



Application Design and Trust as Moderating Variables in the Relationship between E-Service Quality, Customer Satisfaction, and Customer Loyalty

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ABSTRACT

The increasing adoption of digital public services has encouraged organizations to enhance service quality, user experience, and system reliability through mobile-based applications. The JMO (Jamsostek Mobile) application developed by BPJS Ketenagakerjaan is one such innovation aimed at improving service accessibility for users. However, challenges related to system usability, performance, and user trust may influence overall satisfaction and loyalty. This study aims to examine the effect of e-service quality and price perception on customer satisfaction and customer loyalty, while also analyzing the moderating roles of application design and trust. A quantitative approach was employed using data collected from 400 active JMO users through an online questionnaire. The data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The results indicate that e-service quality, price perception, and trust have a positive and significant effect on customer satisfaction. In addition, e-service quality, customer satisfaction, trust, and application design significantly influence customer loyalty. Customer satisfaction also mediates the relationship between e-service quality and customer loyalty. Furthermore, application design and trust act as moderating variables that strengthen the relationship between customer satisfaction and customer loyalty. These findings highlight that improving service quality, enhancing application design, and strengthening user trust are essential strategies in increasing customer satisfaction and fostering long-term customer loyalty in digital public service applications.

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INTRODUCTION

The rapid growth of digital technology has transformed public service delivery through mobile applications that provide faster, more accessible, and user-oriented services. In Indonesia, internet penetration has exceeded 80% of the population, accelerating the adoption of digital platforms across various sectors, including social security services (We Are Social, 2026). In response to this trend, BPJS Ketenagakerjaan launched the Jamsostek Mobile (JMO) application, enabling users to access employment-related services such as balance inquiries, claims submission, and personal data updates remotely. Although JMO has achieved widespread adoption and positive user ratings, users continue to report issues related to application errors, slow response times, and system reliability. These challenges may negatively affect customer satisfaction and loyalty. Previous studies have identified e-service quality as a key determinant of customer satisfaction and loyalty (Parasuraman et al., 2005; Venkatakrishnan & Alagiriswamy, 2023). Trust is also recognized as a critical factor influencing users' willingness to continue using digital services (Gefen et al., 2003; Putri & Marlana, 2021), while application design contributes to a more positive user experience and engagement (Rahmawati, 2024).

Despite extensive literature on digital services, several research gaps remain. Most studies examine e-service

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quality, trust, satisfaction, and loyalty separately or in limited combinations, with a primary focus on commercial platforms such as e-commerce and mobile banking. Research investigating these variables simultaneously in public-sector digital services remains limited. Furthermore, the moderating role of application design in strengthening the relationship between e-service quality and customer satisfaction has received little empirical attention.

These gaps create both theoretical and practical challenges. Theoretically, limited evidence exists regarding the interaction between e-service quality, trust, and application design in shaping customer satisfaction and loyalty within public digital services. Practically, BPJS Ketenagakerjaan requires empirical insights to identify the key factors that enhance user satisfaction and loyalty toward the JMO application. Therefore, this study aims to examine the effects of e-service quality, trust, and price perception on customer satisfaction and customer loyalty among JMO users. This study also investigates the mediating role of customer satisfaction and the moderating role of application design. The novelty of this research lies in the development of an integrated model that simultaneously examines e-service quality, trust, price perception, application design, customer satisfaction, and customer loyalty within a public-sector digital service context, extending prior studies that predominantly focus on commercial applications.

LITERATURE REVIEW

E-Service Quality

E-service quality refers to the overall capability of a digital platform to deliver efficient, reliable, and user-oriented services through electronic systems (Berliana & Zulestiana, 2020). In the context of digital services, it is not limited to functional performance but also encompasses user experience, accessibility, and system responsiveness. Compared to traditional service quality, e-service quality emphasizes virtual interactions, requiring platforms to ensure reliability, speed, and information accuracy in the absence of physical contact (Amalia & Widodo, 2020). As such, e-service quality plays a crucial role in shaping users' perceptions of service effectiveness and directly influences satisfaction and behavioral intentions. E-service quality is commonly measured through multiple dimensions, including responsiveness, ease of use, credibility, accessibility, personalization, and assurance (Venkatakrishnan & Alagiriswamy, 2023). Responsiveness reflects the system's ability to provide quick and effective responses, while ease of use determines how easily users can navigate the platform (Sinurat et al., 2024). Credibility and assurance relate to the reliability and security of the service, which are particularly critical in digital environments where perceived risk is high (Hikmah, 2020). Furthermore, personalization and accessibility enhance user engagement by tailoring services to individual needs and ensuring availability across various platforms. Therefore, e-service quality is a key determinant of user satisfaction and long-term service loyalty.

