

The impact of electronic service quality on customer satisfaction and loyalty



Tarig Osman Abdallah Helal¹, Nasareldeen Hamed Ahmed Alnor^{2,*}, Shatha Salem Alruwali¹, Abderhim Elshazali Yahia Abdallah³, Hamza Abdallah Abdalrhman Yahya¹, Nuseiba Azzam Ibrahim Youseif⁴

¹Department of Business Administration, College of Business, Jouf University, Sakaka, Saudi Arabia

²Accounting Department, College of Business, Jouf University, Sakaka, Saudi Arabia

³Administrative and Humanitarian Programs Unit, Applied College, Jouf University, Sakaka, Saudi Arabia

⁴Department of Business Administration, College of Business, Abu Dhabi University, Abu Dhabi, United Arab Emirates

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ABSTRACT

In recent years, e-commerce has become increasingly common. Many studies have shown that improving internet quality, enhancing purchasing processes, and effectively retaining customers significantly contribute to customer satisfaction and loyalty. This study aims to examine the relationship between the quality of electronic services and customer satisfaction and loyalty. The researchers employed descriptive and case study methods and distributed 122 questionnaires to a sample of Sudanese bank customers. The results indicate a statistically significant positive relationship between performance and customer loyalty. A significant positive effect was also found between fulfillment of requirements and customer satisfaction, as well as between fulfillment of requirements and customer loyalty. In addition, system accessibility had a statistically significant positive impact on both customer satisfaction and customer loyalty. Privacy was found to have a statistically significant positive relationship with customer satisfaction and customer loyalty. Overall, customer satisfaction and loyalty improved significantly depending on the availability of quality dimensions in electronic services.

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1. Introduction

Since the inception of the Internet, a vital marketing tool and distribution channel for service providers, it has offered businesses many opportunities to grow their customer bases through a strong online presence. Sales revenue and profits depend on how successful a website is in attracting qualified visitors, converting them into paying customers, and building a loyal following. The general evaluation of an online service's efficacy, dependability, and efficiency in meeting client needs is known as electronic service quality, or E-SQ (Nandankar et al., 2023). Customers evaluate service providers not just on the basis of product quality but also on the responsiveness, transaction security, convenience of use, and accuracy of the information

provided by the electronic platform, as digital interaction either replaces or enhances in-person interactions (Akram et al., 2022). A favorable opinion of the quality of e-services increases consumer happiness, which in turn encourages loyalty, which is essential for keeping clients in fiercely competitive marketplaces.

The Internet has radically changed the business environment, as people now work together to exchange information and knowledge (Alnor et al., 2024). In addition to serving as a marketing tool, the Internet can also have social benefits that encourage consumer loyalty (Hamza et al., 2025). A number of studies have sought to identify the factors that influence online purchasing, such as good faith, network security, and privacy are believed to be Service availability, website accessibility, goodwill, and network security will all influence customer trust in a website, which will directly impact online purchase motivation (Frik and Mittone, 2019). In addition to the impact of privacy protection, it is believed that service quality can bring potential strategic benefits, such as improving customer loyalty and increasing the efficiency of corporate operations and benefits (Arslan, 2020). Therefore,

* Corresponding Author.

Email Address: nhelnuor@ju.edu.sa (N. H. A. Alnor)

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Corresponding author's ORCID profile:

<https://orcid.org/0000-0001-7679-3084>

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we conclude that the quality of electronic service will have a positive impact on customer satisfaction and loyalty (Ayinaddis et al., 2023). Taking Bank K as an example, it checks that the positive effects of electronic service quality on customer satisfaction during these effects increase bank benefits and experience significantly impact trust and customer relationships (Alnor, 2024; Ayinaddis et al., 2023). All of these current research achievements also show that the quality of electronic service can improve customer satisfaction, customers, and maintain long-term relationships with them.

