E-SERVICE QUALITY ON CUSTOMER LOYALTY IN MALAYSIA E-BANKING: MEDIATING ROLE OF CUSTOMER SATISFACTION

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(Received 18th March 2026; revised 26th June 2026; accepted 28th July 2026)

Abstract. In today's digital age, the rapid growth of digital banking has significantly enhanced customer convenience. Consequently, the quality of e-services has emerged as a key factor for banks aiming to improve their digital offerings by focusing on customer satisfaction and loyalty. This study explores the influence of specific e-service quality dimensions, namely, responsiveness, reliability, and security & privacy; on customer loyalty in Malaysia's e-banking sector, with particular attention to the mediating role of customer satisfaction, grounded in the E-SERVQUAL model. Data was collected through a self-administered online survey using a non-probability purposive sampling method, resulting in 212 valid responses. Analysis conducted using SPSS revealed that while responsiveness did not have a significant direct impact on customer loyalty, both reliability and security & privacy were found to influence loyalty positively. Additionally, customer satisfaction was shown to play a crucial mediating role in the relationships between all three e-service quality dimensions and customer loyalty. These findings suggest that improving reliability, security & privacy, and responsiveness leads to greater customer satisfaction, which subsequently fosters stronger loyalty.
Keywords: *e-service quality, customer satisfaction, customer loyalty, banking industry*

Introduction

In Malaysia, digital banking has been integrated through various platforms such as mobile banking, internet banking, and automated banking systems to meet the diverse needs of customers. However, the constantly evolving demands of customers in the digital banking sector remain challenging, as these demands tend to fluctuate frequently. Moreover, concerns over fraudulent activities have raised doubts about customer confidence in digital banking, which can negatively affect customer satisfaction and loyalty (Yilmaz et.al, 2018). Therefore, Malaysian banks must dedicate resources to enhancing their digital banking services to achieve high levels of customer satisfaction and loyalty. It is crucial for bank management not only to focus on developing robust digital platforms but also to implement strategies aimed at ensuring customer satisfaction. With rapid technological advancements and the increasing adoption of digital services, the banking industry is undergoing a significant transformation. E-service quality, including critical dimensions such as responsiveness, reliability, and security & privacy; has become foundational to customer satisfaction and loyalty in the digital era. As banks increasingly rely on digital platforms to deliver services, understanding how these e-service quality factors influence customer loyalty is vital for maintaining a competitive advantage. Despite the importance of e-service quality, customer satisfaction is often viewed as a key mediator in the relationship between e-service quality and customer loyalty. While traditional banking services' impact on

eISSN: 2716-6481
https://doi.org/10.55197/qjssh.v7si4.1546

customer loyalty has been widely studied, less is known about how e-service quality affects loyalty specifically in digital banking contexts. This gap is particularly relevant in Malaysia, where digital banking usage continues to grow. However, comprehensive research examining the interplay between e-service quality, customer satisfaction, and customer loyalty remains limited.

The importance of studying this relationship is further highlighted by several factors. First, the digitalisation of banking services has lowered switching barriers, making it easier for customers to change banks if their expectations are not met. This increased ease of switching places greater pressure on banks to not only attract but also retain customers through superior e-service quality. Additionally, the integration of advanced technologies such as artificial intelligence, big data analytics, and cybersecurity into digital banking platforms raises the stakes for banks to provide highly reliable, responsive, and secure services (Rodrigues et al., 2022). Failure to meet these heightened expectations can result in significant customer dissatisfaction and attrition. The objectives of this study are: (RO1): To assess the direct impact of E-service quality responsiveness on customer loyalty in e-banking services in Malaysia; (RO2): To assess the direct impact of E-service quality reliability on customer loyalty in e-banking services in Malaysia; (RO3): To assess the direct impact of E-service quality security & privacy on customer loyalty in e-banking services in Malaysia; (RO4): To analyse the mediating effect of customer satisfaction in the relationship between e-service quality responsiveness and customer loyalty in e-banking services in Malaysia; (RO5):To analyse the mediating effect of customer satisfaction in the relationship between e-service quality reliability and customer loyalty in e-banking services in Malaysia; (RO6): To analyse the mediating effect of customer satisfaction in the relationship between e-service quality security & privacy and customer loyalty in e-banking services in Malaysia.