Application Design

Application design refers to the visual and functional aspects of a digital platform that influence how users interact with and perceive the system (Bangun, 2022). It encompasses both the aesthetic presentation and the structural organization of the application interface, including layout, typography, navigation, and overall usability. A well-designed application not only enhances visual appeal but also ensures that users can perform tasks efficiently, thereby improving overall user experience (Zahra et al., 2024). In digital service environments, application design acts as the first point of interaction between users and the system, making it a critical factor in shaping initial impressions and subsequent usage behavior. The effectiveness of application design lies in its ability to integrate dimensions such as aesthetics, structure, reliability, accessibility, usability, and convenience (Bangun, 2022). Aesthetic elements contribute to user engagement by creating visually appealing interfaces, while structural design ensures logical navigation and information organization (Riam, 2025). Reliability and usability further enhance user confidence by ensuring consistent system performance and ease of operation. Additionally, convenience and accessibility allow users to interact with the application across different devices and conditions, thus increasing overall satisfaction (Ari & Hanum, 2021). Consequently, application design not only influences satisfaction directly but also strengthens the impact of satisfaction on customer loyalty.

Trust

Trust is defined as the degree of confidence users have in the reliability, integrity, and competence of a service provider (Damayanti et al., 2025). In digital environments, where direct physical interaction is absent, trust becomes a fundamental factor influencing user behavior. Users rely heavily on system security, data protection mechanisms, and the credibility of information presented to evaluate whether a platform is trustworthy (Latifah et al., 2020). Without sufficient trust, even well-designed systems with high functionality may fail to retain users, as perceived risks can outweigh the benefits of using the service.

Trust is multidimensional, encompassing integrity, competence, consistency, loyalty, and openness (S. F. A. Putri & Marlana, 2021). Integrity reflects honesty and transparency, while competence relates to the ability of the provider to deliver reliable services. Consistency ensures stable performance over time, and openness enhances user confidence through clear communication of policies and processes (Suryani & Sukri, 2021). In digital service contexts, trust not only directly influences customer satisfaction but also plays a moderating role by strengthening the relationship between satisfaction and loyalty. Therefore, building trust is essential for sustaining long-term user engagement and retention.

Price Perception

Price perception refers to users' evaluation of the fairness and value of a service based on the comparison between the costs incurred and the benefits received (Diotiharta et al., 2023). In digital services, price is not always reflected in monetary terms alone but also includes non-monetary sacrifices such as time, effort, and cognitive load (Suhardi, 2022). Users assess whether the service provides sufficient value relative to these sacrifices, which significantly influences their satisfaction and decision to continue using the application. The concept of price perception includes dimensions such as affordability, competitiveness, price-quality match, and price-benefit alignment (Khoirunnisa, 2023). Affordability reflects users' financial capability, while competitiveness compares pricing with alternative services. Furthermore, price-quality match indicates whether users perceive the service quality to be worth the cost, and price-benefit alignment measures the extent to which the benefits justify the effort or expense (Sudirman & Harini, 2020). Positive price perception leads to higher satisfaction because users feel that the service offers good value, thereby increasing the likelihood of continued use and loyalty.

Customer Satisfaction

Customer satisfaction is defined as the overall evaluation of a service based on the comparison between expectations and actual performance (Rahayu, 2022). According to expectation-confirmation theory, satisfaction occurs when perceived performance meets or exceeds user expectations, whereas dissatisfaction arises when expectations are not fulfilled (Apriliani et al., 2022). In digital applications, satisfaction is influenced by factors such as ease of use, service speed, reliability, and overall user experience. Customer satisfaction is commonly measured through overall satisfaction, expectation fulfillment, and willingness to recommend the service (Rahayu, 2022). Overall satisfaction reflects users' general evaluation, while expectation fulfillment measures how well the service matches prior expectations. Recommendation willingness indicates the extent of positive user experience that leads to advocacy behavior (Kunadi & Wuisan, 2021). High levels of satisfaction are associated with increased customer retention and loyalty, making it a critical variable in understanding user behavior in digital service environments.

Customer Loyalty

Customer loyalty refers to a user's commitment to consistently use a service and maintain a long-term relationship with the provider (Budiman et al., 2020). Loyalty extends beyond repeated usage behavior and includes positive attitudes, emotional attachment, and a willingness to recommend the service to others (Ningsih, 2023). In digital services, loyalty is particularly important due to the high level of competition and the ease with which users can switch between platforms. Customer loyalty can be measured through dimensions such as word-of-mouth, influence, and preference (Budiman et al., 2020). Word-of-mouth reflects users' willingness to share positive experiences, influence captures their ability to encourage others to use the service, and preference indicates the tendency to choose the service over competitors (Febrianti, 2020). Loyalty is strongly influenced by customer satisfaction and trust, as users who are satisfied and confident in the service are more likely to continue using it and develop long-term engagement. Therefore, customer loyalty represents the ultimate outcome of successful service delivery and user experience management.

FRAMEWORK

This study is grounded in Expectation Confirmation Theory (ECT), which explains that customer satisfaction results from the comparison between expectations and perceived performance (Bhattacharjee, 2001). When performance meets or exceeds expectations, satisfaction increases, leading to loyalty. Additionally, Relationship Marketing Theory emphasizes long-term relationships between service providers and users, highlighting the role of satisfaction and trust in fostering loyalty (Hasbiah, 2025; Wulandari et al., 2026).

H1: E-service quality has a positive and significant effect on customer satisfaction.

E-service quality is a key determinant of customer satisfaction in digital services. High-quality electronic services characterized by efficiency, responsiveness, security, and ease of use can enhance users' experiences and meet their expectations. Previous studies have found that e-service quality positively influences customer satisfaction (Parasuraman et al., 2005; Venkatakrishnan et al., 2023). Therefore, higher perceived e-service quality is expected to increase customer satisfaction with the JMO BPJS Ketenagakerjaan application.