These views provide a favorable theoretical and practical basis for further analysis of e-service. Electronic services, or e-services, are now a crucial factor in determining an organization's sustainability and competitiveness in the digital age (Hamza et al., 2024; Valackiene and Giedraitiene, 2024). Customers are spending more and more on electronic service delivery to suit their needs as a result of the quick expansion of digital platforms, e-government, online banking, and e-commerce. E-services, as opposed to traditional services, are provided via technologically enabled platforms where client experiences are largely shaped by the caliber of engagement, usability, and responsiveness. Organizations looking to enhance digital platforms and gain a sustainable competitive edge can benefit greatly from an understanding of how e-service quality affects customer happiness and loyalty. Thus, by investigating how aspects of service quality influence user experiences and sustained engagement, this study investigates the connection between electronic service quality, customer satisfaction, and customer loyalty.

Despite increasing interest in electronic providers' high-quality within emerging economies, considerable gaps persist in comprehending how unique factors of carrier satisfaction have an effect on each pleasure and loyalty in precarious banking contexts like Sudan. Current studies in growing nations frequently emphasize general e-banking adoption or satisfaction independently, neglecting the inconsistent correlation between satisfaction and loyalty, which remains tenuous in several emerging markets (Hult et al., 2022). Furthermore, restrained studies integrate complete pleasant traits, along with efficiency, accessibility, and privacy simultaneously. Consequently, empirical facts from Sudan remain few, highlighting the necessity for further exploration.

The number one intention of this research is to analyze the impact of digital service quality on client satisfaction and loyalty in Sudanese banks. They have a specific purpose is to examine how important factors of e-carrier, such as high-quality performance, gratifying standards, accessibility, and privateness impact purchaser perceptions and impact pleasure with online banking offerings. The take a look at also tries to take a look at the extent to which patron satisfaction contributes to client loyalty in Sudan's banking sector. By assessing those links, the undertaking hopes to present empirical

information to assist in building powerful digital provider strategies to improve client experience and retention.

This study gives more than one essential scholarly contribution. It complements the body of carrier first-class literature by offering an updated empirical model that connects electronic provider pleasant dimensions to purchaser pleasure and loyalty within digital contexts. It emphasizes the comparative importance of critical e-provider factors, including performance, reliability, responsiveness, and privacy in influencing client perceptions, presenting more comprehensive insights into their wonderful impacts. Methodologically, the study employs rigorous statistical methods to confirm the proposed relationships. Practically, it provides a comprehensive framework that organizations can undertake to improve digital service strategies, build customer success, and foster long-term loyalty within distinctly aggressive online markets.

2. Literature review

The four elements chosen: performance, success, accessibility, and privacy, are the most relevant for the Sudanese context because of the country's particular virtual banking troubles. With confined infrastructure, changing net pleasant, and varying virtual literacy tiers, performance and accessibility are important for assuring clean and dependable online transactions (Omodan, 2024). Customer expectations for a unique and rapid provider of completion, regardless of operational constraints within banks, make success equally important. Privacy is extremely critical in Sudan, on the grounds that there are giant concerns about cybersecurity, fraud, and information protection. Together, these traits at once shape agreement, pleasure, and subsequently loyalty in Sudanese e-banking services.

2.1. Electronic services

Internet use has increased rapidly in recent years. In 2012, there were 2,405 million Internet subscribers worldwide, representing 34.3% of the total world population (Nguyen, 2020). This was followed by the emergence of E-commerce. With the increasing number of service organizations operating through Websites, one of the most recent challenges has been the quality of electronic service for e-commerce companies (Gajewska et al., 2020).

The empirical literature on identifying the extent of satisfaction with electronic service has focused on two questions. First, what are the dimensions of customer evaluation of an organization's electronic service? Second, what are the relationships between the quality of performance in these dimensions and measures of overall service performance? Market information represents the cornerstone of the contemporary marketing concept and is important for Market-focused strategic planning and implementation. Global business leaders believe that