Literature review

Relationship between Responsiveness (“RES”) and Customer Loyalty (“CL”)

A study by Chandra (2022) found that responsiveness positively influences customer loyalty in the context of ATM service quality within the Bangladeshi banking sector ($\beta = 0.344$, $p < 0.05$). Similarly, the positive effect of responsiveness on customer loyalty ($\beta = 0.155$, $t = 2.493$, $p < 0.05$), emphasizing that customer loyalty is essential for maintaining profitability. Customers who rely heavily on a particular bank’s services often perceive switching to another institution as risky. As consumer awareness and expectations rise, banks must strengthen their customer service efforts to ensure long-term viability. In addition, service responsiveness positively affects customer loyalty in the hypermarket industry ($\beta = 0.165$, $p < 0.10$), indicating that responsiveness is a critical loyalty driver even in the retail sector. Furthermore, a significant positive relationship between responsiveness and customer loyalty in online shopping contexts ($\beta = 0.417$, $p < 0.01$). They noted that the COVID-19 pandemic accelerated the growth of online shopping, prompting businesses to prioritize service responsiveness. Their findings suggest that as responsiveness improves, so does customer loyalty in digital retail. Therefore, this study hypothesizes that: (Hypothesis 1): There is a positive relationship between responsiveness and customer loyalty in e-banking services in Malaysia.

eISSN: 2716-6481
https://doi.org/10.55197/qjssh.v7si4.1546

Relationship between Reliability ("REL") and Customer Loyalty ("CL")

Reliability significantly influences customer loyalty within commercial banks in Malaysia, reporting a strong positive effect ($\beta = 0.486$, $t = 6.681$, $p < 0.05$). This underscores the critical role of reliable banking services in fostering and maintaining customer loyalty. Similarly, reliability has a direct positive effect on customer loyalty in commercial banks located in Saudi Arabia's Eastern Province ($\beta = 0.229$, $t = 5.516$, $p < 0.05$), suggesting that customer trust in the consistent performance of banking services is key to sustaining loyalty. In the Pakistani banking sector, Mahmood et al. (2018) also reported a substantial positive relationship between reliability and customer loyalty ($\beta = 0.651$, $p < 0.05$), reinforcing the idea that dependable service delivery is essential for customer retention. Furthermore, this relationship in the context of online shopping platforms and revealed that reliability is a critical factor affecting customer loyalty in the e-commerce sector. Their findings ($\beta = 0.701$, $p < 0.01$) emphasize that customers value consistent and dependable service, which significantly enhances their loyalty toward digital service providers. Therefore, this study hypothesizes that: (Hypothesis 2): There is a positive relationship between reliability and customer loyalty in e-banking services in Malaysia.

Relationship between Security & Privacy ("SP") and Customer Loyalty ("CL")

E-security has a positive effect on customer loyalty within the context of e-business in Pakistan ($\beta = 0.360$, $p < 0.05$). Similarly, a study conducted by Gabriella Santoso and Tommy Setiawan Ruslim (2024) found that security and privacy significantly influence customer loyalty among BCA mobile users in Jakarta. Their findings indicated that loyalty is positively impacted by the mobile service's security and privacy features, including protection from risks, service disruptions, and losses, as well as the overall assurance provided ($\beta = 0.139$, $p < 0.05$). Consistent with these findings, Guluwita and Sapukotanage (2020) highlighted that e-service quality—particularly security and privacy—has a positive influence on customer e-loyalty in the context of e-commerce platforms ($\beta = 0.409$, $p < 0.001$), emphasizing the critical importance of safeguarding users' information in digital environments. Therefore, this study hypothesizes that (Hypothesis 3): There is a positive relationship between Security & Privacy and customer loyalty in e-banking services Malaysia.

Mediating effect of Customer Satisfaction ("CS") in the Relationship between Responsiveness("RES") and Customer Loyalty ("CL")