H2: E-service quality has a positive and significant effect on customer loyalty.

E-service quality also contributes to the development of customer loyalty. Reliable, secure, and user-friendly digital services encourage continued usage and strengthen customers' commitment to the service provider. Prior research has demonstrated a positive relationship between e-service quality and customer loyalty (Blut et al., 2015; Venkatakrishnan et al., 2023). Thus, better e-service quality is expected to enhance customer loyalty.

H3: Price has a positive and significant effect on customer satisfaction.

Price reflects customers' evaluation of the value received relative to the costs incurred. Customers are more likely to be satisfied when perceived benefits exceed their financial, time, and effort sacrifices. According to Zeithaml (1988), perceived value is derived from this trade-off between benefits and costs. Empirical evidence also indicates that favorable price perceptions positively affect customer satisfaction (Venkatakrishnan et al., 2023). Therefore, a more positive price perception is expected to increase customer satisfaction.

H4: Customer satisfaction has a positive and significant effect on customer loyalty.

Customer satisfaction is widely recognized as a major antecedent of customer loyalty. Satisfied customers are more likely to continue using a service, maintain long-term relationships, and recommend it to others. Previous research confirms the positive effect of customer satisfaction on customer loyalty (Oliver, 1999; Venkatakrishnan et al., 2023). Therefore, higher customer satisfaction is expected to lead to stronger customer loyalty.

H5: Customer satisfaction positively and significantly mediates the relationship between e-service quality and customer loyalty.

Customer satisfaction may mediate the relationship between e-service quality and customer loyalty. High-quality electronic services enhance customer satisfaction, which subsequently promotes loyalty. Prior studies have shown that customer satisfaction serves as an important mechanism linking service quality to loyalty (Caruana, 2002; Venkatakrishnan et al., 2023). Hence, customer satisfaction is expected to positively mediate the effect of e-service quality on customer loyalty.

H6: Trust has a positive and significant effect on customer satisfaction.

Trust represents customers' confidence in the reliability, security, and integrity of a digital service. In online environments, trust plays a critical role in shaping users' perceptions and experiences. Previous studies have identified trust as a significant predictor of customer satisfaction (Gefen et al., 2003; Venkatakrishnan et al., 2023). Therefore, greater trust in the JMO application is expected to enhance customer satisfaction.

H1a: Web design moderates the relationship between e-service quality and customer satisfaction, such that the relationship becomes stronger when the quality of web design is higher.

Web design can strengthen the relationship between e-service quality and customer satisfaction. A visually appealing, user-friendly, and well-structured interface improves users' interactions with digital services and enhances the value derived from service quality. Prior studies suggest that web design positively moderates the effect of e-service quality on customer satisfaction (Lee & Lin, 2005; Venkatakrishnan et al., 2023). Therefore, the positive impact of e-service quality on customer satisfaction is expected to be stronger when web design quality is high.

H1b: Trust moderates the moderating effect of web design on the relationship between e-service quality and customer satisfaction. Higher levels of trust strengthen the combined effect of e-service quality and web design on customer satisfaction.

Trust may further strengthen the moderating effect of web design on the relationship between e-service quality and customer satisfaction. Users who highly trust a digital platform are more likely to perceive service quality and interface design positively, resulting in greater satisfaction. Consistent with Venkatakrishnan et al. (2023), trust is expected to enhance the combined influence of e-service quality and web design on customer satisfaction.

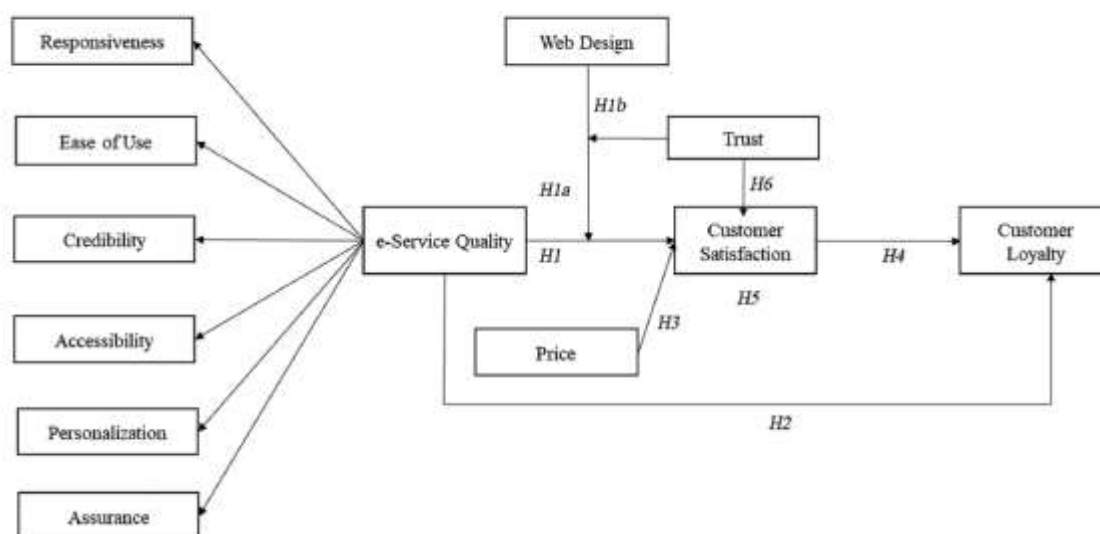


Figure 1. Framework

Source: Venkatakrishnan & Alagirisamy (2023)

