

Improving User Satisfaction Through Service Quality with Service Digitalization as a Moderating Variable

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Abstract. *This study employs an explanatory and associative research design aimed at examining and elucidating the relationship between Service Quality, Service Digitalization, and Customer Satisfaction. The primary objective is to test specific hypotheses to reinforce the theoretical framework underpinning this study. The population consists of service users of the Tanjung Emas Customs and Excise Supervision and Service Office (KPPBC TMP) Tanjung Emas who access digital services via the "Gendis Legi" portal (gendis-legi.id). Based on the Slovin formula, a sample size of 152 respondents was determined. The sampling technique utilized non-probability sampling with a convenience sampling approach, selecting respondents based on accessibility and availability to ensure time and cost efficiency. Primary data were collected through the distribution of closed-ended questionnaires using a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree." This instrument served to measure respondents' perceptions regarding the variables under investigation. Data analysis was conducted using the Partial Least Square (PLS) method to examine the relationships between variables within the structural model. The results indicate that Service Quality has a positive influence on Customer Satisfaction. Furthermore, Service Digitalization was found to strengthen the impact of Service Quality on Customer Satisfaction. These findings underscore the importance of service quality and innovation in service digitalization as strategic measures to enhance customer satisfaction.*

Keywords: Customer; Digitalization; Quality; Satisfaction.

1. Introduction

The spread of the COVID-19 virus, which has caused a global pandemic, has reinforced the belief that information and communication technology (ICT) is a necessity and the answer to solving the problems caused by the spread of the COVID-19 virus for both government and business organizations (Ilyas & Bahagia, 2021). The COVID-19 pandemic has accelerated the digital transformation of public services, ensuring uninterrupted service delivery to the public (Rahman, et al., 2021).

Digitization is the transformation of analog data into digital form (Reis et al., 2020), facilitating accessibility, availability, and transparency (Hagberg et al., 2016). Traditional forms of government service delivery, unethical behavior by civil servants, manual systems, government procurement systems, bureaucratic hurdles, and cumbersome red tape contribute to corruption. Digitization in government increases transparency, simplifies bureaucracy, and makes government services more efficient and accessible to citizens (Shah, 2023).

The Directorate General of Customs and Excise is a central government agency under the Ministry of Finance that is carrying out the digitalization process for public services. The initiation of the service digitalization policy refers to Law Number 17 of 2006, which is an amendment to Law Number 10 of 1995 concerning Customs, Article 5A paragraph (1) regulates the use of customs notification documents in the form of electronic data. The development of digitalization at the Directorate General of Customs and Excise is urgently needed to facilitate business processes and to meet the expectations of service users in services (Directorate General of Customs and Excise, 2021).

The Tanjung Emas Customs and Excise Supervision and Service Office (KPPBC TMP Tanjung Emas) launched the Gendis Legi application (Integrated Information and Service Gateway) on Monday, March 20, 2023, in conjunction with the launch of the Clean and Serving Bureaucracy Area (WBBM) in order to realize a clean and accountable bureaucracy and excellent public services through bureaucratic reform. The Gendis Legi application was created as an innovation to optimize services to Service Users by reducing face-to-face meetings, making it easier for Service Users to obtain and monitor the status of the service process anywhere and anytime easily and free of charge. There are 16 online services that Service Users can access on the Gendis Legi Application, namely submission of supplementary documents and Certificate of Origin, submission of softcopy of Customs Value Declaration, submission of softcopy of Document Research Note, cancellation of PEB (Goods Export Notification) data, cancellation of PIB (Goods Import Notification) Data, changes to PIB Data, reactivation of Manifest Module, reactivation of PIB / PEB Module, return of sample goods, new activation of PIB / PEB desktop Module, Analyzing Point research, supervision of opening and sealing for fumigation, request for partial release of goods, opening of customs access, registration form for Service User Portal (customer.beacukai.go.id) and new activation of Manifest Module.

