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Electronic banking services quality and customer loyalty: double mediation

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Abstract

This study explored the impact of e-banking service quality (EBSQ) on customer loyalty (CL) in Sierra Leone's banking sector, using customer satisfaction (CS) and trust as mediating variables. Using a quantitative research approach, structural equation modelling (PLS-SEM), 500 valid responses were collected from e-banking users across the commercial banks in Sierra Leone. The results showed that EBSQ significantly impacts CS, trust and CL. It also shows that CS and trust directly impact CL, emphasising their essential role in building long-term customer relationships. The mediation analysis indicated that CS and trust partially mediated the relationship between EBSQ and CL, suggesting that higher EBSQ indirectly leads to higher CL through greater satisfaction and trust. The study highlights the importance of digital service quality, relational factors in maintaining CL in developing economies. These findings offer valuable insights for banks seeking to optimise e-service strategies, improve digital customer experiences in Sierra Leone's evolving financial landscape.

Keywords Electronic banking service quality, Customer satisfaction, Trust, Customer loyalty, Structural equation model, Sierra Leone

Introduction

The banking industry has changed rapidly worldwide through globalisation and digitalisation, and e-banking is among the key innovations and service-delivery drivers. Electronic channels offer 24/7 availability, low to zero transaction costs, and faster processing of financial transactions [1, 2]. E-banking enables banks to gain a competitive advantage by expanding market coverage, strengthening customer relationships, and improving operational effectiveness. The performance of e-banking hinges on banks' ability to offer high-quality online services that meet customers' needs, instil trust, and foster loyalty [3, 4].

Electronic banking service quality (EBSQ) substantially influences customer satisfaction (CS) and loyalty, with trust acting as a crucial mediator, particularly in high-stakes financial environments [5, 6]. CS and trust mediate the relationship between EBSQ and CL. Amin's [1] evidence from Asian and Middle Eastern studies found that CS strengthened the effect of service quality (SQ) on loyalty in Malaysian banking, while Ariff et al. [4] emphasised the significance of trust in internet banking acceptance. SQ is not directly related to CL, but rather to psychological outcomes such as satisfaction and trust, and to sustaining customer relationships.

The relationship between EBSQ and CL is well investigated in developed and developing countries [1, 2, 4]; nonetheless, there is scant evidence on the joint mediation of CS and trust, and also, there is no evidence of this relationship in Sierra Leone, where the structural problems, such as unreliable internet access, low consumer trust, and low digital literacy, impede the uptake of e-banking. Previous studies have investigated satisfaction or trust as a sole mediating variable [2, 3, 5]. This study

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addresses this gap by examining the separate and joint mediation of CS and trust on the relationship between EBSQ and CL.

The DeLone and McLean Information Systems (IS) Success Model is relevant in this context. The model explains how technology systems enhance organisational performance by six features of information system success that include system quality, information quality, service quality, use, user satisfaction, and net benefits. It estimates that high system, information, and service quality positively impact consumer satisfaction, use, trust, and loyalty in e-banking. Accordingly, this method contributes to evaluating how e-banking systems create consumer value, CS, build trust, and achieve strategic objectives in digital banking contexts.

These limitations underscore the need for research that investigates both mediating effects of satisfaction and trust in the EBSQ relationship. Sierra Leone has 14 commercial banks and 17 community banks that have adopted e-banking systems, which is a significant contribution. The future of digital banking is on the rise, but customer adoption is inconsistent. Therefore, this paper seeks to answer the following three questions: What is the effect of EBSQ on CL? What roles do satisfaction and trust play in the relationship? How do the two factors jointly mediate this relationship? This study applies the PLS-SEM technique to identify factors that stimulate CL in developing economies and encourages government elites to adopt policy guidelines to enhance digital banking services in their various countries.

Literature review

Theoretical framework

DeLone and McLean information systems (is) success model

This model evaluates information system effectiveness by examining system quality, information quality, service quality, and important organisational and behavioural consequences [7]. This is also true for electronic banking, as the user's perceptions and attitudes are significantly affected by their experiences with the system. Attributes of technology, such as usability, reliability, and security, constitute system quality in e-banking [7]. This incorporates ease of navigation, processing speed, stringent security protocols, and e-banking uptime. System quality facilitates human CS, which is key to improving CS. So long as the system is secure and easy to use, customers will adopt it more and trust it. The accuracy, speed, and timeliness of electronic financial data are all concepts related to information quality [7]. This aspect would also involve up-to-the-minute account balance reporting, a transaction record that actually balances, and notice in a timely notice of any activity on the account. When information is reliable and good, customers are happier with the service and trust the system. This trust also strengthens client loyalty by increasing confidence in financial services. SQ involves response to queries, prompt complaint processing, and multimedia support for e-banking users [7]. Great service also helps clients feel that their concerns are being taken seriously, which in turn builds trust and satisfaction. Satisfied and loyal customers lead to the bank when they are served quickly and effectively. Customer satisfaction as an important component of system characteristics and behaviour is also emphasised in the IS Success Model (7). This method treats customer satisfaction as a feeling of reaction to the quality of electronic banking. CS is measured when the overall system, information, and service quality exceed customers' expectations, leading to long-term loyalty [8]. This connection focused on great customer experiences to get customers to stay. For example, trust was not a part of the original IS Success Model but has been included in adaptations and extensions. Trust is when a customer feels that the e-banking system is dependable, secure, and honest. [9] Trust is the basis of e-banking to decrease the risks in online financial transactions. When we trust the financial system as customers, we become more loyal, and the cycle of satisfaction and loyalty begins. The IS Success Model relates features of the system to net benefits [7]. The customer loyalty effect in online banking is a net yield from incremental service usage and consumer referrals. This commitment is derived from both customer satisfaction and faith, factors directly influenced by the quality of the system. This model illustrates that good system characteristics, satisfaction, and trust can foster customer loyalty in electronic banking. Banks need to know more about these attributes in order to grow customer relationships within a digitally competitive market. However, this study used EBSQ as a single variable instead of the IS Success model to assess EBSQ direct impact on CL, CS, and trust. Other researchers have reported inconsistent findings on EBSQ measurements when using various variables [2, 4], with some variables being significant while others are not, making it perplexing to assert that EBSQ directly influences loyalty without a comprehensive assessment. Shanker [2] investigates EBSQ's impact on loyalty and finds that reliability, privacy, and security are significant, whereas online design is not. Consequently, this study adheres to Al-Slehat [5] in evaluating EBSQ. Other researchers have examined trust and customer satisfaction independently in their investigations of EBSQ's influence on CL [2, 5]; thus, this study used both as mediators.