consumer expectations for service quality are higher than ever before. As a critical advantage for businesses in a harsh environment, high service quality is a globalization requirement for service providers (Ozbekler and Ozturkoglu, 2020). Excellence in service delivery is crucial for attracting and retaining cost-effective customers (Wirtz and Zeithaml, 2018). The dimensions of service quality are ease of use, privacy, security, responsiveness, website design, and reliability. These are among the most frequently cited variables that influence the quality of e-services. Leading service quality attributes can be grouped into reliability, efficiency, and empathy (Prakash, 2019). For service providers, including banks, raising the level of service is crucial because of its impact on customer attraction. For many customers, shopping online has become a routine for e-retailers to differentiate themselves from each other; the quality offered through their websites is important (Kumar and Ayodeji, 2021). Service satisfaction influences merchandise purchasing behaviors and, consequently, final market outcomes (Zarei et al., 2019). High service should lead to increased customer loyalty and revenue, positive word of mouth, and market valuation feedstock (Marcos and Coelho, 2022). Experienced online retailers have realized that the key determinants of success or failure are not just design. Good for the website, but also the quality of the website's service (Rita et al., 2019). People often make judgments about service quality based on information about the quality of each service provider, even though they are primarily concerned with the quality of each customer's experience (Medberg and Grönroos, 2020). And the quality of the service provided has always been a key factor for the success of E-commerce (Gajewska et al., 2020). Yoo et al. (2023) believe that customers' perceptions of website quality are influenced by a number of factors, namely, security, privacy and loyalty, reliability, website design, customer service, informativeness, and customization. Efficiency refers to the fact that the website is relatively easy to access and use, including speed of access and general directory design, as well as the provision of information. Fulfillment of requirements also indicates whether the site's processing and delivery of goods are reliable and dependable. Accessibility refers to whether a site relies on technology in its operation and ease of use, and privacy and security refer to whether a site can maintain its extension. Customer information confidentiality and secure payments. As companies increasingly need to collect and use customer data, customers become increasingly concerned about their privacy and the potential for harm from this activity. These concerns are called "privacy issues." Privacy is the greatest value that customers seek in their dealings with the website (Acquisti et al., 2020). Fulfilling requirements also refers to meeting demands and adhering to work rules under any circumstances and warns organizations against routinely taking the easy way out (Manning, 2020).

2.2. Customer satisfaction

It can be defined as a customer's overall evaluation of the performance provided to date (Afthanorhan et al., 2019). According to conventional wisdom, the organization's highest and ultimate interests are linked to customer satisfaction (Lepistö et al., 2024). Customer satisfaction is viewed as the extent to which a company's product or service meets customer expectations. Customer satisfaction affects how they feel during and after a purchase decision in a way that has implications for their consumption (Prianggono and Sitio, 2020). High customer satisfaction leads to long-term dedication and a strong emotional connection to the product. Therefore, customers who are happy with a product or service are more willing to repurchase it or continue using it in the future. For an activity to remain ongoing and sustainable, it is essential to maintain customer satisfaction. Many researchers also explain that customer loyalty is positively and significantly influenced by customer attractiveness (Yeh et al., 2020). Customer happiness and satisfaction are influenced by the duration of the warranty and the expected failure rates after the warranty period expires (Wang et al., 2022). Customer satisfaction indicates Customer satisfaction is defined as the extent to which products and services meet customer standards in terms of quality and perceived offering (Samudro et al., 2020). Customers can increase their purchases if they are satisfied with the product and service provided. Therefore, it can be said that low price elasticity, isolating existing customers from competitive efforts, reducing future transaction costs, reducing the costs of attracting new customers, and improving the image are some of the benefits of customer satisfaction (Alnor, 2024). Therefore, it is a purchase outcome in which consumers buy after comparing rewards and costs with the expected consequences. A number of studies have indicated a factor one indicator of customer satisfaction, defined as an individual and self-derived positive evaluation of an outcome or experience associated with the consumption of a product (Mishra et al., 2025).