In line with the spirit to continue to maintain and improve the satisfaction of service users, the Head of KPPBC TMP Tanjung Emas issued the Decree of the Head of KPPBC TMP Tanjung Emas Number KEP-756/KBC.1001/2025 concerning the Third Amendment to the Decree of the Head of the Tanjung Emas Customs and Excise Supervision and Service Office Number KEP-376/WBC.10/2023 concerning the Full Implementation (Mandatory) of Submitting Services Through Online Media at the Tanjung Emas Customs and Excise Supervision and Service Office. In the Decree of the Head of the Office, 31 services are stipulated for Service Users which can be accessed through the address <https://gendis-legi.id/>. These services include:

Table Gendis Legi Service List

No	Service Name
1.	Release of Imported Goods in Part of Container Without Stripping
2.	BC 1.1 (Redress Manifest) Major Fix
3.	Redress (Data Repair) Manifest
4.	Changes to PIB Data
5.	PIB Data Cancellation Has Not Received Registration Number
6.	Return of Goods Example
7.	Submission of Softcopy of PIB and SKA Supplementary Documents
8.	Submission of Softcopy of PIB Document Request Note
9.	Analyzing Point Confirmation
10.	Supervision of Opening and Sealing for Fumigation
11.	Request for Partial Release of Goods
12.	Trucklocing Notification
13.	Billing Printing Services
14.	Billing Data Changes
15.	Manual Reconciliation of Receipts
16.	PEB Data Cancellation
17.	Re-export Application
18.	PEB Correction Exceeding the Time Period
19.	Cancellation of PKBE
20.	Export Realization Report
21.	Re-export of Postal/PJT Goods
22.	Opening of Post in the Context of Settlement of Customs Obligations for BTB
23.	Application for a Landfill Permit in Other Locations Equivalent to TPS
24.	Application for Permit to Load Export Goods Outside the Customs Area
25.	Permit for Unloading Imported Goods in Places Other Than Customs Areas
26.	Physical Inspection of Imported Goods at the Importer's Location
27.	Exemption from Import Duty for Scientific Research and Development Purposes
28.	Exemption from Import Duty and Excise for Defense and Security Purposes
29.	Manual Quota Cutting through an Integrated System
30.	Import/Export Permit without Customs Registration
31.	Exemption from Import Duty on Re-import of Goods that Have Been Exported (Reimport)

Customer satisfaction is a feeling of pleasure or disappointment that arises after comparing a product's perceived performance (result) to its expected performance (or outcome). It arises spontaneously, without coercion (Kotler & Keller, 2021). Customer satisfaction or dissatisfaction is the comparison of consumer expectations to their perceptions of actual service interactions (Tjiptono et al., 2020).

2. Research Methods

This research is explanatory research. Miroslav Damyanov (2023) stated that research is used to gain a deeper understanding of the underlying reasons, causes, and relationships behind certain problems. These variables include service quality, service digitalization, and user satisfaction. The data sources in this study include primary and secondary data. Primary data is obtained through field surveys using all original data collection methods (Paramita et al. 2021). The study's primary data includes service digitalization, service quality, and customer satisfaction. Secondary data is data obtained from other parties. This data, including the number of service users and the identities of respondents, was obtained from the Directorate General of Customs and Excise, which in this study was Tanjung Emas Customs and Excise, and related references. This study's data collection method involved distributing questionnaires using Google Forms, an electronic method of data collection conducted by submitting a list of questions to respondents. The questionnaires were distributed via the Google Forms application and automatically collected in a Google Sheet. Each respondent could only complete the questionnaire once.

3. Results and Discussion

3.1. Respondent Description

This study is based on data from 152 service users at the Tanjung Emas Tax Office (KPPBC) in TMP Tanjung Emas. The characteristics of the respondents are presented using statistical data obtained through questionnaire distribution. In the field, all respondents were willing to complete the questionnaire, resulting in 152 completed questionnaires that could be used in the data analysis.