Hypothesis and research model

Impact of electronic banking service quality on customer loyalty

E-service quality includes web design, reliability, responsiveness, privacy, and web customisation [10]. Electronic banking has evolved as a dominant force in industrialised countries due to its ease and cost efficiency, fulfilling the growing customer demand for easily available banking services [11]. Flexible e-banking services can draw a larger user base, consistent with [12] theory of reasoned action. This theory asserts that an individual's intention to behave is affected by their attitude towards the behaviour and subjective norms, which are informed by beliefs regarding the behaviour's outcomes and the perspectives of others.

Marcos and Coelho [17] analysed SQ, CS, and customer value as integral factors influencing loyalty. The study employs a theoretical model and tests it through structural equation modelling. Collecting 744 structured questionnaires from a group of Portuguese people who have car insurance. The results show that while perceived value and satisfaction have a substantial correlation, SQ has a direct relationship with both happiness and perceived value. Perceived value and satisfaction have an impact on loyalty. By differentiating between manned and unstaffed services, Sun and Pan [18] investigated the effects of convenience and SQ on CS and loyalty in self-service fitness centres. The results showed a favourable correlation between the elements of the structural model. This highlights the need of improving SQ while reducing customer effort in loyalty management. Instead of providing actual commodities, banks primarily focus on keeping and engaging consumers, necessitating high SQ, satisfaction, and loyalty [19]. Banks must expand their customer engagement operations beyond physical branches, kiosks, direct mail, and websites to include social media, mobile applications, and location-based services in order to satisfy the rising demands of their customers. In compliance with Saudi banking sector rules, a multi-channel approach that blends online and retail banking can enhance customer pleasure, quality, and loyalty.

H1

EBSQ has a direct positive impact on CL

EBSQ impact on trust

Reliable and secure e-banking allows for safe and responsive online interactions, leading to increased trust of the customer. Suppose the e-banking system has good usability, security, and perceived ease of use. In that case, customers believe that their information is managed in a reliable manner, which tasks will reduce uncertainty in overall perceptions about the organisation, and they consider it efficient and dependable. Empirical work has demonstrated the positivity between perceived EBSQ and trust across different banking sectors [1, 20–22]. In environments like Sierra Leone, where questions of infrastructure dependability and security remain unanswered, high levels of EBSQ are especially important to develop the same level of trust in digital financial channels.

H2

EBSQ has a positive and significant effect on customer trust

EBSQ impact on customer satisfaction

EBSQ has an impact on customer satisfaction by influencing the perceptions of consumers in terms of reliability, security, responsiveness, and easy use. Higher levels of satisfaction are reported when internet banking runs smoothly and is able to fulfil users' expectations [1, 4]. Good services increase customer trust, reduce annoyance, and produce positive encounters that enhance satisfaction [3, 7]. The continuous use of e-banking service is triggered by the satisfaction, which in turn can be achieved when the system ensures stability, accessibility, and information is accurate [1, 23, 24]. Therefore, the reliability and quality of e-banking service are crucial to customer satisfaction and relationship longevity.

H3

EBSQ has a positive and significant effect on customer satisfaction

Customer satisfaction impact on customer loyalty

Customer satisfaction is a post-consumption evaluative judgment of service performance as compared to customer expectations [8]. Satisfaction is generally considered a powerful predictor of loyalty: satisfied customers are more likely to make higher attitudinal commitments and behavioural intentions [3]. The cognitive and affective mechanism underlying this relationship is grounded in satisfaction, strengthening the belief that services have been good in the past and generating positive feelings, which reduce psychological as well as

transaction costs associated with repeated engagement. Findings of online and e-banking studies reveal that higher e-satisfaction results in higher e-loyalty, sometimes mediated by trust or perceived value [1, 4, 23]. Relatively low rate of usage and satisfaction with the internet banking's convenience, transaction speed, and clarity of information can act as an obstacle towards sustainable use among internet users in developing countries like Sierra Leone, where choices differ significantly between customer segments. Thus, customers who exhibit higher satisfaction with their e-banking experience are likely to be more loyal—through repeat purchases, less inclination to switch, and a higher propensity to spread positive word-of-mouth about the bank in Sierra Leone especially when supported by service reliability and perceived security [1, 3, 8].

H4 Customer satisfaction positively influences customer loyalty

Trust impact on customer loyalty

Trust is a fundamental concept of relationships that reduces uncertainty and perceived risk in current exchange relations; it is an essential psychological bridge between good experiences of the past and promises for the future [9]. In e-environments, characterised by impersonal and technology-mediated transactions, trust assumes an even more critical role: customers will be less willing to engage in repeat business or word-of-mouth referrals through any given e-channel service provider if such a customer does not perceive the channel service provider as being trustworthy [25]. Trust not only directly affects the intentions of loyalty but also mediates how service quality and satisfaction influence loyalty, as confirmed in most research on banking [20, 24, 26]. In practice, trust erodes the mental vigilance of customers to future threats and increases reliance on the trusted supplier by maximising service usage from them and transacting more with it. Trust of e-banking systems is probably also essential to retaining customers and inducing them to spread the technology, especially in a drive like this among clients with little access to information, whose infrastructure challenges and fear of fraud can serve to heighten perceived risk. This is because higher trust in the e-channels of a bank would be positively associated with increased customer loyalty, both in terms of attitudes (i.e. preerence, intention to recommend) and behaviours (repeat transactions, account loyalty) for its services [9, 25, 26].