Research by Zariman et al. (2023) identified customer satisfaction as a mediating factor in the relationship between responsiveness and customer loyalty intentions within the mobile commerce applications (MCA) industry, with a statistically significant effect ($\beta = 0.166$, $p < 0.05$). Similarly, Nyan et.al, (2020) examined the mediating role of customer satisfaction in the link between service quality and customer loyalty in Ghana's telecommunications sector. Their study revealed a strong positive relationship ($\beta = 0.806$, $p < 0.05$), emphasizing the importance of prioritizing customer satisfaction as a key predictor of loyalty alongside service quality. Chandra (2022) also provided evidence supporting this mediation effect in the Bangladeshi banking sector, particularly in the context of ATM service quality. The study found that customer satisfaction significantly mediates the relationship between responsiveness and customer loyalty, with a robust coefficient ($\beta = 0.344$, $t = 7.420$, $p < 0.001$), further

eISSN: 2716-6481
https://doi.org/10.55197/qjssh.v7si4.1546

underscoring the role of satisfaction in enhancing customer loyalty. Therefore, this study hypothesizes that: (Hypothesis 4): Customer satisfaction mediates the relationship between Responsiveness and Customer Loyalty with e-banking services in Malaysia.

Mediating effect of Customer Satisfaction ("CS") in the Relationship between Reliability ("REL") and Customer Loyalty ("CL")

According to Firdaus and Rachmawati (2024), customers of higher levels of satisfaction and loyalty as a result of service reliability ($t = 3.441$, $p < 0.05$). Their study aimed to identify factors influencing customer satisfaction and loyalty in the mobile banking sector, concluding that the continuous availability and reliability of services are essential for enhancing customer experience and fostering loyalty. Similarly, customer satisfaction mediates the relationship between service quality, particularly reliability, and customer loyalty among Grab users in Medan, Indonesia ($\beta = 0.831$, $p < 0.05$). Their findings indicated that dependable service strongly contributes to loyalty by first improving customer satisfaction. Supporting this, in the Malaysian digital commercial banking context, customer satisfaction mediates the effect of reliability on customer loyalty ($\beta = -0.03$, $t = 2.329$, $p < 0.05$), further emphasizing the influence of reliability in building long-term customer relationships through satisfaction. Likewise, Chandra (2022) observed a significant mediating effect of customer satisfaction in the relationship between reliability and loyalty in the banking industry in Bangladesh ($t = 2.329$, $p < 0.05$). Therefore, this study hypothesizes that: (Hypothesis 5): Customer satisfaction mediates the relationship between Reliability and Customer Loyalty in e-banking services in Malaysia.

Mediating effect of Customer Satisfaction ("CS") in the Relationship between Security & Privacy ("SP") and Customer Loyalty("CL")

In today's highly competitive mobile social media landscape, service quality, particularly security and privacy, plays a vital role in enhancing customer loyalty through customer satisfaction. Yum and Yoo (2023) found that customer satisfaction mediates the relationship between security and privacy and customer loyalty in mobile social media platforms ($\beta = 0.138$, $p < 0.05$). Their results indicated a full mediation effect, suggesting that improvements in security and privacy, especially within wireless environments prone to data breaches and hacking, significantly increase customer satisfaction, which in turn boosts loyalty. Similarly, security and privacy positively impact customer loyalty through the mediating role of customer satisfaction ($\beta = 0.044$, $p < 0.05$) among BCA mobile users in Jakarta. Their findings emphasize the importance of ensuring customers feel secure and protected from potential threats, losses, and disruptions. Therefore, this study hypothesizes that: (Hypothesis 6): Customer satisfaction mediates the relationship between Security & Privacy and Customer Loyalty in e-banking services in Malaysia

Theoretical framework

The theoretical framework is based on the formulated hypotheses.

eISSN: 2716-6481
https://doi.org/10.55197/qjssh.v7si4.1546

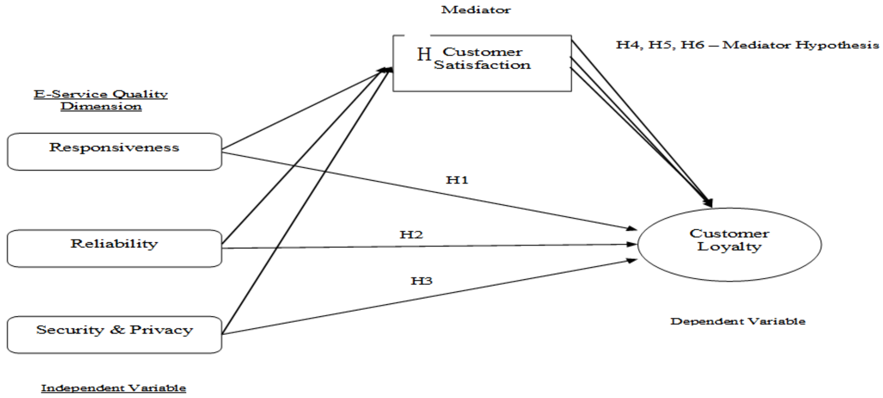

Figure 1. *Theoretical framework on the impact of E-service quality on customer loyalty in Malaysian E-banking: The mediating role of customer satisfaction.*