The respondents of this study can be described in four characteristics, namely based on age, gender, length of service, and last education, which are explained as follows:

1) Gender

From the questionnaire data of 152 respondents in this study, their characteristics can be described based on gender factors as follows:

Table Respondent Characteristics Data Based on Gender

Gender	Frequency	Percentage
Man	92	60.53
Woman	60	39.47
Total	152	100

Source: Data processing results, 2026.

Table above shows that there were 92 male respondents (60.53%) and 60 female respondents (39.47%). The majority of respondents in this study were male. This indicates that the majority of employees at the offices using the services of the Tanjung Emas Tax Office (KPPBC TMP)

are male. However, the difference in the number of male and female respondents was not significant.

2) Age

From the questionnaire data of 152 respondents in this study, their characteristics can be described based on gender factors as follows:

Table Respondent Characteristics Data Based on Age

Age	Frequency	Percentage
≤30 years	72	47.37
31–40 years	53	34.87
>40 years	27	17.76
Total	152	100

Source: Data processing results, 2026.

From the data presented in Table above, it can be concluded that the majority of respondents were aged ≤30 years, namely 72 respondents (47.37%). This age group indicates that many young employees assigned to the office generally understand and are skilled in using various technologies, such as computers used to access Gendis Legi. The fewest respondents were aged >40 years, namely 27 respondents (17.76%).

3) Length of work

From the questionnaire data of 152 respondents in this study, their characteristics can be described based on the length of service factor as follows:

Table Respondent Characteristics Data Based on Length of Service

Length of work	Frequency	Percentage
<5	67	44.08
5–8	42	27.63
>8	43	28.29
Total	152	100

Source: Data processing results, 2026.

Table shows that the majority of respondents (67 respondents or 44.08%) had worked for less than 5 years. This indicates that many new employees were assigned to access KPPBC TMP Tanjung Emas services through Gendis Legi. Furthermore, it can be identified that no high work experience is required to access the service and that the menus on Gendis Legi are easy to use.

4) Last education

From the questionnaire data of 152 respondents in this study, their characteristics can be described based on the last education factor as follows:

Table Respondent Characteristics Data Based on Last Education

Education	Frequency	Percentage
≤High School/Equivalent	32	21.84
Diploma III	64	42.11
≥S1/Diploma IV	56	36.84
Grand Total	152	100

Source: Data processing results, 2026.

Table shows that the majority of respondents had a Diploma III level of education, namely 64 respondents (42.11%). Respondents who had a high school/equivalent or lower education level were 32 respondents (21.84%), and a Bachelor's degree/Diploma IV or higher were 56 respondents (36.84%). This indicates that the majority of respondents had a Diploma III educational background, which is in accordance with the requirements and expertise demands needed by the offices/companies using the services.

Descriptive analysis aims to obtain an overview of respondents' assessments of the variables studied. Through descriptive analysis, information will be obtained regarding respondents' tendencies in responding to the indicator items used to measure the research variables.

The data is explained by assigning a weighted assessment to each statement in the questionnaire. Respondent response criteria are based on the following assessment scale: Strongly Agree (SS) score 5, Agree (S) score 4, Quite Agree (CS) score 3, Disagree (TS) score 2, Strongly Disagree (STS) score 1. Furthermore, from this scale, the data will be categorized into 3 groups. To determine the score criteria for each group, the calculation can be done as follows:(Sugiyono, 2017):

- a. Highest score = 5
- b. Lowest score = 1
- c. Range = highest score – lowest score
= 5-1 = 4
- d. Class interval = range / number of categories
= 4 / 3 = 1.33

Based on the size of the class interval, the criteria for the three categories are: low category, score = 1.00 – 2.33, medium category, score = 2.34 – 3.66 and high/good category, with a score of 3.67 – 5.00.

Structural model or inner model evaluation is conducted to examine the relationships between latent constructs formulated in the research conceptual framework. This analysis aims to assess the strength and significance of the influence between variables, as well as the model's ability to explain endogenous variables. Several indicators used in this evaluation

include the path coefficient, R-squared (R^2), effect size (f^2), and predictive relevance ($Q^2_{predict}$).

