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Loyalty through Convenience: The Role of AI-Powered Personalisation in Fostering Customer Loyalty in Digital Banking

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Abstract

Customer loyalty is a critical determinant of sustainable growth in the increasingly competitive digital banking sector, driven by the rise of AI-powered personalisation. This study examines the influence of perceived usefulness, perceived ease of use, and service quality on customer loyalty, with customer experience as a mediating variable. The research aims to provide a holistic understanding of how functional and experiential factors collectively foster loyalty, addressing gaps in existing literature that often prioritise technological adoption over experiential outcomes. Data were collected via electronically distributed survey questionnaires, employing a purposive sampling technique due to the absence of a complete sampling frame. After distribution, 381 clean responses were retained for analysis from 501 distributed surveys, yielding a response rate of 79.6%. The data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) via SmartPLS 4, which allowed for simultaneous assessment of the measurement and structural models. All 11 hypotheses were supported, confirming significant direct and indirect effects. Perceived ease of use positively influenced perceived usefulness and customer experience, while service quality emerged as the strongest predictor of loyalty. Customer experience significantly mediated the relationships between the independent variables and loyalty. The study offers practical implications for digital banks to enhance user interfaces, personalise services, and improve service reliability to foster loyalty. Theoretical contributions include the integration of the

Technology Acceptance Model and SERVQUAL theory within an AI-enabled banking context. Future research should incorporate variables like trust and privacy concerns, explore cross-cultural contexts, and employ longitudinal designs to deepen understanding of loyalty dynamics. This study underscores the necessity of balancing technological innovation with experiential excellence to achieve long-term customer loyalty.
Keywords: Perceived Ease Of Use, Perceived Usefulness, Service Quality, Customer Experience, Customer Loyalty

Introduction

In the increasingly competitive digital banking sector, customer loyalty has become a critical determinant of sustainable growth (Aripin, 2025; Zaman et al., 2025). AI-powered personalisation is revolutionising how banks interact with customers by delivering tailored financial products, proactive advice, and customised user experiences (Siddquee, 2025; Akin & Yetgin, 2025). By leveraging machine learning algorithms and vast datasets, banks can anticipate customer needs, reduce decision-making friction, and create highly relevant engagement strategies (Christy & Lisana, 2025). This enhances customer satisfaction, strengthens emotional connections, and fosters long-term loyalty, directly impacting customer lifetime value and retention rates (Julika et al., 2024; Arora & Banerji, 2024). Globally, digital banks are integrating AI to offer hyper-personalised services such as dynamic pricing, predictive financial wellness insights, and context-aware notifications (Wakhidah et al., 2025). Trends include the use of chatbots for personalised support, AI-driven investment recommendations, and behavioural biometrics for seamless authentication (Lolemo & Pandya, 2024). However, issues persist regarding data privacy, algorithmic transparency, and ethical concerns (Maskur et al., 2025). Many customers remain sceptical about how their data is used, and inconsistent personalisation can lead to frustration rather than loyalty (Haghighinasab et al., 2025). Additionally, there is significant divergence in adoption rates between tech-savvy markets like East Asia and more cautious regions like Europe (Christy & Lisana, 2025). Despite the proliferation of AI in banking, significant research gaps remain (Aripin, 2025). Most studies focus on technological implementation rather than the psychological and behavioural mechanisms linking personalisation to loyalty (Lolemo & Pandya, 2024). There is limited understanding of how perceived usefulness, ease of use, and service quality collectively shape customer experience in AI-driven interactions (Maskur et al., 2025; Arora & Banerji, 2024). Moreover, the role of trust as a mediating variable is underexplored, particularly in contexts where data sensitivity is high (Haghighinasab et al., 2025). Existing research also lacks integrated theoretical frameworks that combine technology acceptance models with service quality paradigms (Arora & Banerji, 2024; Wakhidah et al., 2025). Many digital banks invest heavily in AI technologies but fail to achieve corresponding gains in customer loyalty (Akin & Yetgin, 2025; Zaman et al., 2025). This disconnect often arises because personalisation efforts are perceived as intrusive, inaccurate, or lacking in human touch (Julika et al., 2024). Without a nuanced understanding of how AI attributes influence customer experience and trust, banks struggle to design implementations that resonate deeply with users (Siddquee, 2025). The problem is exacerbated by insufficient knowledge of the mediating factors that translate algorithmic efficiency into emotional loyalty (Aripin, 2025; Christy & Lisana, 2025). This study holds substantial significance for multiple stakeholders. For policymakers, it offers insights into designing regulations that balance innovation with consumer protection, ensuring ethical AI use (Siddquee, 2025). The digital banking sector can leverage the findings to develop AI strategies that prioritise

