaction and loyalty*.

Wisnel, W., Wirdianto, E., & Cantika, T. (2022). Analysis of the effect of e-service quality on e-commerce customer satisfaction and loyalty. *Motive - Journal of Mechanical Electrical and Industrial Engineering*, 4(3), 209–222. <https://doi.org/10.46574/motivection.v4i3.145>