Data processing in this study was performed using SmartPLS 4.1.1.6 software. The results of this data processing are shown in the following figure:

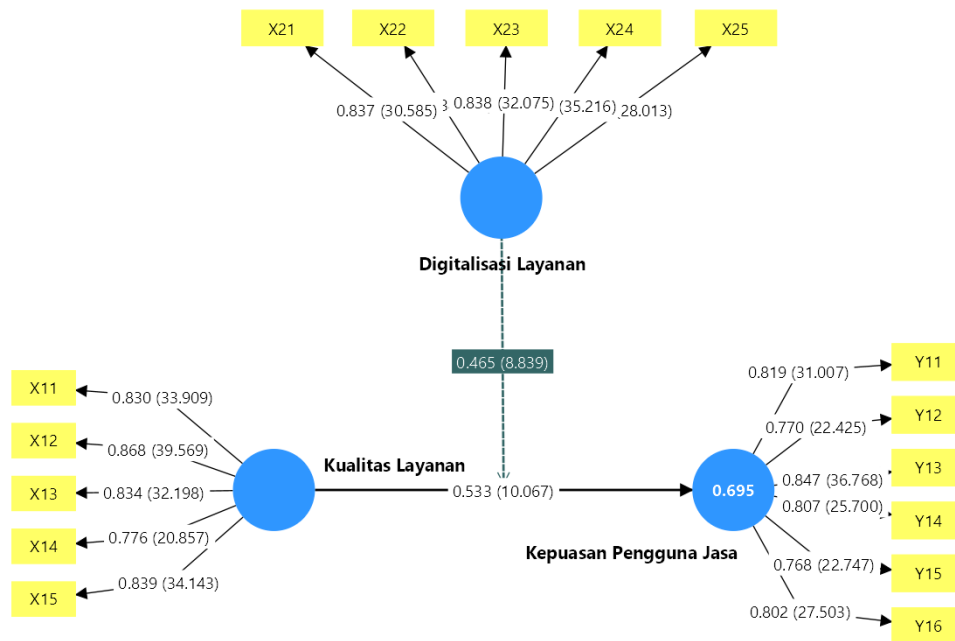


Figure Bootstrapping Calculation

Source: Data processing results with Smart PLS 4.1.1.6 (2026)

1) Path Coefficient and Path Significance (Bootstrapping)

The path coefficient indicates the magnitude of the influence of the exogenous construct on the endogenous construct in the model. This value is obtained through PLS-SEM estimation and tested for significance using the bootstrapping method.

Table Path Coefficient Matrix and Path Significance

			Original sample (O)	T statistics (O/STDEV)	P values
Service Digitalization	->	User Satisfaction	0.327	5,596	0,000
Service Digitalization x Service Quality	->	Service User Satisfaction	0.465	8,839	0,000
Service Quality	->	User Satisfaction	0.533	10,067	0,000

Source: Data processing results with Smart PLS 4.1.1.6 (2026)

Based on the data presented in table it shows that:

- a. Service Digitalization → User Satisfaction has a coefficient of 0.327 with a t-statistic of 5.596 and a p-value of 0.000. This indicates a positive and significant influence.
- b. The interaction of Service Digitalization × Service Quality → Service User Satisfaction has a coefficient of 0.465, t-statistic of 8.839, and p-value of 0.000, which means that the influence is very strong and significant.
- c. Service Quality → User Satisfaction has a coefficient of 0.533, t-statistic of 10.067, and p-value of 0.000, indicating a dominant and significant influence.

This interpretation indicates that all three pathways have a positive and significant influence on service user satisfaction, with the interaction and service quality pathways providing a greater contribution than direct service digitalization.

2) R-Square (R²) Value

The R² value is used to measure the ability of an independent variable to explain a dependent variable. In other words, R² represents the proportion of variance in the endogenous variable that can be explained by the exogenous variable.