Materials and Methods

The sample size was determined using G*Power version 3.1.9.7. A non-probability sampling method was employed due to its cost-effectiveness, rapid implementation, and flexibility. .Primary data collection was carried out using a structured questionnaire. A cross-sectional approach was adopted, which is both cost-efficient and suitable for analyzing data within a specific timeframe and population (Zazpe et al., 2019). According to Zazpe et al. (2019), self-administered questionnaires are an effective means of reaching large sample groups quickly and economically. As such, the survey was created using Google Forms, and the distribution of the survey link was facilitated through messaging platforms such as WeChat and WhatsApp, along with social media channels like Facebook, Telegram, and Instagram, leveraging the researchers' personal networks. The unit of analysis for this study is at the individual level, specifically focusing on individuals residing in the Northern region of Malaysia who have experience using e-banking services.

Construct measurement and questionnaire design

The questionnaire was divided into two sections. Part A aimed to gather demographic information from respondents, including gender, age, education level, income, and occupation. Part B focused on measuring the constructs related to customer loyalty. The items addressing responsiveness, reliability, security & privacy, and customer satisfaction were adapted from previous validated studies, including those by Firdaus and Rachmawati (2024), Chandra (2022) as well as Yum and Yoo (2023). A five-point Likert scale was employed to assess the respondents' level of agreement with each statement, ranging from "1" (Strongly Disagree) to "5" (Strongly Agree). The data is collected using different data analysis techniques. This study includes analyses of demographic descriptive analysis, data descriptive analysis, normality test, validity analysis, reliability test, correlation analysis, and regression analysis.

Results and Discussion

Normality test result-skewness and kurtosis test

Normality was assessed using skewness and kurtosis statistics as shown in *Table 1*, skewness values ranged from –1.028 to -1.712, indicating slight negative skewness but remaining within acceptable limits (±2). Kurtosis values ranged from 0.023 to 3.946, which are also within the recommended threshold for normality. Overall, the results suggest that the data are approximately normally distributed.

Table 1*. Skewness and kurtosis result.*

Category	RES	REL	SP	CS	CL
Skewness	-1.028	-1.160	-1.358	-1.048	-1.712
Std. Error of Skewness	0.167	0.167	0.167	0.167	0.167
Kurtosis	0.023	1.069	1.588	1.523	3.946
Std. Error of Kurtosis	0.333	0.333	0.333	0.333	0.333

Validity analysis – Kaiser-Meyer-Olkin (“KMO”) and Bartlett’s Test

The results presented in *Table 2* show a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of 0.906, indicating that the sample is adequate and exceeds the minimum acceptable threshold of 0.60. Additionally, Bartlett’s test of sphericity yielded an approximate chi-square value of 4240.331 with a significance level of less than 0.001, satisfying the requirement of a p-value below 0.05.

Table 2*. KMO and Barlett’s Test.*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.906
Bartlett's Test of Sphericity	Approx. Chi-Square	4240.331
	df	210
	Sig.	<0.001

Reliability analysis – Cronbach’s Alpha Test

As shown in *Table 3*, results indicate that all variables meet the acceptable reliability threshold of 0.60, with a minimum Cronbach’s Alpha of 0.70, demonstrating satisfactory internal consistency of the questionnaire. Furthermore, the Alpha values for each variable range from 0.748 to 0.970. According to commonly accepted guidelines for Cronbach’s Alpha interpretation, the service quality dimensions, Responsiveness (RES), Reliability (REL), and Security & Privacy (SP), with Alpha values of 0.918, 0.970, and 0.916, respectively, show excellent internal reliability.

Table 3*. Cronbach’s Alpha Testing.*

Variables	Number of Items	Items Dropped	Cronbach's Alpha
Responsiveness (“RES”)	5	0	0.918
Reliability (“REL”)	5	2	0.970
Security & Privacy (“SP”)	5	0	0.916
Customer Satisfaction (“CS”)	5	2	0.748
Customer Loyalty (“CL”)	5	0	0.883

Correlation analysis

Table 4 presents the correlation matrix displaying Pearson correlation coefficients among five variables: Responsiveness (RES), Reliability (REL), Security & Privacy (SP), Customer Satisfaction (CS), and Customer Loyalty (CL).