2.3. Customer loyalty

Customer retention is an important aspect of a business's marketing plan and long-term performance. Many elements contribute to loyalty, such as perceived value, good customer reviews, and perceived service quality (Hamza et al., 2025). Therefore, customer loyalty is a frequently discussed topic in marketing and service. Given its importance to the effective operation of any business, service providers have paid attention to it (Wolor et al., 2020). Sometimes referred to as "a customer's intention to engage in a variety of behaviors that indicate a desire to maintain a relationship with the focal company," it is what marketing firms refer to as demonstrating loyalty (Zephaniah et al., 2020). It is

one of the most controversial business topics, as it is linked to profitability and therefore receives this attention (Lowe et al., 2020). The importance of customer loyalty in today's market cannot be denied for a number of reasons, including maintaining the acquired market share and, in some cases, ensuring long-term business continuity that depends on it (Niemimaa et al., 2019). Finding the factors that influence or drive customer loyalty is crucial because it has become crucial for companies. Many studies in the marketing and services literature have identified customer happiness as one of the main factors that influence customer loyalty (de Azambuja et al., 2023). Customer loyalty adds many financial benefits to companies and contributes to increasing their market value (Arslan, 2020). Therefore, in order to have effective sales relationships between companies, customer loyalty is essential. It refers to the likelihood of a buyer making repeat purchases from a particular vendor and maintaining a strong, long-term commitment to that vendor. Therefore, gaining customer loyalty is crucial for a company's long-term profitability. Customer loyalty is often linked to customer happiness. Several studies have examined the nature of the relationship between the two variables. As shown in Fig. 1, this study seeks to further investigate the relationship between e-service quality, customer satisfaction, and customer loyalty by examining different dimensions within the current online transaction framework in Sudan.

3. Methodology, theoretical model, and hypotheses

Many studies have investigated the relationship between technological services and customer satisfaction. Several papers have sought to identify the various effects of service quality on customer satisfaction and loyalty. However, only a few studies have focused on the direct effects of various factors on consumer loyalty. The effects of service quality on various dimensions of customer satisfaction, as well as customer loyalty. Based on the above research, this paper develops the following theoretical model and hypothesis to investigate how electronic service

quality affects customer satisfaction and loyalty across four dimensions in Sudan. The descriptive and case study approaches were used, where 122 questionnaires were distributed to a sample of Sudanese bank customers. The number of respondents was 122, and the hypotheses can be summarized as follows:

- H1.** Efficiency has a positive impact on customer satisfaction.
- H2.** Efficiency has a positive impact on customer loyalty.
- H3.** There is a positive impact of requirements on customer satisfaction.
- H4.** Requirements have a positive impact on customer loyalty.
- H5.** Accessibility has a positive impact on customer satisfaction.
- H6.** Accessibility has a positive impact on customer loyalty.
- H7.** Privacy has a positive impact on customer satisfaction.
- H8.** Privacy has a positive impact on customer loyalty.

Nature requires the use of the analytical descriptive approach, and the research community is represented by a group of Sudanese bank clients. Society needs to be precisely defined. I suggest that the workers in the Sudanese banks be, and then the sample will be by defining the target groups as groups within these banks. The type of the sample must also be determined; is it random or stratified?

The study examined the population of 39 Sudanese banks. A stratified sample of 122 individuals was selected from these banks. The researchers used a questionnaire as the main instrument for data collection in order to understand the opinions and attitudes of the study participants. In total, 200 questionnaires were distributed, and 122 valid responses were received, resulting in a response rate of 61%. The questionnaires were distributed to a randomly selected sample of bank customers.