H5 Trust is positively associated with customer loyalty

Mediating effects

Customer satisfaction, e-banking services quality, and customer loyalty

Customer Satisfaction (CS) is an important determinant of SQ and loyalty [27]. Loyalty is influenced by CS levels, which rise after a positive e-banking service experience. Positive customer experiences, such as quick transactions, secure premises, and helpful support staff, increase the likelihood that customers will remain loyal to a bank [3]. A high SQ score for a feature improves CS, which improves CL [28]. Having a positive experience increases the likelihood that a customer would return and perhaps recommend the business to others [28]. Researchers Rezeki et al. [30] examined consumers in Banda Aceh, Indonesia, to determine whether there was a relationship between online satisfaction and loyalty. Higher degrees of e-loyalty and e-satisfaction were associated with superior electronic services, according to the study. Bank consumers are more loyal as a result of their e-satisfaction. Research shows that e-satisfaction mediates the relationship between e-SQ and BSI. According to CL. Khatoon et al. [31], customers' happiness with EBSQ greatly increases their propensity to buy. According to their findings, CS mediates the connection between EBSQ and customers' propensity to buy. According to the results, CS had an effect on the correlation between IT, EBSQ, and consumers' propensity to buy. Chikazhe [32] investigates the factors that mediate and moderate the connection between CS and loyalty. The research involved 308 bank clients from Chinhoyi, Zimbabwe, who completed a standardised questionnaire through a cross-sectional survey. The researchers examined the data using SmartPLS and moderated regression analysis. The Research indicated that customer happiness directly enhances CL. SQ and corporate image were identified as partial moderators of the connection between CS and loyalty. According to Raza and Burney [33], there is a pressing need for SQ assessment. The most significant methods are those that increase CS. CS is an important issue that all firms must consider [34].

H6 CS mediates the relationship between EBSQ and CL

Trust, EBSQ, and customer loyalty

Trust is very important for personal growth and for keeping good relationships between service providers and their clients. Customers are more likely to stay loyal to a bank if they have had a good experience and trust it [35]. So, banks must do everything they can to earn and keep their customers' trust [36]. Customers' ideas of value change all the time; therefore, providers need to be able to adapt to match their needs. Two surveys employing SEM indicated that customers exhibited more

satisfaction and loyalty towards organisations capable of precisely predicting their preferences [37]. The mediation of trust says that even if the service is good, customers might not stay loyal if they don't trust the company. So, banks that want to keep more customers should always put security and openness first. Osman and Sentosa [38] studied the Malaysian tourist industry and found that trust is what makes pleased customers come back. When customers trust a business, they are more likely to stay loyal [39]. Trust leads to loyalty, which is an important part of any customer-service relationship. Stressing the importance of establishing long-term, trusting relationships with clients [25]. Because financial transactions are risky by nature, it is very important to have a trusting connection with clients [26]. In the context of electronic banking, trust serves as another significant mediator. Trustworthiness in service providers encourages customers to form deeper relationships with banks. For banks to maintain and enhance CL, they must demonstrate reliability and commitment to their services [40]. Maintaining a service relationship with a bank, then, is highly dependent on trust [41]. Providing top-notch e-service can significantly boost customer trust, satisfaction, and loyalty.

H7 Trust mediates the relationship between EBSQ and CL

Customer satisfaction, EBSQ, and trust

Customer satisfaction and trust in the banking industry are highly critical. Reliable, responsive, private, and usable online banking interfaces enhance customers' satisfaction and increase the credibility of banks [1]. However, EBSQs that consistently meet or exceed customer expectations will generate emotional and cognitive trust among bank customers [42]. According to Oliver [8], satisfaction theory, the degree of satisfaction is a cognitive antecedent for that trust-level difference. Butt [20] and Haider et al. [21] also discovered that satisfaction mediated the link between EBSQ and customers' trust in the digital financial context. Accordingly, consumer satisfaction results in e-banking trust through judgments of service quality [3, 43].

H8 CS will mediate the association between EBSQ and trust

Trust, customer satisfaction, and customer loyalty

Trust is the key to electronic banking satisfaction and loyalty. Satisfaction reflects clients' satisfaction with the service, while trust is their belief in the bank's trustworthiness and benevolence, respectively, leading to repeat purchase and advocacy. Even the happy customer will not stay loyal before they trust such a service provider [25]. Studies of traditional and Internet banking have found that trust mediates the satisfaction–loyalty relationship [38, 43]. Satisfied e-banking users will generate high trust, which leads to loyalty intentions and usage. Again, [42] explores that satisfied EBSQ users will create significant trust, which increases loyalty intentions and further use. Trust changes satisfaction from an affective to a conative response [9, 23].

H9 Trust mediates the relationship between CS and CL
CS mediates the relationship between EBSQ and CL

Customer satisfaction and trust mediate the relationship between e-banking services and customer loyalty

The combination of CS and trust establishes a strong foundation for improving CL in electronic commerce and banking [44]. The double mediation highlights the importance of simply providing high-quality services. However, simply providing high-quality services is not enough; banks also need to foster a trustworthy environment and ensure elevated CS to enhance overall loyalty, given the markedly negligible correlation between EBSQ and CS. CS is important for building loyalty because happy consumers are more likely to strengthen their links with service providers, which leads to good word-of-mouth recommendations [45]. Horppu et al. [46] assert that two primary elements affecting website loyalty are satisfaction and trust regarding website quality. Their study examines the correlation among loyalty, trust, and online satisfaction, in addition to the impact of the offline parent brand. Sources [39, 47, 48] assert that empirical evidence demonstrates a significant correlation among e-SQ, e-trust, e-satisfaction, and e-loyalty. These elements are interconnected, with e-trust functioning as a partial mediator among diverse e-SQ and e-satisfaction attributes [49]. Alnaim et al. [47] identified direct relationships among e-SQ, e-trust, e-satisfaction, and e-loyalty [47]. They did not, however, endorse the notion that e-trust or e-satisfaction modifies the relationship between e-SQ and e-loyalty. Ghane et al. [48] assert that electronic trust, satisfaction, and SQ exert a direct and substantial influence on electronic loyalty. The indirect advantages are much stronger when e-satisfaction and e-trust are the main mediators.

H10

Both CS and Trust Mediate the relationship between EBSQ and CL

Figure 1 shows the research model of the study.