METHOD

This study employs a quantitative research approach using a survey design to examine the relationships among e-service quality, price perception, trust, customer satisfaction, and customer loyalty, as well as the moderating roles of application design and trust. The data were collected from users of the JMO (Jamsostek Mobile) application through a structured questionnaire distributed online using purposive sampling, targeting respondents who have experience using the application (Amruddin, 2022). A total of 399 valid responses were obtained and analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS software, which is suitable for testing complex models involving mediation and moderation effects (Hair et al., 2022). All constructs were measured using a five-point Likert scale, and the measurement model was evaluated based on validity and reliability criteria, including outer loading, Average Variance Extracted (AVE), composite reliability, and discriminant validity using the HTMT ratio (Hair et al., 2022). The structural model was assessed using path coefficients, t-statistics obtained through bootstrapping, and R^2 values to determine the explanatory power of the model.

RESULTS

Respondent Profile

This study was conducted on the JMO BPJS Ketenagakerjaan application, focusing on users who met the specified research criteria. Data were collected through an online survey by distributing questionnaires to respondents who were active users of the application. The research instrument was developed using Google Forms, which was selected due to its flexibility, accessibility, and efficiency in facilitating data collection within a limited timeframe. The questionnaire distribution was carried out from June 12 to June 17, 2026. A questionnaire was considered valid if all items were completed by the respondent and each statement contained only one selected response, ensuring that the collected data met the eligibility criteria for further analysis. The details of the questionnaire distribution are presented in the fTable 1.

The respondent profile in this study provides an overview of the characteristics of 400 participants who are active users of the JMO BPJS Ketenagakerjaan application. Based on gender distribution, the majority of respondents were female (66%), while male respondents accounted for 34%. In terms of age, most respondents were within the productive age range, with the highest proportion in the 23–27 years category, followed by respondents aged 28–32 years and above 42 years. This indicates that the sample is dominated by individuals who are relatively active in using digital services and mobile applications.

In terms of educational background, most respondents had attained higher education, with the majority holding a Bachelor's degree or Diploma, followed by those with high school, Master's, and Doctoral degrees. This suggests that respondents generally possess adequate digital literacy, which may influence their perception of service quality and usability. Additionally, the distribution of monthly income reflects a variation across different economic groups, although it is largely concentrated in the middle-income category. These characteristics indicate that the respondents represent a relevant user group for evaluating digital service performance, particularly in the context of public service applications such as JMO.

Measurement Model Assessment

The measurement model was evaluated through assessments of convergent validity, discriminant validity, and construct reliability. Convergent validity was first examined using indicator loadings and Average Variance Extracted (AVE). All constructs achieved AVE values above the recommended threshold of 0.50, indicating that the constructs explained more than half of the variance of their respective indicators. Furthermore, all indicators demonstrated satisfactory loading values, confirming that the observed variables adequately represented their underlying latent constructs (Hair et al., 2022).

Construct reliability was assessed using Cronbach's Alpha and Composite Reliability. The results showed that all constructs exceeded the recommended threshold of 0.70 for both measures, indicating a high degree of internal consistency and reliability. These findings suggest that the indicators consistently measured their corresponding latent variables and were suitable for subsequent analysis.

Discriminant validity was evaluated using both the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio (HTMT). The results demonstrated that the square root of AVE for each construct exceeded its correlations with other constructs, satisfying the Fornell–Larcker criterion. In addition, all HTMT values remained below the recommended threshold of 0.90, confirming that each construct was empirically distinct from the others (Henseler et al., 2015; Hair et al., 2022). Overall, the results indicate that the measurement model possesses satisfactory validity and reliability and is therefore appropriate for structural model evaluation and hypothesis testing.

Table 1. Standardized Loading

Variable	Indicator	Loading Factor	AVE	Cronbach's Alpha	Composite Reliability
e-Service Quality	Accessibility1	0.935	0.686	0.985	0.99
	Accessibility2	0.833			
	Accessibility3	0.851			
	Accessibility4	0.951			
	Accessibility5	0.719			
	Accessibility6	0.843			
	Assurance1	0.927			
	Assurance2	0.848			
	Assurance3	0.814			
	Assurance4	0.893			
	Assurance5	0.839			
	Assurance6	0.573			
	Credibility1	0.949			
	Credibility2	0.814			
	Credibility3	0.879			
	Credibility4	0.927			
	Credibility5	0.839			
	Credibility6	0.853			