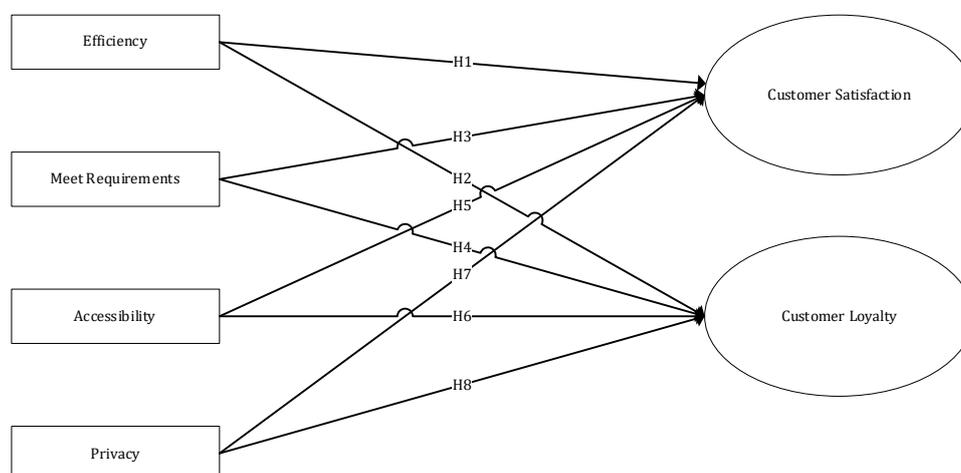


Fig. 1: Proposed conceptual model linking electronic service quality dimensions to customer satisfaction and customer loyalty

For data analysis, several statistical methods were applied to analyze the responses of the research sample. The validity and reliability of the instrument were tested using Cronbach's alpha coefficient. In addition, Simple Mean Analysis (SMA) and standard deviation were used to analyze the data. To examine internal consistency, the researcher tested experimental validity using Pearson's correlation coefficient between the relevant scale items. The correlation coefficients ranged between 0 and 0.65.

Table 1 indicates that most aspects of electronic banking services were positively evaluated by

respondents. High weighted mean values (above 4.3) were observed for efficiency, fulfillment of requirements, and accessibility, suggesting that customers perceive the websites as user-friendly, well-organized, and efficient in processing requests. Overall customer satisfaction with online banking services was also high (mean = 4.097). However, customer loyalty showed a lower weighted mean (3.195) and a relatively high standard deviation (1.573), indicating differing opinions among respondents and highlighting the need to strengthen customer trust and encourage consistent positive recommendations.

Table 1: Descriptive statistics of the variable's indicators

Construct	Statement	Mean	SD
Efficiency	I can easily find what I need on the website	4.54	0.56
	Information on the site is well organized	4.47	0.69
	The website is easy to use	4.50	0.59
	The website design helps me use the services	4.49	0.62
	The website has a good structure	4.39	0.75
	Construct mean	4.48	0.64
Meet requirements	My requests through the website are processed quickly	4.21	0.81
	Services are delivered in a timely manner	4.17	0.77
	The system confirms my service requests	4.26	0.67
	The site provides various service options	4.21	0.73
	Transactions are completed when confirmed	4.47	0.55
	Construct mean	4.26	0.71
Accessibility	I can use the site wherever internet access is available	4.40	0.61
	The website is secure against electronic intrusions	4.37	0.68
	The site is easy to use for electronic transactions	4.30	0.79
	The bank provides online portals to complete requests	4.28	0.72
	Customers with different backgrounds can use the website	4.50	0.62
	Construct mean	4.37	0.69
Privacy	The website assures the confidentiality of my personal information	4.48	0.59
	My personal information is not shared with other websites	4.50	0.58
	The website protects my bank card information	4.25	0.67
	The website requires secure password authentication	4.07	0.82
	The bank regularly updates security measures on the website	4.16	0.77
	Construct mean	4.29	0.69
Customer satisfaction	I am satisfied with completing transactions via banking websites	4.07	0.84
	Using banking websites for transactions is a good decision	4.07	0.81
	The websites successfully fulfill my service needs	4.15	0.80
	Construct mean	4.10	0.82
Customer loyalty	I will share positive experiences about online banking	4.01	0.90
	I will recommend others to use online banking services	2.38	2.25
	Construct mean	3.20	1.57

3.1. Reliability indicator and internal consistency reliability

When assessing the dependability of a measurement tool, like the survey I used for this study, reliability indices and internal consistency reliability are essential components (Hamza et al., 2024). Cronbach's alpha, the most popular metric for assessing internal consistency reliability, calculates the average correlation between every conceivable pair of items on a scale (Alnor et al., 2024; Vaske et al., 2017). Greater internal consistency is indicated by a higher Cronbach's alpha coefficient (Benzerrouk et al., 2023; Vaske et al., 2017). The degree to which items on a test or scale consistently measure the

same construct is known as internal consistency reliability.