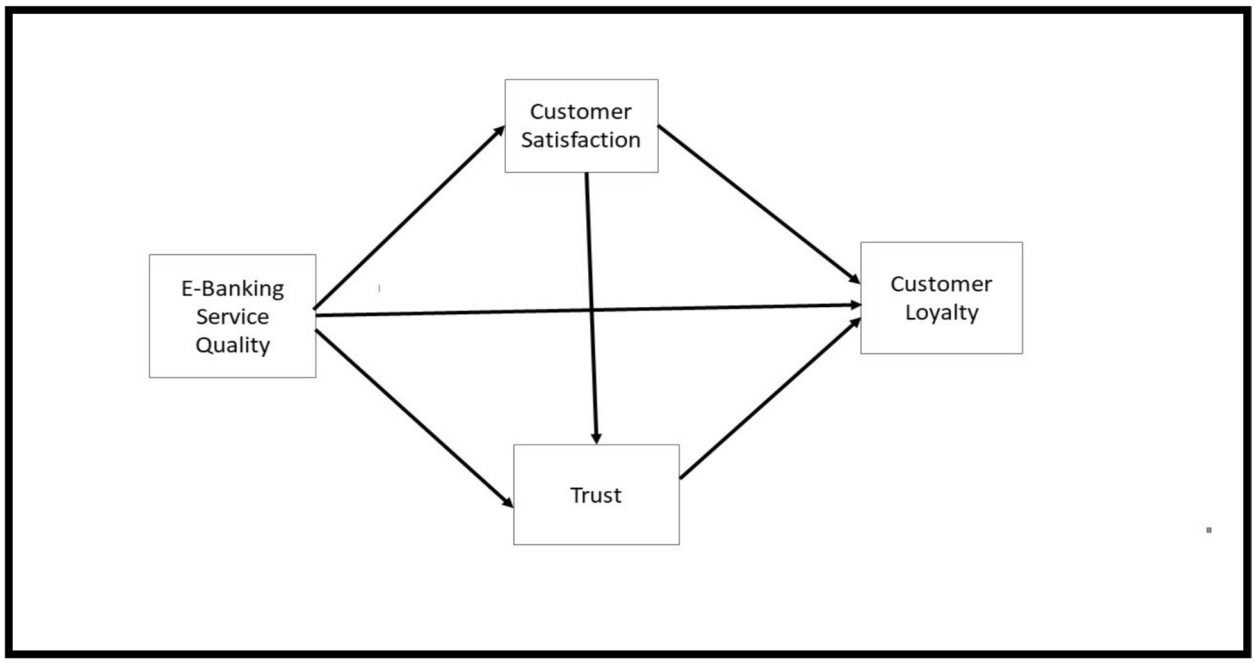

Fig. 1 Research framework

Participants and research design

This study utilised a quantitative research methodology to assess the impact of EBSQ on CL on banks in Sierra Leone. The study analysed the mediating function of CS and trust, as depicted in the conceptual framework. Participants were chosen using convenience sampling. This technique was chosen as it offers a feasible, low-cost means of data collection, especially in resource-constrained countries and challenges in logistics [50, 51]. Convenience sampling was used since only active e-banking users were investigated, and thus only e-banking service users with experience of their use were included [52]. This methodology is also frequently used in previous studies on e-banking, as it facilitates researchers to easily access the data from customers already using online banking [1, 2]. Moreover, convenience sampling is an appropriate sampling technique in exploratory as well as quantitative studies, in which to collect valid data from eligible participants in a short period of time [53].

Sierra Leonean Bank clients were invited to complete the questionnaires if they are internet banking users. The main selection criterion was the current use of the bank's e-banking products. After a brief explanation of the subject of the questionnaire that was going to be given, it was explained the way some questions should be answered was explained with a view to clarifying the task to the participants. In the data collection, 550 participants were asked to complete the survey in 15 min. Upon completion of the data collection, 500 filled questionnaires were returned, and 50 were disregarded due to incomplete responses. The effective response rate was thus 90.9% for the questionnaires that were issued. The limitations of the convenience sampling method are, however, recognised, i.e. potential for sampling bias and poor generalisation of findings to the general population. However, as the study is not generalizable, rather targeted or biased towards this particular segment of the population, which is the customers of e-banking in Sierra Leone, the method is still applicable for the study's aims.

Table 1 Participants' profile

Variable	Item	Frequency	Percentage
Gender	Male	289	57.8
	Female	211	42.2
	Total	500	100
Age	Under 35 years	225	45
	35–45	190	38
	46 and above	85	17
	Total	500	100
Educational Level	High School Diploma	160	32
	Bachelor's Degree	200	40
	Master's Degree	125	25
	Doctorate and above	15	3
	Total	500	100

Participants profile

Table 1 displays the information of the survey participants, revealing 289 males (57.8%) and 211 females (42.2%). The study categorises the age groups into three divisions. Under 35, 35–45, and 46 years and older. The majority of participants were under 35 years old, with a total of 225 participants representing 45% of the sample. The age group 35–45 has a response rate of 190, constituting 38%, while the age group 46 and above comprises 85 respondents, representing 17%. This statistic indicates a youthful population utilising more E-banking products based on our selected sample. The second highest category comprises individuals aged 35–45, and the lowest participant rate was individuals aged 46 and above.

Utilising E-Banking, particularly mobile and internet banking, necessitates minimal education. The research also recorded the educational attainment of the respondents. According to the collected data, 200 participants have a Bachelor's degree, representing 40% of the total. One hundred and sixty respondents obtained a high school diploma, representing 32%. One hundred and twenty-five participants have a master's degree, representing 25%, while those with a PhD or higher are scarce, totaling 15 participants, which accounts for 3% of the response rate.

Measurement tools

A five-point Likert scale was used to measure the parts of the study. There were five levels on the scale: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree). Table 8 lists the indicators for the measures that were utilised in the study. Here is a list of the numerous approaches that people use to measure each construct:

E-Banking service quality

We used five items from the scale created by [16, 54] to grade EBSQ. We utilised phrases like "The e-banking website gives the services that were promised" and "I am happy with how fast and easy e-banking transactions are". Table 2 shows that the convergent validity (CV) analysis proved that the concept was both valid and reliable (R&V). EBSQ's Cronbach's alpha (CA) was 0.757, and its composite reliability (CR) was 0.837. This scale has a lot of R&V.

Customer satisfaction

Customer satisfaction was evaluated using five items from the scale created [3, 55]. We employed statements like "I am happy with my overall e-banking service experience" and "I am satisfied with my bank's online banking transactions". The CV analysis validated the construct's R&V, as indicated in Table 2; the CA for customer satisfaction was 0.800, and the CR was 0.862. This scale exhibits robust R&V.