Table R-Square (R²) Value Matrix

	R-Square(R ²)
User Satisfaction	0.695

Source: Data processing results with Smart PLS 4.1.1.6 (2026)

Based on Table, the R² value for the Service User Satisfaction construct is 0.695. Based on Hair et al.'s (2019) criteria, an R² value of 0.695 is categorized as substantial (strong). This value can be interpreted as meaning that 69.5% of the variation in Service User Satisfaction can be explained by Service Digitalization, Service Quality, and the interaction between the two. The remaining 30.5% is explained by other factors outside this research model.

3.2. Hypothesis Testing

This section presents the results of the research hypothesis testing conducted in the previous chapter. This is to determine whether the hypothesis is accepted or not. Hypothesis testing is conducted by comparing the calculated t-value with the t-table, assuming that the calculated t-value is greater than the t-table. The t-table value for a 5% significance level is 1.96. Table 4.19 below shows the results of the test of influence between variables using Partial Least Squares analysis.

Table Path Coefficients

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
Service Digitalization → User Satisfaction	0.327	0.327	0.058	5,596	0,000

Service Digitalization x Service Quality -> Service User Satisfaction	0.465	0.463	0.053	8,839	0,000
Service Quality -> User Satisfaction	0.533	0.534	0.053	10,067	0,000

Source: Data processing results with Smart PLS 4.1.1.6 (2026)

Based on the results of the data processing, testing can then be carried out for each research hypothesis, namely:

1) Hypothesis Testing 1

H1: If the service quality improves, then user satisfaction will improve.

Test The first hypothesis was conducted by looking at the estimated coefficient value (original sample) of the influence of Service Quality on Service User Satisfaction, which was 0.533. These results prove that Service Quality has a positive influence on Service User Satisfaction. This is supported by the test results obtained with a t-statistic of 10.067 with a p-value of 0.000. Thus, the test conclusion can be drawn that Service Quality has a positive and significant influence on Service User Satisfaction. This result means that the better the Service Quality, the Service User Satisfaction will tend to increase. Based on this, the first hypothesis proposed in this study, namely "The better the Service Quality, the better the Service User Satisfaction" can be accepted.

2) Hypothesis Testing 2

H2: If service digitalization improves, the influence of service quality on service user satisfaction will be stronger.

Before conducting the second hypothesis test, a test was also conducted on the effect of Service Digitalization on Service User Satisfaction. The results of the statistical analysis of the data in Table 4.18 indicate that Service Digitalization has a direct, positive and significant effect on Service User Satisfaction. This effect can be seen from the estimated coefficient value (original sample) of the effect of Service Digitalization on Service User Satisfaction, which is 0.327 with a t-statistic value of 5.596 with a p-value of 0.000. The test results can be identified that the more optimal the implementation of Service Digitalization, the higher the level of Service User Satisfaction. However, the magnitude of the effect of Service Digitalization on Service User Satisfaction is moderate when compared to the effect of Service Quality on Service User Satisfaction.

The second hypothesis test was conducted by examining the estimated coefficient value (original sample) of the interaction effect of Service Digitalization with Service Quality on Service User Satisfaction, which was 0.533. This result proves that the interaction of Service Digitalization with Service Quality has a positive effect on Service User Satisfaction. This is supported by the test results obtained with a t-statistic of 8.839 with a p-value of 0.000. Thus, the test conclusion is that the interaction of Service Digitalization with Service Quality has a

positive and significant effect on Service User Satisfaction. This result means that the better the interaction of Service Digitalization with Service Quality, the higher the Service User Satisfaction will tend to be. Based on this, the second hypothesis proposed in this study, namely "The better Service Digitalization, the stronger the influence of Service Quality on Service User Satisfaction" can be accepted.

A summary of the results of the hypothesis testing in this study is presented in full in table.

Table Summary of Hypothesis Test Results

	Hypothesis	t-statistic	p-value	Conclusion
H1	If the service quality is better, then user satisfaction will be better.	10,067	0,000	Accepted
H2	If the digitalization of services improves, the influence of service quality on user satisfaction will be stronger.	8,839	0,000	Accepted

Description: The hypothesis is accepted if the t-statistic > 1.96 and the p value < 0.05

Source: Data processing results with Smart PLS 4.1.1.6 (2026)

Discussion:

1) The Influence of Service Quality on Service User Satisfaction

The analysis results demonstrate that service quality influences user satisfaction. This implies that as service quality improves, user satisfaction tends to increase. These results confirm previous research by Fitria and Indah (2020) that found a positive relationship between service quality and customer satisfaction.