The Table 2 findings show that all of the study variables have a high degree of internal consistency and dependability. The measurement scales are very reliable, as seen by Cronbach's Alpha values, which range from 0.877 to 0.901 and all surpass the acceptable threshold of 0.70. Furthermore, Hotelling's T-Squared and F-values are significant at Sig. = 0.000, suggesting that each variable's items make a significant contribution to the construct as a whole. These results show the statistical validity and reliability of the tool used to gauge consumer pleasure, loyalty, and the quality of electronic services.

Table 2: Reliability indicator and Internal consistency reliability

Variable	Number of items	Cronbach's alpha	Hotelling's t-squared	F	Sig.	
Quality of electronic services	Efficiency	5	0.895	63.620	48.350	0.000
	Meet requirements	5	0.896	82.540	46.851	0.000
	Accessibility	5	0.896	79.112	45.902	0.000
	Privacy	5	0.895	80.801	49.989	0.000
Customer satisfaction and loyalty	Customer satisfaction	3	0.901	77.910	44.950	0.000
	Customer loyalty	2	0.877	93.561	54.752	0.000

3.2. Correlation coefficient

The correlation coefficient between the variables is displayed in Table 3. If the correlation coefficient is +1, it is considered to be perfect; if it is larger than 0.5, it is considered to be strong; if it is greater than zero, it is considered to be weak; and if it is zero, it indicates that there is no correlation. An entirely negative connection is another interpretation of it. If it is less than -0.5, it is a strong negative; if it is less than zero, it is a weak negative (Hamza et al., 2024). The correlation results show that the majority of the variables pertaining to customer happiness, loyalty, and the quality of electronic services have strong and

significant positive correlations with one another. Customer happiness is especially positively correlated with efficiency, accessibility, and privacy ($r = 0.860, 0.455, \text{ and } 0.839$, respectively, $p < 0.01$), suggesting that user-friendly, secure, and well-designed banking websites raise satisfaction levels. Additionally, the quality dimensions themselves show moderate to strong correlations, indicating internal consistency.

Client satisfaction and loyalty, however, show a rather poor association ($r = 0.119$), suggesting that client loyalty may not always be guaranteed by contentment alone.

Table 3: Correlations and coefficients

Variable		Statistic	E	MR	A	P	CS	CL
Quality of electronic services	Efficiency (E)	Pearson correlation	1	0.593	0.682*	0.837	0.860**	0.692
		Sig.		0.000	0.000	0.000	0.000	0.000
	Meet requirements (MR)	Pearson correlation		1	0.643	0.776	0.702	0.719
		Sig.			0.000	0.000	0.000	0.000
	Accessibility (A)	Pearson correlation			1	0.833	0.455	0.490
		Sig.				0.000	0.000	0.000
Privacy (P)	Pearson correlation				1	0.839	0.612	
	Sig.					0.000	0.000	
Customer satisfaction and loyalty	Customer satisfaction (CS)	Pearson correlation				1	0.119	
		Sig.					0.000	
	Customer loyalty (CL)	Pearson correlation						1
		Sig.						

*: Correlation is significant at the 0.05 level (2-tailed); **: Correlation is significant at the 0.01 level (2-tailed)

3.3. Hypotheses testing result

Table 4 shows that customer happiness and loyalty are significantly positively impacted by all aspects of electronic service quality, according to the regression results. Efficiency plays a crucial role, as evidenced by its largest effects on loyalty ($\beta = 1.211$, $T = 4.400$) and satisfaction ($\beta = 1.838$, $T = 2.123$, $p < 0.01$). Although to differing degrees, contentment and loyalty are likewise positively impacted by privacy, accessibility, and meeting standards. Strong predictive correlations between variables and good explanatory power are demonstrated by the model's ability to explain 35.8% of the variation in satisfaction ($R^2 = 0.358$, $F = 20.925$, $\text{Sig.} = 0.000$).