Table 2 Convergent validity outcomes

Variables	Items	Outer	Rho_A	Composite
LoadingsAlpha	Reliability	AVE	VIF	
E-Banking Service Quality	**0.**757	0**.758**	**0.837**	**0.508**
EBSQ1	0.734	1.263		
EBSQ2	0.732	1.533		
EBSQ3	0.728	1.495		
EBSQ4	0.727	1.425		
EBSQ5	0.727	1.388		
Customer Satisfaction	**0.800**	**0.803**	**0.862**	**0.556**
CS1	.727	1.499		
CS2	0.710	1.444		
CS3	0.750	1.565		
CS4	.782	1.661		
CS5	0.757	1.565		
Customer Trust	**0.751**	**0.768**	**0.833**	**0.502**
Trust1	0.723	1.202		
Trust2	0.744	1.546		
Trust3	0.738	1.551		
Trust4	0.730	1.395		
Trust5	0.758	1.407		
Customer Loyalty	**0.760**	**0.773**	**0.839**	**0.511**
CL1	0.733	1.328		
CL2	0.744	1.286		
CL3	0.732	1.476		
CL4	0.749	1.435		
CL5	0.777	1.499		

Customer trust

Customer Trust was evaluated using five items from the scale created [38]. We employed statements like "I believe that e-banking transactions are secure" and "I trust the e-bank to keep my personal information safe". The CV analysis confirmed the construct's R&V, as shown in Table 2; CA for customer trust was 0.751, and the CR was 0.833. This scale demonstrates strong R&V.

Customer loyalty

Customer Loyalty was evaluated using five items from the scale created [1, 43]. We employed statements like "I would suggest m-banking or e-banking to other people", and "I plan to persist in utilising e-banking". The CV analysis confirmed the construct's validity and reliability, as shown in Table 2; the CA for trust was 0.760, and the composite reliability was 0.839. This scale demonstrates strong R&V.

Results

We used the PLS-SEM for data analysis. Research using both simple and complicated simulations, particularly those involving mediators and moderators, has found the PLS-SEM method helpful [56]. PLS-SEM also allows for easier evaluation of the model's R&V and has a better estimating strategy than CBS-SEM [55, 56]. Before evaluating the inner model, the measurement model must be evaluated in PLS-SEM analysis. The blind method evaluates the accuracy of the model's predictions [55]. According to [57], we used the Standard Root Mean Residual (SRMR < 0.008) and the Normal Fit Index (NFI > 0.80) to evaluate the model's goodness of fit.

Measurement model

The researchers proceeded with the analysis as it aligns with Hair et al. [55], it was asserted that the CA coefficient should exceed 0.70. With construct coefficients ranging from 0.757 to 0.800, the variables for CA, as shown in Table 2, support this claim by showing that all construct values satisfy the given condition, hence validating the precision of the measurements used in our research. All of the study's latent variables are found to be reliable in this examination. Fornell and Larcker [58] assert that the CR must be higher than 0.70 for the model to be right. The CR coefficient values for the construct in Table 2, which range from 0.837 to 0.920, illustrate how trustworthy these evaluations are. In [58], it states that the average extracted variance (AVE) coefficient must exceed 0.50 to evaluate the construct's internal coherence. The test showed that the AVE coefficient was greater than 0.50, which means that our parameters have enough convergent validity and that the model is quite consistent on the inside.

Common methods bias (CMB)

The impact of CMB cannot be entirely disregarded in research. Therefore, before the study data analyses, we used the Harman [59] test to prevent CMB [60]. We employed the VIF coefficient to assess the collinearity among variables in this study. The VIF coefficient should be below 5.0 [58]. The result in Table 2 indicates that CMB is insignificant, as the VIF coefficient values range from 1.202 to 1.661. The results indicated that CMB is not an issue in this study.

Table 3 Discriminant validity

Construct	CL	CS	EBSQ	TRUST
CL	0.715			
CS	0.657	0.746		
EBSQ	0.615	0.715	0.713	
TRUST	0.873	0.641	0.592	0.709

Discriminant validity (DV)

We utilised the Harman modern factor [59] criteria to evaluate the discriminant and convergent validity (D&CV) of the research model [57] proposed that the model variables should exhibit cross-loadings exceeding 0.70, which serves as the criterion for assessing DV. Table 3 illustrates the results pertaining to DV. The cross-loading scores indicate that all variables exceeded 0.70. The parameters indicate that the latent variable exhibited DV across all structures in the analysis.

Heterotrait–Monotrait ratio (HTMT)

The HTM is a further approach for assessing the robustness and multicollinearity of research models, including PLS-SEM. Fornell Lacker [58] posited that DV is established when the HTMT statistical value is below 0.9. The

Table 4 Heterotrait–Monotrait Ratio (HTMT)

Construct	CL	CS	EBSQ	TRUST
CL				
CS	0.846			
EBSQ	0.815	0.812		
TRUST	0.820	0.818	0.781	

Table 5 Combined and cross loadings

	CL	CS	EBSQ	TRUST
CL1	**0.733**	0.482	0.482	0.51
CL2	**0.744**	0.493	0.412	0.506
CL3	**0.732**	0.432	0.456	0.58
CL4	**0.749**	0.457	0.406	0.72
CL5	**0.777**	0.5	0.46	0.751
CS1	0.476	**0.727**	0.474	0.462
CS2	0.423	**0.71**	0.526	0.426
CS3	0.494	**0.75**	0.521	0.482
CS4	0.53	**0.782**	0.581	0.487
CS5	0.52	**0.757**	0.557	0.527
EBSQ1	0.42	0.484	**0.734**	0.413
EBSQ2	0.403	0.465	**0.732**	0.379
EBSQ3	0.424	0.507	**0.728**	0.419
EBSQ4	0.464	0.516	**0.727**	0.438
EBSQ5	0.472	0.563	**0.727**	0.453
TRUST1	0.404	0.342	0.328	**0.733**
TRUST2	0.555	0.487	0.468	**0.744**
TRUST3	0.534	0.445	0.442	**0.738**
TRUST4	0.737	0.466	0.39	**0.73**
TRUST5	0.774	0.508	0.463	**0.758**

HTMT test presented in Table 4 demonstrates compliance with the established guidelines; consequently, the HTMT discriminant level was deemed acceptable in this study, as the values are below 0.9.

Combined loadings and cross loadings (CL&CL)

Table 5 shows the findings for the constructions' CL&CL. Individual constructs have larger item loading values than other constructs, according to the data. As a result, we may infer that each construct in this investigation has a valid CV with respect to item loadings. The structures' CL&CL demonstrate that the possibility of measurement bias has no influence on our research strategy [60].