	EaseToUse1	0.913			
	EaseToUse2	0.813			
	EaseToUse3	0.834			
	EaseToUse4	0.95			
	EaseToUse5	0.878			
	EaseToUse6	0.858			
	Personalization1	0.929			
	Personalization2	0.8			
	Personalization3	0.833			
	Personalization4	0.932			
	Personalization5	0.821			
	Personalization6	0.848			
Application Design	ApplicationDesign1	0.759	0.556	0.842	0.858
	ApplicationDesign2	0.745			
	ApplicationDesign3	0.667			
	ApplicationDesign4	0.777			
	ApplicationDesign5	0.784			
	ApplicationDesign6	0.742			
Customer Loyalty	CustomerLoyalty1	0.732	0.663	0.897	0.906
	CustomerLoyalty2	0.742			
	CustomerLoyalty3	0.839			
	CustomerLoyalty4	0.899			
	CustomerLoyalty5	0.858			
	CustomerLoyalty6	0.802			
Customer Satisfaction	CustomerSatisfaction1	0.872	0.783	0.944	0.945
	CustomerSatisfaction2	0.905			
	CustomerSatisfaction3	0.856			
	CustomerSatisfaction4	0.951			
	CustomerSatisfaction5	0.884			
	CustomerSatisfaction6	0.836			
Price Perception	PricePerception1	0.897	0.741	0.929	0.931
	PricePerception2	0.857			
	PricePerception3	0.88			
	PricePerception4	0.902			
	PricePerception5	0.881			
	PricePerception6	0.739			
Trust	Trust1	0.895	0.626	0.877	0.907
	Trust2	0.829			
	Trust3	0.795			
	Trust4	0.862			

Trust5	0.787
Trust6	0.524

Convergent validity was assessed using the Average Variance Extracted (AVE). As shown in Table 1, all constructs achieved AVE values above the recommended threshold of 0.50, ranging from 0.556 to 0.783. Specifically, the AVE values were 0.741 for price perception, 0.556 for application design, 0.663 for customer loyalty, 0.783 for customer satisfaction, 0.686 for e-service quality, and 0.626 for trust. These results indicate that each construct explains more than 50% of the variance of its indicators, thereby demonstrating satisfactory convergent validity. According to Hair et al. (2021), AVE values greater than 0.50 confirm that the indicators adequately represent their underlying latent constructs. Therefore, all constructs in this study satisfy the convergent validity criterion and are suitable for further structural model analysis. Construct reliability was evaluated using Cronbach's Alpha and Composite Reliability (CR). As shown in Table 1, all constructs exceeded the recommended threshold of 0.70 for both reliability measures. Cronbach's Alpha values ranged from 0.842 to 0.987, while Composite Reliability values ranged from 0.858 to 0.990. These results indicate a high level of internal consistency among the measurement items and confirm that the constructs are reliably measured. According to Hair et al. (2021), values above 0.70 demonstrate satisfactory reliability and support the adequacy of the measurement model for subsequent structural analysis.

The results indicate that all constructs satisfy the reliability criteria, as both Cronbach's Alpha and Composite Reliability values exceed the minimum recommended threshold of 0.70. Therefore, the measurement model is considered reliable and suitable for further hypothesis testing. Discriminant validity was assessed using the Heterotrait–Monotrait Ratio (HTMT), which is widely recommended for evaluating construct distinctiveness in PLS-SEM. As presented in Table 2, all HTMT values were below the recommended threshold of 0.90. The highest HTMT value was observed between customer satisfaction and customer loyalty (0.691), while all other construct relationships ranged from 0.034 to 0.643. These results indicate that each construct is empirically distinct and measures a unique concept. According to Henseler et al. (2015) and Hair et al. (2021), HTMT values below 0.90 provide evidence of adequate discriminant validity. Therefore, the measurement model successfully satisfies the discriminant validity criterion and is appropriate for subsequent structural model assessment.

Since all HTMT values were below the critical threshold of 0.90, no issues related to construct overlap or multicollinearity were identified. Consequently, the discriminant validity of all constructs was confirmed, indicating that each latent variable captures a distinct phenomenon within the research model.

Table 2. Heterotrait–Monotrait Ratio (HTMT)

Variable	Price	Application Design	Customer Loyalty	Customer Satisfaction	e-Service Quality	trust	Application Design x e-Service Quality	trust x application Design	trust x application Design x e-Service Quality	trust x e-Service Quality
Price										
Application Design	0.082									
Customer Loyalty	0.413	0.240								
Customer Satisfaction	0.427	0.152	0.691							
e-Service Quality	0.446	0.188	0.510	0.511						
Trust	0.427	0.167	0.643	0.606	0.498					
Application Design x e-ServiceQuality	0.049	0.076	0.034	0.059	0.147	0.056				
trust x application Design	0.038	0.091	0.049	0.034	0.054	0.129	0.606			
trust x application Design x e-ServiceQuality	0.038	0.425	0.148	0.087	0.166	0.222	0.459	0.550		
trust x e-ServiceQuality	0.084	0.082	0.144	0.094	0.350	0.400	0.175	0.243	0.382	

Structural Model Assessment

As shown in Figure 2, all constructs achieved AVE values above the recommended threshold of 0.50, ranging from 0.556 to 0.783. Customer satisfaction recorded the highest AVE value (0.783), followed by price perception (0.741), customer loyalty (0.663), trust (0.626), and application design (0.556). These results confirm that the constructs explain more than half of the variance of their indicators and therefore satisfy the convergent validity criterion. According to Hair et al. (2021), AVE values greater than 0.50 indicate that the indicators adequately represent their respective latent constructs.