The findings provided in Table 4 exhibit that each proposed hypothesis was supported, with each

courting among e-carrier first-rate dimensions and the effects of customer delight and loyalty exhibiting advantageous and statistically significant consequences. Efficiency exhibited the maximum widespread impact on each satisfaction and loyalty, succeeded by using achievement and privacy, while accessibility confirmed a lesser but nonetheless tremendous effect. These findings confirm that enhancements throughout all four dimensions considerably make contributions to improving customer delight and selling loyalty within Sudanese banking establishments. The importance values ($\text{Sig.} = 0.000$) and advantageous beta coefficients throughout all pathways substantiate the attractiveness of every speculation, indicating sturdy predictive relationships.

Table 4: Hypotheses testing

Hypothesis	β	SD	T	R	R^2	F	Sig.
Efficiency -> Customer satisfaction	1.838	0.110	2.123				
Efficiency -> Customer loyalty	1.211	0.002	4.400				
Meet requirements -> Customer satisfaction	1.138	0.015	3.557				
Meet requirements -> Customer loyalty	0.208	0.007	2.863				
Accessibility -> Customer satisfaction	0.126	0.038	2.160	0.598	0.358	20.925	0.000
Accessibility -> Customer loyalty	0.197	0.035	3.100				
Privacy -> Customer satisfaction	0.924	0.115	1.990				
Privacy -> Customer loyalty	0.872	0.093	2.520				

4. Discussion

The findings of this study demonstrate that among Sudanese bank customers, customer happiness and loyalty are significantly influenced by the caliber of electronic services. The findings are consistent with past studies that have stressed the role of service quality dimensions, efficiency, meeting standards, accessibility, and privacy in

shaping pleasant customer experiences in online banking.

With Cronbach's Alpha values ranging from 0.877 to 0.901, the reliability analysis showed good internal consistency across all constructs, above the suggested threshold of 0.70. This shows that the underlying notions of e-service quality, pleasure, and loyalty were successfully captured by the study's measurement items. The scales' internal validity and

dependability are further supported by the significance of Hotelling's T-squared and F-values (Sig. = 0.000).

Strong positive correlations between the major variables were found by the correlation analysis, suggesting that enhancements in the quality aspects of electronic services typically result in concurrent increases in customer satisfaction and loyalty. Customer satisfaction was shown to be positively connected with efficiency, accessibility, and privacy ($r = 0.860, 0.455, \text{ and } 0.839$, respectively). This suggests that banking platforms that are secure and easy to use significantly improve the entire customer experience. Nonetheless, the comparatively low correlation ($r = 0.119$) between loyalty and satisfaction suggests that client retention may not always follow from satisfaction alone. According to Milan et al. (2015), additional variables, including perceived value, trust, and switching costs, might modify this association.

These results were further supported by regression analysis. Efficiency was found to be the most significant factor influencing loyalty ($\beta = 1.211, T = 4.400$) and satisfaction ($\beta = 1.838, T = 2.123, p < 0.01$), underscoring the significance of operational performance and website usability in digital banking. Significant benefits were also demonstrated by meeting standards and being accessible, highlighting the significance of dependability, prompt service delivery, and accessibility. Likewise, privacy had a substantial impact on loyalty ($\beta = 0.872, T = 2.520$) and satisfaction ($\beta = 0.924, T = 1.990$), demonstrating that consumer confidence in data security is essential for promoting repeat business and goodwill.

According to the model's explanatory power ($R^2 = 0.358, F = 20.925, \text{ Sig.} = 0.000$), almost 36% of the variation in customer satisfaction can be explained by the four e-service quality factors. Considering how complicated customer behavior is in the digital sphere, this is a significant percentage. It backs with earlier research showing that raising the caliber of e-services can significantly increase customer loyalty and happiness (Sousa and Voss, 2009).

By offering empirical data from the setting of developing nations, the study adds to the expanding corpus of literature on the quality of electronic services. The findings imply that by making investments in effective, safe, and responsive e-banking platforms, Sudanese banks can improve their competitiveness and client connections. However, in order to maintain long-term client commitment, future tactics should also emphasize emotional connection, trust-building, and individualized digital experiences, as contentment does not always equate to loyalty.