Model performance and goodness of fit

The forecast's accuracy is represented by the R^2 value [55]. The statistical value of R^2 ranges from 0.19 (poor) to 0.67 (robust) [61]. Based on Table 6, the R^2 value is 0.782, meaning that variables TRUST (0.448) and CS (0.511) may predict 78.2% of the CL variant with a high degree of confidence. According to [62], in order to assess the model fit of PLS-SEM, the SRMR should be 0.08. With an SRMR of 0.073, our results show that the model is sufficiently fit. According to [57], the model satisfies the NFI requirement with an NFI of 0.815. [63] suggested a threshold of 1.87 and 0.530 for the d-ULS and d_G, respectively, and both values were below that. Our study satisfies the saturated model's goodness-of-fit requirements, as shown by these statistics.

Table 6 Model performance and goodness of fit

Variables	R-square	R-square adjusted
CL	0.782	0.78
CS	0.511	0.51
TRUST	0.448	0.446
	Saturated model	Estimated model
SRMR	0.073	0.073
d_ULS	1.431	1.431
d_G	1.991	1.991
NFI	0.512	0.512

Path analysis

The path coefficient results are obtained by evaluating the structural model. This research obtained the PLS-SEM approach's t-statistics and original means (β) using a resampling bootstrap technique. In this study, 5000 bootstrapped samples were used to process the data [55]. Path analysis (p value) for the four main hypotheses falls from 0.000 to 0.05, as illustrated in Table 7 and Fig. 2.

Presentation of hypothesis

Table 7 shows the findings of our direct and mediation path analyses. Before establishing the study's hypothesis, we examine the direct link between EBSQ, CS, and TRUST. EBSQ is positively associated with CL, which confirms H1. The results suggest a weak positive impact of EBSQ on CL ($\beta = 0.093$, $T = 2.189$, $P < 0.05$). Although the t-value of this finding is significant, it indicates that enhancements in EBSQ contribute only marginally to CL. This means that satisfaction or trust tends to be more important in explaining the relationship between EBSQ and CL. H2 is confirmed because EBSQ exerted a significant and positive effect on trust ($\beta = 0.274$, $T = 4.572$, $P < 0.001$), in contrast to loyalty based on the first H1. This is a robust relationship, though it implies that customers who perceive e-banking services to be efficient, reliable, and secure are also more likely to trust their banks. Good-quality e-banking can build trust, which is the foundation for a long-term relationship with customers. The path coefficient is also confirmed in H3, which

Table 7 Direct and mediating effects

Hypothesis		β	T stats	P values	Decision
H1	EBSQ—> CL	0.093	2.189	0.029	Supported
H2	EBSQ- > Trust	0.274	4.572	0.000	Supported
H3	EBSQ—> CS	0.715	25.625	0.000	Supported
H4	CS—> CL	0.113	2.533	0.011	Supported
H5	Trust—> CL	0.745	22.311	0.000	Supported
Mediating Effects					
H6	EBSQ—> CS—> CL	0.081	2.473	0.013	Supported
H7	EBSQ—> Trust—> CL	0.204	4.605	0.000	Supported
H8	EBSQ—> CS—> Trust	0.318	6.532	0.000	Supported
H9	CS—> Trust—> CL	0.332	6.84	0.000	Supported
H10	EBSQ—> CS—> Trust—> CL	0.237	6.368	0.000	Supported