Table 3. Path Coefficients

Relation	Path coefficients
applicationDesign -> customerSatisfaction	0.051
applicationDesign x e-ServiceQuality -> customerSatisfaction	-0.033
customerSatisfaction -> customerLoyalty	0.529
e-ServiceQuality -> customerLoyalty	0.221
e-ServiceQuality -> customerSatisfaction	0.307
Price -> customerSatisfaction	0.097
trust -> customerSatisfaction	0.453
trust x applicationDesign -> customerSatisfaction	0.006
trust x applicationDesign x e-ServiceQuality -> customerSatisfaction	-0.014
trust x e-ServiceQuality -> customerSatisfaction	0.157

Source: Author's calculation using SmartPLS 4 (2026)

(2026)

The explanatory power of the structural model was evaluated using the coefficient of determination (R^2), which reflects the proportion of variance in the endogenous constructs explained by their predictor variables. As presented in Table 4, the R^2 value for customer satisfaction is 0.443, indicating that 44.3% of the variance in customer satisfaction is explained by e-service quality, price perception, trust, application design, and the interaction effects included in the model. Meanwhile, customer loyalty achieves an R^2 value of 0.448, suggesting that 44.8% of its variance is explained by customer satisfaction and other antecedent variables within the proposed framework.

Table 4. R-Square

Variable	R-square
customerLoyalty	0.448
customerSatisfaction	0.443

Source: Author's calculation using SmartPLS 4

According to Hair et al. (2021), R^2 values of 0.25, 0.50, and 0.75 can be interpreted as weak, moderate, and substantial, respectively. Therefore, the R^2 values obtained in this study indicate a moderate level of explanatory power. These findings suggest that the proposed model provides a reasonably strong explanation of customer satisfaction and loyalty among JMO users, although additional factors not included in the model may also contribute to explaining user behavior.

Table 5. F-Square

Variable	f-square
applicationDesign -> customerSatisfaction	0.004
applicationDesign x e-ServiceQuality -> customerSatisfaction	0.001
customerSatisfaction -> customerLoyalty	0.373
e-ServiceQuality -> customerLoyalty	0.065
e-ServiceQuality -> customerSatisfaction	0.105
Price -> customerSatisfaction	0.012
trust -> customerSatisfaction	0.235
trust x applicationDesign -> customerSatisfaction	0.000
trust x applicationDesign x e-ServiceQuality -> customerSatisfaction	0.001
trust x e-ServiceQuality -> customerSatisfaction	0.046

Source: Author's calculation using SmartPLS 4 (2026).

The effect size of each exogenous construct on the endogenous variables was assessed using the f-square (f^2) statistic, which measures the contribution of each predictor construct to the explained variance of the endogenous construct. As presented in Table 5, customer satisfaction exhibits a large effect on customer loyalty ($f^2 = 0.373$), indicating that it is the most influential predictor in the model. Trust also demonstrates a moderate effect on customer satisfaction ($f^2 = 0.235$), highlighting its important role in shaping users' satisfaction with the JMO application. In contrast, e-service quality shows a small effect on customer satisfaction ($f^2 = 0.105$) and customer loyalty ($f^2 = 0.065$), while the interaction between trust and e-service quality has a small effect on customer satisfaction ($f^2 = 0.046$). Furthermore, price perception ($f^2 = 0.012$) and application design ($f^2 = 0.004$) contribute only negligible effects to customer satisfaction. The remaining interaction terms, including application design $\times$ e-service quality ($f^2 = 0.001$), trust $\times$ application design ($f^2 = 0.000$), and the three-way interaction among trust, application design, and e-service quality ($f^2 = 0.001$), exhibit virtually no effect on the endogenous construct. According to Hair et al. (2021), f^2 values of 0.02, 0.15, and 0.35 indicate small, medium, and large effect sizes, respectively. Therefore, the results suggest that customer satisfaction and trust are the most influential constructs in the model, while e-service quality contributes relatively smaller effects and the remaining variables provide minimal additional explanatory power.

Hypothesis Testing

Hypothesis testing was conducted using the bootstrapping procedure by evaluating the t-statistics and p-values of each structural path. As shown in Table 6, four of the seven proposed hypotheses are supported. E-service quality significantly influences customer satisfaction and customer loyalty, indicating that improvements in service accessibility, reliability, responsiveness, and security contribute to higher levels of satisfaction and loyalty among JMO users. Trust also demonstrates a significant positive effect on customer satisfaction and represents the strongest antecedent of satisfaction in the model. Furthermore, customer satisfaction significantly affects customer loyalty and exhibits the largest path coefficient among all tested relationships, highlighting its central role in fostering user loyalty.

Table 6. Hypothesis Testing

Hypotheses	Original sample (O)	Standard deviation (STDEV)	T statistics ($ O/STDEV $)	P values	Hypothesis Decision
e-ServiceQuality -> customerSatisfaction	0.307	0.066	4.647	0.000	Accepted

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<i>Hypotheses</i>	<i>Original sample (O)</i>	<i>Standard deviation (STDEV)</i>	<i>T statistics (O/STDEV)</i>	<i>P values</i>	<i>Hypothesis Decision</i>
e-ServiceQuality -> customerLoyalty	0.221	0.051	4.307	0.000	Accepted
Price -> customerSatisfaction	0.097	0.069	1.397	0.163	Reject
customerSatisfaction -> customerLoyalty	0.529	0.052	10.131	0.000	Accepted
trust -> customerSatisfaction	0.453	0.064	7.129	0.000	Accepted
applicationDesign x e-ServiceQuality -> customerSatisfaction	-0.033	0.080	0.413	0.679	Reject
trust x applicationDesign x e-ServiceQuality -> customerSatisfaction	-0.014	0.063	0.222	Reject	Reject

Source: Author's calculation using SmartPLS 4 (2026).