5. Conclusion

The study revealed that positive and statistically significant relationships exist between the quality dimensions of electronic services and both customer satisfaction and loyalty. Specifically, efficiency

showed a strong effect on customer satisfaction and loyalty, while fulfilling requirements also had a significant impact on both outcomes. Similarly, the accessibility of the system demonstrated a positive and significant influence on customer satisfaction and loyalty. Privacy was also found to play a crucial role, exerting a significant effect on both customer satisfaction and loyalty. Overall, the findings indicate that customer satisfaction and loyalty improve to a greater extent when the key dimensions of electronic service quality, efficiency, accessibility, privacy, and fulfillment of requirements are effectively provided.

The effects of this study correspond with current literature on developing countries, emphasizing that the enhancement of high-quality electronic service is essential for augmenting purchaser happiness and loyalty in burgeoning banking sectors. Previous research underscores that performance, accessibility, and privacy are essential in contexts where virtual infrastructure and online services are still evolving. Studies in African and Middle Eastern contexts imply that secure, person-pleasant digital structures markedly enhance patron happiness; nonetheless, they do not invariably assure loyalty because of economic volatility and minimal switching prices. The sizable outcomes diagnosed on this have a look at wider geographical developments.

The study's conclusions have a number of significant ramifications for financial sector policymakers and bank management. Customer satisfaction and loyalty are strongly positively correlated with the quality of electronic services, which emphasizes the need for banks to constantly improve their digital service platforms. Banks should place a high priority on user-friendly interface design, quick system responsiveness, and strong cybersecurity measures to foster confidence among online consumers, as efficiency and privacy have been found to be the best indicators of satisfaction and loyalty.

Additionally, the findings show that satisfying client needs and making services easily accessible have a big role in enhancing customer perceptions. This suggests that banks need to make investments in systems that guarantee the prompt delivery of online transactions and provide seamless access to services across several devices. The entire service experience can be improved by improving website navigation, offering real-time assistance, and guaranteeing proper information flow.

The very modest correlation between customer satisfaction and loyalty implies that customer retention requires more than just contentment. Therefore, in order to turn customer happiness into enduring commitment, banks should create relationship management strategies that incorporate personalized communication, loyalty rewards, and after-service engagement.

The findings also highlight the significance of incorporating digital service quality measures into banks' performance evaluation frameworks from a strategic perspective. In order to maintain competitiveness in a banking environment that is

becoming more digital, management can identify areas that require development with the help of ongoing monitoring of customer feedback and technology performance.

Several limitations should be noted, despite the fact that this study offers insightful information about how customer happiness and loyalty are affected by the quality of electronic services in the Sudanese banking industry. Initially, the study used cross-sectional survey data, which record consumer opinions at one particular moment in time. The capacity to demonstrate causal links between customer outcomes and the quality of electronic services is restricted by this architecture. Longitudinal methods could be used in future research to look at how consumer satisfaction and loyalty evolve over time.

Overall, in order to confirm and broaden the findings of this study, future research should strive to use a combination of methodologies, larger samples, and cross-cultural comparisons.

List of abbreviations

A	Accessibility
AI	Artificial intelligence
CL	Customer loyalty
CS	Customer satisfaction
E	Efficiency
E-SQ	Electronic service quality
F	F-statistic
MR	Meet requirements
N	Number
P	Privacy
R	Correlation coefficient
R ²	Coefficient of determination
SD	Standard deviation
Sig.	Significance level
SMA	Simple mean analysis
T	T-statistic
β	Beta coefficient

Compliance with ethical standards

Ethical considerations

This study involved the collection of survey data from bank customers. Participation in the questionnaire was voluntary, and respondents were informed about the purpose of the research before completing the survey. No personal identifying information was collected, and all responses were kept anonymous and used solely for academic research purposes. Participants were assured that their responses would remain confidential. The study complied with the ethical standards for research involving human participants.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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