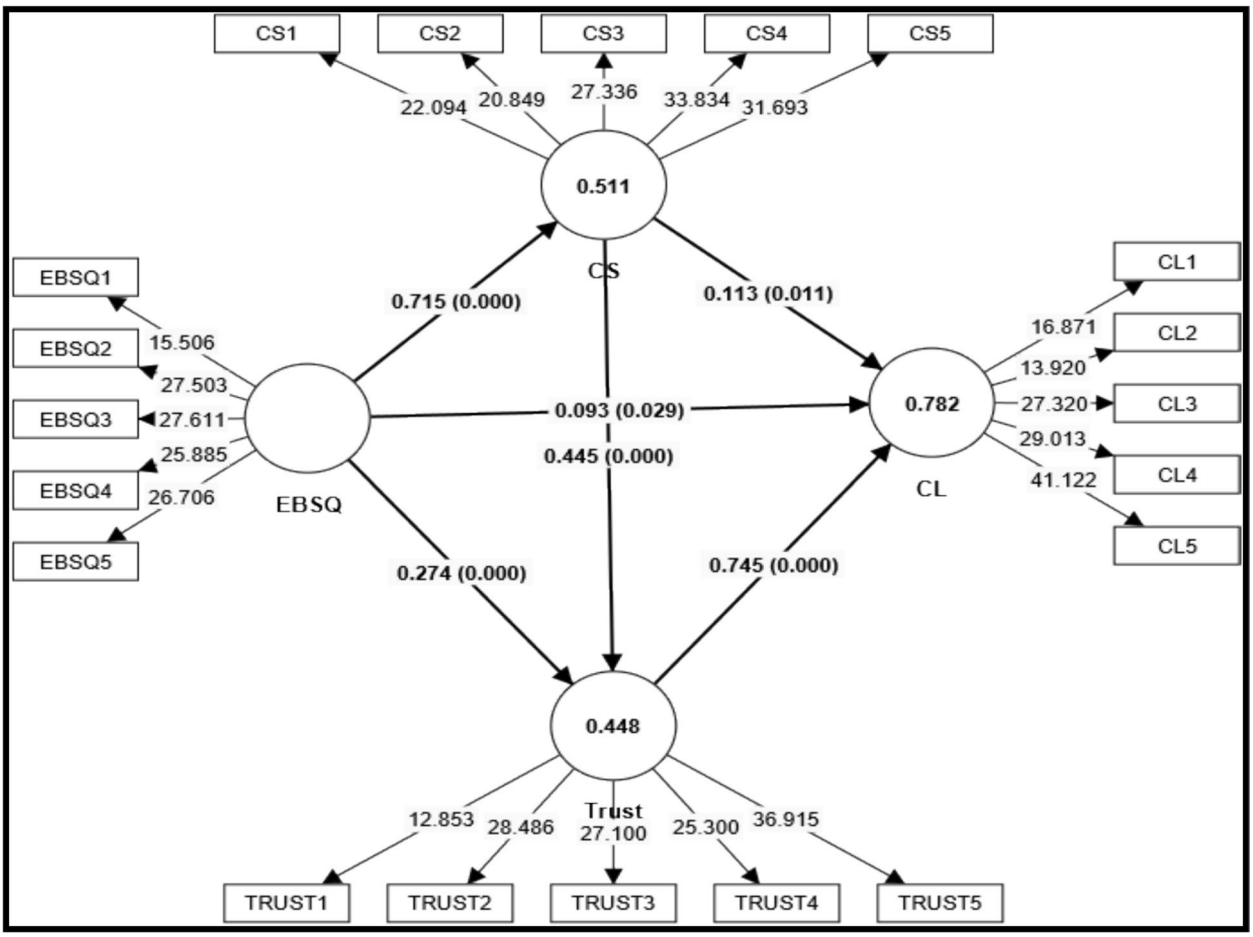

Fig. 2 Structural equation model results

posits that EBSQ has a positive relationship with CS (β = 0.715, T = 25.625, P = 0.000), indicating a substantial relationship between EBSQ and CS. High-quality e-banking services contribute significantly to customer satisfaction. When banks provide convenient, user-friendly, and secure online services, they are more likely to have satisfied customers. This strong, positive relationship suggests that customers' perceptions of e-banking system quality directly influence satisfaction. H4 confirmed the relationship between CS and CL. CS has a positive effect on CL (β = 0.113, T = 2.533, P = 0.011). The association is statistically significant but modest, indicating that satisfaction alone is insufficient to ensure CL without trust or other reinforcing factors. If trust or emotional affinity is low, customers may switch banks even if they are satisfied with online services. In H5, the direct impact of trust on CL is also confirmed, with the highest impact (β = 0.745, T = 22.311, P = 0.000). Trust appears to be the most significant determinant of e-banking loyalty. Customers who trust their bank's e-services—believing that transactions are safe and the institution is dependable—are more loyal. This confirms that trust is a mediating factor in the relationship among service, satisfaction, and loyalty.

Mediation analysis is a useful method for examining the relationship between two variables. We hypothesised, in an intervening model, that mediators (C) will facilitate the link between variable A and the outcome variable B [64]. We employed the PLS-SEM methodology to examine the mediating roles of CS and TRUST in the EBANK–CL relationship, following the contemporary mediation framework outlined in [65]. H6 posits that CS positively mediates the relationship between EBSQ and CL. This hypothesis is confirmed, as it shows a positive, statistically significant effect (β = 0.081, T = 2.473, P = 0.013). This shows that CS is a key driver of loyalty in the banking sector.

Trust mediates EBSQ and CL (β = 0.204, T = 4.605, P = 0.000) confirming H7. Better service quality promotes client trust, which increases loyalty, demonstrating the importance of trust in changing situational conditions into behavioural commitment. H8 confirms that CS strongly mediates the relationship between EBSQ and

trust (β = 0.318, T = 6.532, P = 0.000), indicating that satisfied customers are more inclined to trust their bank's e-services. H9 is confirmed; it shows that trust mediates the relationship between CS and CL (β = 0.332, T = 6.84, P = 0.000). This suggests that satisfaction builds trust and loyalty. The key model for this research centres on H10 (EBSQ → CS → Trust → CL), suggesting that CS and trust jointly mediate the relationship between EBSQ and CL. A significant mediating effect exists (β = 0.237, T = 6.368, P = 0.000). This shows that EBSQ leads to CS, trust, and loyalty.

Discussion

This study proposed a double mediation model to enhance the relationship between EBSQ and CL. The first key hypothesis is about the direct relationship between EBSQ and CL. The findings show that EBSQ has a positive and direct impact on CL. This outcome aligns with previous studies [1, 2]. This shows that individuals who appreciate efficient and intuitive EBSQ are more inclined to utilise the products of the same bank. In a nascent digital banking industry such as Sierra Leone, clients would prioritise reliability as a crucial factor in sustaining long-term relationships. The H2 investigates how EBSQ impacts customers' trust in the banking system. The results show that the quality of e-banking indeed helps people trust the bank and remain with it, as it is very easy and convenient to use. This finding aligns with the findings of Gefen et al. [9] and Shainesh [25]. This finding highlights the importance of system security and privacy in enhancing customer trust in online banking, as the greater transparency, safety, and reliability customers see in e-banking platforms, the stronger their trust will be. Establishing digital trust is key to addressing scepticism towards electronic transactions in emerging economies [6]. The H3 investigates the direct relationship between EBSQ and CS. The finding shows that EBSQ is a substantial predictor of CS. This finding corroborates earlier research done by [1, 4]. This is because CS largely depends on the accuracy, convenience, and user-friendliness of Internet banking interfaces. Increased online SQ, including transaction speed and user-friendliness, correlates with CS. This aligns with the DeLone and McLean information system success model, which highlights service quality as a facilitator of user satisfaction. In the H4, we check for the relationship between CS and CL. It shows that CS positively influenced CL, corroborating the theoretical perspective that satisfaction fosters recurrent purchasing behaviour and support [3, 8]. In the banking sector, similar findings indicate that users are reluctant to switch banks and are more inclined to recommend their banks to friends and family [5, 64]. H5 investigate the relationship between trust and CL. The finding is positive and significant. Trust was identified as a key predictor of CL. Prior research indicates that trust is a critical variable in long-term relationships within online service contexts [26, 31]. When consumers perceive their banks as very reliable, trustworthy, and capable of safeguarding personal data, it conveys a psychological signal that enhances loyalty. Therefore, trust functions as the cognitive and emotional foundation of loyalty in digital banking [43].