Table 4*. Correlation matrix.*

Category		RES	REL	SP	CS	CL
RES	Pearson Correlation	1	.369**	.713**	.583**	.555**
	Sig. (1-tailed)	-	<0.001	<0.001	<0.001	<0.001
REL	Pearson Correlation	.369**	1	.347**	.463**	.530**

eISSN: 2716-6481
https://doi.org/10.55197/qjssh.v7si4.1546

	Sig. (1-tailed)	<0.001	-	<0.001	<0.001	<0.001
SP	Pearson Correlation	.713**	.347**	1	.586**	.676**
	Sig. (1-tailed)	<0.001	<0.001	-	<0.001	<0.001
CS	Pearson Correlation	.583**	.463**	.586**	1	.649**
	Sig. (1-tailed)	<0.001	<0.001	<0.001	-	<0.001
CL	Pearson Correlation	.555**	.530**	.676**	.649**	1
	Sig. (1-tailed)	<0.001	<0.001	<0.001	<0.001	-

*Note: **. Correlation is significant at the 0.01 level (1-tailed).*

Regression analysis findings

Table 5 displays the ANOVA results, revealing an F-value of 87.660 with a p-value below 0.001, which indicates a statistically significant effect of the independent variables, responsiveness (RES), reliability (REL), and security & privacy (SP), on the dependent variable, customer loyalty (CL). The R-squared value of 0.558 suggests that these predictors explain 55.80% of the variance in customer loyalty. Overall, this regression model demonstrates that SP, REL, and RES are significant factors in explaining the influence of e-service quality on customer loyalty.

Table 5*. One-Way ANOVA (IVs – DV).*

Model	Sum of Squares	df	Mean Square	R Square	F	Sig.
Regression	959.116	3	319.705	0.558	87.660	<.001[b]
Residual	758.601	208	3.647			
Total	1717.717	211				

Note: a. Dependent Variable: CL. b. Predictors: (Constant), SP, REL, RES.

Summary of the result

Table 6*. Summary of the result.*

Hypotheses	Description	Result
H1	There is a positive relationship between responsiveness and customer loyalty in e-banking services Malaysia.	Rejected
H2	There is a positive relationship between reliability and customer loyalty in e-banking services Malaysia.	Accepted
H3	There is a positive relationship between Security & Privacy and customer loyalty in e-banking services Malaysia.	Accepted
H4	Customer satisfaction mediate the relationship between Responsiveness and Customer Loyalty with e-banking services in Malaysia.	Accepted
H5	Customer satisfaction mediate the relationship between Reliability and Customer Loyalty in e-banking services Malaysia.	Accepted
H6	Customer satisfaction mediate the relationship between Security & Privacy and Customer Loyalty in e-banking services Malaysia.	Accepted

Conclusion

The results revealed that responsiveness did not have a significant direct effect on customer loyalty, suggesting that e-banking customers may prioritize other factors, such as reliability and security, over responsiveness. Conversely, reliability and security & privacy were identified as key drivers positively affecting customer loyalty, underscoring their importance in building trust and sustaining long-term customer relationships. A major contribution of this research is the identification of customer satisfaction as a crucial mediator in the relationships among responsiveness, reliability, security & privacy, and customer loyalty. While reliability and security & privacy directly enhance customer loyalty, their effects are strengthened when customer satisfaction increases. Specifically, improvements in reliability and security measures lead to higher customer satisfaction, which in turn fosters greater loyalty. This

eISSN: 2716-6481
https://doi.org/10.55197/qjssh.v7si4.1546

mediation highlights the necessity for banks not only to provide dependable and secure services but also to actively enhance customer satisfaction to cultivate loyalty.

Acknowledgement

I would like to extend my sincere thanks to Tan Yi Zhen for his unwavering support of this publication. Their extensive knowledge, enthusiasm, and motivation have been invaluable. Tan Yi Zhen's calm and thoughtful guidance throughout the research and thesis writing process has been particularly beneficial, making his exceptional mentor in my publication.

Conflict of interest

The authors confirm that there is no conflict of interest involving any parties in this research study.

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