customer experience over purely transactional efficiency (Akin & Yetgin, 2025; Wakhidah et al., 2025). Digital banks will benefit from evidence-based guidance on allocating resources toward features that enhance loyalty, such as transparent algorithms and user-controlled personalisation (Maskur et al., 2025). Finally, customers stand to gain from improved services that are not only smart but also respectful, secure, and genuinely valuable to their financial lives (Haghighinasab et al., 2025; Zaman et al., 2025). By bridging theory and practice, this research contributes to a more sustainable and customer-centric future for digital banking (Arora & Banerji, 2024; Lolemo & Pandya, 2024). This study aims to assess the indirect and direct influence of perceived usefulness, perceived ease of use, and service quality on customer loyalty, with the customer experience as a mediator on the role of artificial intelligence-powered personalisation.

Literature Review

Underpinning Theory

This study is theoretically anchored in the integrated framework of the Technology Acceptance Model (TAM) and Service Quality (SERVQUAL) theory. This synthesis provides a robust, dual-perspective foundation for analysing the mechanisms through which AI-powered personalisation influences customer loyalty. TAM (Davis, 1989) offers the core technology adoption rationale, establishing that Perceived Ease of Use is a key driver of Perceived Usefulness, and that both constructs are fundamental antecedents to positive user behaviour. SERVQUAL theory (Parasuraman et al., 1988) crucially complements this by introducing the indispensable dimension of service quality, ensuring the model evaluates not just the system's utility but also the reliability and excellence of the AI-delivered service output. The proposed research model synthesises these theories by positing that the system's characteristics, as defined by TAM and its service quality from SERVQUAL, are not direct drivers of loyalty. Instead, they function as primary exogenous variables that collectively shape the customer's holistic journey. It is hypothesised that a useful, easy-to-use, and high-quality AI personalisation system is a prerequisite for creating a superior, seamless, and valuable customer experience. This positive experience, born from the fusion of technological efficacy and service excellence, is the central mechanism that translates functional attributes into an emotional connection. Consequently, it is this mediated pathway through Customer Experience that ultimately cements the attitudinal attachment and behavioural intentions that constitute profound, sustainable customer loyalty. This integrated approach thus offers a more nuanced understanding than either theory could provide alone.

Relationship between Perceived Ease of Use and Perceived Usefulness

In the banking sector, the relationship between Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) is foundational to technology adoption, as delineated by Davis's (1989) Technology Acceptance Model (TAM) and reinforced by contemporary studies (Sikarwar et al., 2025; Anwar et al., 2024). PEOU, the degree to which customers believe using a digital banking service is free of effort, directly enhances PU, which is the belief that the service will improve their banking performance (Latreche et al., 2024; Hussain et al., 2025). When mobile apps or online platforms are intuitive, easy to navigate, and require minimal mental effort, customers are more likely to perceive them as useful tools that save time, simplify transactions, and enhance financial management (Sikarwar et al., 2025; Abdul Razak et al., 2025). This relationship is particularly critical in banking, where complex tasks, such as transferring funds or applying for loans, can be daunting; a seamless user experience reduces

cognitive load, thereby increasing the perceived utility of the service (Alshammari & Babu, 2025; Anwar et al., 2024). Furthermore, PEOU often acts as an antecedent to PU, meaning that ease of use not only directly influences adoption intentions but also does so indirectly by strengthening the perception of usefulness (Hussain et al., 2025; Latreche et al., 2024). Consequently, banks that prioritise user-friendly design and effortless interactions in their digital offerings can significantly boost customers' perceptions of both ease and value, driving overall engagement and loyalty (Sikarwar et al., 2025; Anwar et al., 2024). *Therefore, the following hypotheses were proposed for this study:*
H1: There is a relationship between perceived ease of use & perceived usefulness Towards customer loyalty in digital banking.