In contrast, several hypothesized relationships were not supported. Price perception does not significantly affect customer satisfaction, suggesting that users place greater emphasis on service quality and functional benefits than on economic considerations when evaluating the JMO application. Likewise, the moderating effect of application design on the relationship between e-service quality and customer satisfaction was not significant. The three-way interaction involving trust, application design, and e-service quality also failed to demonstrate a significant influence on customer satisfaction. These findings indicate that customer satisfaction is primarily driven by trust and e-service quality, while price perception and the proposed moderating effects do not provide additional explanatory power within the structural model. According to Hair et al. (2022), path relationships are considered significant when the t-statistic exceeds 1.96 and the p-value is below 0.05. Therefore, the hypotheses concerning the effects of e-service quality on customer satisfaction and customer loyalty, trust on customer satisfaction, and customer satisfaction on customer loyalty are supported, whereas the hypotheses involving price perception and the proposed moderating effects are rejected.

DISCUSSION

The results presented in Tables 3–6 demonstrate that customer satisfaction is the most influential predictor of customer loyalty among users of the JMO BPJS Ketenagakerjaan application. The significant positive relationship between customer satisfaction and customer loyalty ($\beta = 0.529$) indicates that users who perceive a favorable service experience are more likely to continue using the application and recommend it to others. This finding is consistent with recent studies that identified customer satisfaction as a critical determinant of customer loyalty in digital service environments (Dawi et al., 2022; Tran & Nguyen, 2023). Furthermore, the large effect size observed for this relationship ($f^2 = 0.373$ in Table 5) suggests that customer satisfaction plays a substantial role in explaining loyalty behavior. Compared with previous studies in mobile service and e-commerce contexts, the present study confirms that satisfaction remains the primary mechanism through which organizations can foster long-term user retention.

The findings also indicate that e-service quality significantly influences both customer satisfaction and customer loyalty, as shown in Table 6. The positive effect of e-service quality on customer satisfaction ($\beta = 0.307$) suggests that users place considerable importance on accessibility, responsiveness, credibility, security, personalization, and ease of use when evaluating digital platforms. This result is in line with studies by Al-Hawari et al. (2022) and Venkatakrishnan and Alagiriswamy (2023), which found that superior service quality enhances customer perceptions and increases satisfaction levels. Moreover, the direct effect of e-service quality on customer loyalty ($\beta = 0.221$) indicates that users are more willing to maintain relationships with platforms that consistently deliver reliable and efficient services. Compared with findings in commercial applications, the influence of e-service quality in this study appears similarly important, suggesting that service quality remains a key success factor regardless of whether the platform operates in private or public sectors.

Another important finding from Table 6 is the significant role of trust in predicting customer satisfaction ($\beta = 0.453$). Among all antecedent variables, trust exhibits the strongest effect on customer satisfaction, highlighting the importance of user confidence in system reliability, information credibility, and data security. This finding supports recent studies by Al-Adwan et al. (2022) and Ameen et al. (2023), which emphasize that trust is a fundamental requirement for successful digital service adoption and continuance. Compared with e-service quality, trust demonstrates a stronger influence on satisfaction, indicating that users of social security applications may prioritize security and reliability over other service attributes. The result suggests that users' confidence in the platform is essential for generating positive service evaluations and enhancing overall satisfaction.

In contrast, the results reveal that price perception does not significantly influence customer satisfaction ($\beta = 0.097$, $p = 0.163$), as shown in Table 6. This finding differs from several studies conducted in commercial service settings, where price perception significantly contributes to satisfaction and behavioral intentions (Tran & Nguyen, 2023). One possible explanation is that JMO operates as a public-sector service platform rather than a profit-oriented application. Therefore, users may evaluate the platform primarily based on service effectiveness, convenience, and accessibility rather than economic considerations. This finding suggests that determinant factors of satisfaction may differ between public digital services and commercial digital platforms.

The mediation analysis further demonstrates that customer satisfaction mediates the relationship between e-service quality and customer loyalty. This result implies that improvements in service quality increase user loyalty both directly and indirectly through enhanced satisfaction. Similar findings have been reported by Dawi et al. (2022) and Venkatakrishnan and Alagiriswamy (2023), who found that customer satisfaction serves as an important mechanism connecting service quality with favorable behavioral outcomes. The present findings reinforce the argument that organizations seeking to increase customer loyalty should focus not only on improving service quality but also on ensuring that such improvements translate into positive user experiences and satisfaction.