Service quality in this study is measured by reflecting five indicators: Tangible, Reliability, Responsiveness, Assurance, and Empathy. These five indicators have been proven to be able to increase service user satisfaction, which in this study is measured by six indicators: Requirements, Systems, Mechanisms, Procedures, Completion Time, Service Product Specifications, Service Officer Competence, and Complaint Handling.

The Reliability indicator in the Service Quality variable shows the highest outer loading value. Reliability reflects an organization's ability to deliver services in accordance with promises communicated to service users, accurately and consistently. This dimension includes timeliness, information accuracy, and the ability to complete services without error. Reliability is the foundation of customer trust in an organization, as consistency in fulfilling service promises creates a sense of security and satisfaction. In an operational context, reliability can be measured through the level of service errors, delays, and the conformity of results to customer expectations.

Meanwhile, the Completion Time indicator in the Service User Satisfaction variable achieved the highest outer loading value. Completion Time is the length of time required to complete the entire service process for each type of service. This finding indicates that the greater an

organization's ability to deliver services according to its promises, the better the completion time for each service provided.

In the Service Quality variable, the indicator with the lowest outer loading value is Assurance. Assurance relates to the knowledge, competence, politeness, and credibility of officers who instill a sense of trust and security for service users. Meanwhile, in the Service User Satisfaction variable, the indicator with the lowest outer loading value is Officer Competence, namely the abilities that must be possessed by the implementer including knowledge, expertise, skills, and experience. These results indicate that the higher the sense of trust and security felt by Service Users, the higher the knowledge, expertise, skills, and experience of the Officers who provide services. Officers who specifically provide services to Service Users are required to continuously improve their knowledge and skills both related to service regulations and procedures and in communication. Therefore, organizations need to facilitate both space and time for training, mentoring, and continuous learning opportunities to improve the knowledge, expertise, skills, and experience of Officers. High competence is an important basis for increasing Service User trust.

2) The Influence of Interaction between Service Digitalization and Service Quality on Service User Satisfaction

The analysis results demonstrate an interaction between service digitalization and service quality on user satisfaction. This suggests that service digitalization positively strengthens the relationship between service quality and user satisfaction. These results confirm previous research by Mia Cahyani Putri and Wulan Yuliyana (2023), which found that the implementation of public service digitalization has a positive and significant impact on public satisfaction.

Service digitalization in this study is measured by five indicators: digital infrastructure, access and use of digital technology, innovation, required skills, and trust in security. This has been shown to increase the influence of service quality on user satisfaction. This means that when services are supported by digital technology, such as web-based applications, integrated information systems, or automation features, service users' perceptions of service quality improve, thus increasing their satisfaction.

4. Conclusion

This study aims to examine the effect of Service Quality on Service User Satisfaction with Service Digitalization as a moderating variable. The model for increasing service user satisfaction at the Tanjung Emas Customs and Excise Supervision and Service Office according to this study is through increasing Service Quality with Service Digitalization as a factor that can encourage optimal improvement in Service User Satisfaction. Based on the results of data processing in this study, the following conclusions were obtained: Service quality has a positive and significant influence on user satisfaction. This finding confirms that the service quality dimension, particularly related to reliability, is a crucial factor in determining user

satisfaction. The better the service quality provided, the higher the level of satisfaction experienced by users. Service digitalization acts as a moderating variable, strengthening the influence of service quality on user satisfaction. The implementation of service digitalization at the Tanjung Emas Customs and Excise Supervision and Service Office through the Gendis Legi platform has been proven to improve service quality effectiveness. Service digitalization enables faster and more efficient service processes, thus increasing user perceptions of service quality.

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