The mediating processes clarify the relationship between EBSQ and CL. H6 posits that CS will mediate the relationship between EBSQ and CL. The result shows that CS partially mediates the relationship between EBSQ and CL. This indicates that when banks prioritise customers' individual needs, security, website efficiency, and create a well-structured, user-friendly website, online banking customers will regard the banks' services as superior and experience greater satisfaction, as service performance will align with or surpass their expectations, and ensure their loyalty to the bank. This finding aligns with [16, 66], but does not align with [2]. H7 is also accepted. The finding shows that trust fully mediates the relationship between EBSQ and CL. Customers are more likely to be satisfied and loyal to an e-banking platform when they trust it, thereby increasing the platform's perceived security and reliability. H8 looks at the relationship among EBSQ, CS, and trust. The finding is positive and significant. This means that satisfied customers are more likely to trust their banks. This finding aligns with [26, 38], who showed that satisfaction precedes and reinforces trust. Satisfaction provides customers with consistent positive experiences that reduce uncertainty, forming the cognitive foundation for trust in the banking system.H9 affirms a positive correlation among CS, trust, and CL. This affirms that trust transforms satisfaction into loyalty. This underscores that satisfaction alone does not guarantee repeat usage; trust serves as the conduit between a positive experience and a lasting client connection. H10 asserts that customer satisfaction (CS) and trust collectively mediate the relationship between electronic banking service quality (EBSQ) and customer loyalty (CL) (EBSQ → CS → Trust → CL), with the complete sequential mediation being significant and positive (β = 0.237, t = 6.368, p < 0.001). This demonstrates a chain reaction wherein superior EBSQ enhances contentment; satisfaction cultivates trust; and trust subsequently engenders loyalty. This discovery aligns with the DeLone and McLean [7] model of information systems success, in which system quality, information quality, and service quality affect satisfaction and trust, ultimately influencing user loyalty. Recent research validates this sequential mediation pattern in e-banking across multiple locations [16, 66]

These findings hold practical relevance for banks in Sierra Leone and other developing economies. Digital transformation should encompass not only technical outcomes but also emotional and social ramifications. The quality of customer engagement, data security, and user assistance collectively enhances satisfaction and trust, ultimately fostering loyalty among e-banking users.

Conclusion

This research focused on the relationships among E-banking Service Quality (EBSQ), Customer Satisfaction (CS), Trust, and Customer Loyalty (CL) in digital banking. Customer satisfaction, trust, and loyalty are directly influenced by EBSQ, suggesting that the quality of online banking services is a critical element in customer relationship management. The strongest direct path was from EBSQ to customer satisfaction, suggesting that when customers perceive e-banking platforms as reliable, secure, and user-friendly, they experience higher satisfaction levels.

CS and trust also served as important mediators between EBSQ and trust. Satisfaction in the short run shapes emotions about service performance, and trust in the long-term shapes relationships. The serial mediation channels indicate that CS and trust each cause the other to transform perceived SQ into long-term loyalty. For digital banking, trust was a robust predictor with longer-term implications for customer relationships. These findings provide empirical evidence of the IS success model, indicating that EBSQ significantly enhances loyalty indirectly through satisfaction and trust. This study highlights important relationships in the digital service quality–loyalty paradigm. In effect, banks particularly in developing countries such as Sierra Leone will need to focus on reliability, trustworthiness, responsiveness, and ease of use, among many other factors, to enhance satisfaction levels, build confidence, and drive client retention and referrals. Overall, this research reveals that better EBSQ enhances CS, trust, and CL. If banks in developing markets can improve digital service quality and instill trust, they can drive greater competition, long-term engagement, and financial inclusion.

Implications

The study's findings have key implications for both theory and practice in the banking system in Sierra Leone and in developing countries. This study has contributed to how EBSQ influences CS, trust, and ultimately CL. It offered a comprehensive model that highlights how EBSQ directly affects CS, trust, and loyalty, and also the mediating roles of CS and trust on the relationship between EBSQ and CL. Earlier research often focused on a single mediating role or on the direct interaction between EBSQ and CL. This research advances the academic literature by demonstrating that, while each variable (CS and TRUST) independently mediates the relationship between EBSQ and CL, their combined effect is more significant than focusing on either alone. Consequently, banks must provide EBSQ services to meet customer needs and foster trust in their systems, enhancing CL. This research also holds significance for executive management across all commercial banks in Sierra Leone, particularly in the operations department, including the IT department, customer services, cashiers, and related areas. Firstly, managers should prioritise the functionality of their e-banking products and services, as it significantly influences satisfaction, trust, and loyalty. Secondly, customer satisfaction must be prioritised by all personnel in the banking sector, as a satisfied consumer will invariably exhibit loyalty to the bank. Third, trust is a crucial component in all facets of business, particularly in the banking industry; hence, managers must establish a system that assures customers funds are secured. Ultimately, prioritising customer satisfaction and trust is essential, as it fosters greater CL.

Limitations and suggestions for future research

This research only gathered data from banking customers in Freetown, the capital of Sierra Leone. Hence, the findings might not be generalised to rural or less developed areas having a lower level of digital penetration and infrastructure. It is recommended that future research may also include customers from other cities and rural areas, and with a larger sample size for greater generalisability. Another drawback is that the effect of EBSQ is considered as the only independent factor, whilst CS and trust are mediated. Important as they are, figures are not the only considerations when it comes to loyalty. Future research may include other determinants, such as switching costs, perceived security, and financial literacy, as well as moderating variables, such as income and digital literacy, to provide a more comprehensive understanding.

Appendix

See Table.

Table 8 Measurement indicators

Indicators	Items	Descriptions
E-Banking Service Quality	EBSQ1	The e-banking website delivers the services that were promised
	EBSQ2	I am pleased with the speed and efficiency of e-banking transactions
	EBSQ3	I feel that my personal needs are met when using the E-banking platforms
	EBSQ4	Using e-banking, I can retrieve the transaction details on my account at any time
	EBSQ5	I can easily use my e-banking platforms at any time and everywhere
Customer Satisfaction	CS1	I am satisfied with my bank's online banking transactions
	CS2	I am happy with my overall e-banking service experience
	CS3	I am impressed with this bank's online services
	CS4	I think I made the correct decision to use e-banking
	CS5	on all of your experience, how satisfied overall are you
Customer Trust	Trust1	I believe that e-banking transactions are secure
	Trust2	I trust the e-bank to keep my personal information safe
	Trust3	trust that the administrators of the e-bank will not misuse my personal information
	Trust4	The services provided by this bank are trustworthy
	Trust5	My bank has good credit and popularity from the customer's view
Customer Loyalty	CL1	I would suggest my e-banking to other people
	CL2	I plan to persist in utilising e-banking
	CL3	I prefer the e-banking of this bank over other banks
	CL4	I encourage friends and family to use e-bank
	CL5	intend to continue the e-banking of this bank

Author contribution
AKK and FSB contributed to the introductory section, wrote the theoretical framework, developed the hypothesis, and contributed to the methodology. AKK and FSB contributed to the demographic presentation of the data, presented the findings, and discussed the findings and the implications of the study. All authors have read and agreed to the published version of the manuscript.

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Declarations

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