The moderating role of application design was not supported in this study. As shown in Table 6 neither the interaction between application design and e-service quality nor the three-way interaction involving trust significantly affected customer satisfaction. These findings differ from studies that reported significant moderating effects of website or application design on user perceptions and service evaluations (Alshurideh et al., 2024). A possible explanation is that users of the JMO application prioritize functional benefits such as service reliability, convenience, and security rather than interface aesthetics. Consequently, although application design remains important for usability, it does not appear to strengthen the relationship between e-service quality and customer satisfaction in the context of employment social security services.

Overall, the results indicate that trust, e-service quality, and customer satisfaction are the primary determinants of customer loyalty in the JMO application. The findings extend previous research on digital service adoption by demonstrating that customer satisfaction remains the most important pathway through which service quality influences loyalty, while trust serves as the strongest antecedent of satisfaction. From a practical perspective, BPJS Ketenagakerjaan should prioritize initiatives aimed at improving service quality, strengthening system reliability, enhancing data security, and fostering user trust to sustain customer satisfaction and long-term loyalty.

CONCLUSION

This study examined the effects of e-service quality, price perception, trust, customer satisfaction, and customer loyalty, as well as the moderating role of application design in the context of the JMO BPJS Ketenagakerjaan application. Based on the results presented in Tables –6, several conclusions can be drawn. First, e-service quality has a positive and significant effect on customer satisfaction and customer loyalty. These findings indicate that improvements in accessibility, reliability, responsiveness, security, and ease of use contribute to higher user satisfaction and stronger loyalty toward the JMO application. Among the dimensions of e-service quality, assurance received the highest score, suggesting that system security, credibility, and reliability are the most important attributes influencing users' evaluations of the application.

Second, trust exerts a positive and significant influence on customer satisfaction and represents the strongest antecedent of satisfaction in the structural model. This finding emphasizes that users place considerable

importance on application reliability, information credibility, and data security when evaluating digital public services. Therefore, user trust serves as an important foundation for enhancing satisfaction with the JMO platform. Third, customer satisfaction has a positive and significant effect on customer loyalty and represents the strongest predictor of loyalty. This result suggests that users who are satisfied with the services provided by the application are more likely to continue using the platform and recommend it to others. Consequently, customer satisfaction plays a central role in fostering long-term user loyalty.

Fourth, price perception was not found to significantly affect customer satisfaction. This finding implies that users of the JMO application place greater emphasis on service quality, system reliability, and usability than on economic considerations when evaluating their overall experiences. As a public-sector digital service, the application is primarily assessed based on its functional benefits rather than perceived pricing aspects. Fifth, customer satisfaction significantly mediates the relationship between e-service quality and customer loyalty. This result indicates that e-service quality contributes to loyalty not only directly but also indirectly through increased levels of user satisfaction. Therefore, customer satisfaction serves as an important mechanism linking service quality to user loyalty. Finally, the moderating role of application design was not supported. Neither the interaction between application design and e-service quality nor the three-way interaction involving trust significantly affected customer satisfaction. These findings suggest that users focus more on the functional performance of the application, such as reliability, usefulness, and accessibility, than on interface design characteristics when evaluating their satisfaction.

RECOMMENDATIONS

Based on the findings of this study, BPJS Ketenagakerjaan should prioritize improvements in e-service quality, particularly in areas related to system reliability, security, responsiveness, and service accessibility. Given that trust emerged as the strongest determinant of customer satisfaction, efforts to strengthen data protection, information accuracy, and system stability should be continuously enhanced to maintain user confidence in the application. Furthermore, initiatives aimed at improving customer satisfaction should become a strategic priority, as customer satisfaction was found to be the strongest predictor of customer loyalty. Enhancing service performance, reducing technical issues, and providing a more seamless user experience may contribute substantially to increasing long-term user retention. For future research, additional variables such as perceived usefulness, perceived ease of use, user experience, service innovation, and continuance intention may be incorporated into the research model to improve its explanatory power. Future studies may also examine other public-sector digital platforms or compare public and private digital services to provide broader insights into the determinants of customer satisfaction and loyalty in digital environments.

RESEARCH LIMITATION AND FUTURE RESEARCH

RESEARCH LIMITATION

This study has several limitations that should be acknowledged. First, the research focused exclusively on users of the JMO BPJS Ketenagakerjaan application, which may limit the generalizability of the findings to other digital service platforms. Second, the cross-sectional research design captures respondents' perceptions at a single point in time and therefore does not allow for the examination of changes in customer behavior over time. Third, the reliance on self-reported data may introduce response bias, as participants' answers are subject to personal perceptions and interpretations. Finally, the study examined a limited set of antecedents of customer loyalty. Other relevant factors, such as user experience, perceived usefulness, brand image, and perceived value, were not included and may provide additional explanatory power.

FUTURE RESEARCH

Future studies are encouraged to extend the proposed model by incorporating additional variables, such as user experience, perceived usefulness, brand image, and perceived value, to provide a more comprehensive understanding of the factors influencing customer loyalty in digital service environments. Researchers may also consider expanding the sample size and geographical coverage to improve the external validity and generalizability of the findings. Furthermore, employing longitudinal research designs would enable the examination of causal relationships and changes in user perceptions over time. The adoption of qualitative or mixed-method approaches may also offer deeper insights into users' experiences and behavioral intentions. Finally, future research should test the proposed model across different digital platforms and service sectors to compare findings and contribute to the broader literature on e-service quality, customer satisfaction, trust, and customer loyalty.

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