Relationship between Perceived Ease of Use, Customer Experience & Customer Loyalty
In the banking sector, the relationship between Perceived Ease of Use (PEOU) and customer loyalty is significantly mediated by customer experience, forming a critical pathway to sustained engagement (Arora & Banerji, 2024; Mokha & Kumar, 2024). When digital banking platforms, such as mobile apps or online services, are intuitive and effortless to navigate (high PEOU), customers encounter reduced friction in completing transactions, managing accounts, or accessing services (Velika & Adnas, 2025; Kumar et al., 2024). This seamless interaction directly enhances the overall customer experience, fostering feelings of competence, satisfaction, and emotional connection with the bank (Talha et al., 2024; Arora & Banerji, 2024). A positive customer experience, characterised by convenience, efficiency, and reduced effort, subsequently cultivates deeper trust and emotional loyalty, transforming transient users into committed advocates (Mokha & Kumar, 2024; Velika & Kebah et al., 2019). Rather than directly influencing loyalty, PEOU operates primarily through this experiential mediator: ease of use improves the user's journey, which in turn strengthens attitudinal and behavioural loyalty (Kumar et al., 2024; Talha et al., 2024). Banks that prioritise user-friendly design and streamlined processes not only elevate immediate usability but also enrich the cumulative customer experience, thereby bridging the gap between functional ease and long-term relational outcomes such as retention, advocacy, and sustained usage (Arora & Banerji, 2024; Mokha & Kumar, 2024; Kebah et al., 2019). This mediated relationship underscores the importance of investing in intuitive digital interfaces as a foundational strategy for building enduring customer loyalty in a competitive financial landscape (Velika & Adnas, 2025; Kumar et al., 2024). *Hence, the following hypotheses were proposed for this study:*

H2: There is a relationship between perceived ease of use & customer experience towards customer loyalty in digital banking.
H3: There is a relationship between perceived ease of use & customer loyalty in digital banking
H4: There is a mediating effect of customer experience on the relationship between perceived ease of use & customer loyalty in digital banking.

Relationship between Perceived Usefulness, Customer Experience & Customer Loyalty
The relationship between Perceived Usefulness (PU) and customer loyalty in the banking sector is profoundly shaped by the mediating role of customer experience, creating a vital indirect pathway to sustained engagement (Haroon-ur-Rasheed et al., 2024; Maskur et al., 2025). When customers perceive digital banking services, such as AI-driven financial insights, personalised product recommendations, or automated savings tools, as genuinely useful in

enhancing their financial efficiency and decision-making, this perception significantly elevates their overall experience (Talha et al., 2024; Dağaşaner & Karaatmaca, 2025; Osman et al., 2025). A service deemed useful not only fulfils functional needs but also enriches the customer journey by delivering value, relevance, and a sense of empowerment, thereby fostering emotional satisfaction and trust (Maskur et al., 2025; Velika & Adnas, 2025; Mohamad et al., 2024). This enhanced customer experience, characterised by perceived competence and personalised value, becomes the primary driver of loyalty, translating utilitarian benefits into long-term relational outcomes such as retention, advocacy, and continued usage (Haroon-ur-Rasheed et al., 2024; Talha et al., 2024). Rather than directly influencing loyalty, PU operates through this experiential mediator: usefulness amplifies perceived value and satisfaction during interactions, which in turn solidifies emotional and behavioural commitment to the bank (Dağaşaner & Karaatmaca, 2025; Velika & Adnas, 2025). Thus, banks that strategically design digital services to be highly useful not only meet immediate customer needs but also craft memorable experiences that build enduring loyalty in a competitive landscape (Maskur et al., 2025; Haroon-ur-Rasheed et al., 2024). *Thus, the following hypotheses were proposed for this study:*

H5: There is a relationship between perceived usefulness & customer experience towards customer loyalty in digital banking.
H6: There is a relationship between perceived usefulness & customer loyalty in digital banking.
H7: There is a mediating effect of customer experience on the relationship between perceived usefulness & customer loyalty in digital banking.

Relationship between Service Quality, Customer Experience & Customer Loyalty

The relationship between service quality and customer loyalty in the banking sector is fundamentally mediated by customer experience, creating a crucial pathway from operational excellence to relational outcomes (Ibrahim, 2025; Laili & Hasan, 2024). When banks deliver high-quality service, characterised by reliability, responsiveness, assurance, and empathy in their digital and physical interactions, this excellence directly shapes the customer's holistic journey (Sultan et al., 2024; Walpola & Gunawardana, 2025). Superior service quality, manifested through accurate transactions, prompt query resolutions, and secure, empathetic engagements, enriches the customer experience by fostering trust, satisfaction, and emotional connection (Arora & Banerji, 2024; Ibrahim, 2025; Mohamad et al., 2023). This enhanced experience, rather than service quality alone, becomes the primary driver of loyalty, transforming functional service attributes into enduring emotional bonds and behavioural commitment (Laili & Hasan, 2024; Sultan et al., 2024). Customers who experience consistent, high-quality service within a seamless and engaging environment are more likely to develop strong loyalty, demonstrated through retention, advocacy, and increased patronage (Abdul Razak et al., 2025; Arora & Banerji, 2024). Thus, service quality operates indirectly through customer experience: excellent service elevates the perceived value and emotional resonance of interactions, which in turn solidifies long-term loyalty (Ibrahim, 2025; Laili & Hasan, 2024). For banks, investing in comprehensive service quality is not merely operational but strategic, as it crafts memorable experiences that sustain competitive advantage and customer devotion in a dynamic financial landscape (Sultan et al., 2024; Walpola & Gunawardana, 2025). *Hence, the following hypotheses were proposed for this study*

H8: There is a relationship between service quality & customer experience towards customer loyalty in digital banking.

H9: There is a relationship between service quality & customer loyalty in digital banking.

H10: There is a relationship between customer experience & customer loyalty in digital banking.

H11: There is a mediating effect of customer experience on the relationship between service quality & customer loyalty in digital banking.

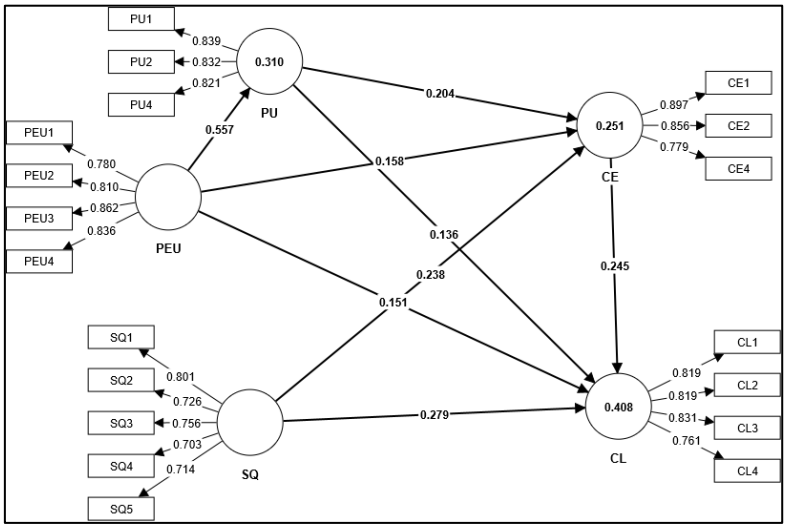

Figure 1: Research Model

Notes: PU=Perceived Usefulness PEU=Perceived Ease of Use SQ=Service Quality CE=Customer Experience CL=Customer Loyalty

Methodology

This study examined the direct effects of perceived usefulness, perceived ease of use, and service quality on customer loyalty, with customer experience acting as a mediating variable, within a sample of commercial bank customers. A survey instrument was developed to measure these constructs using items adapted from validated scales to enhance measurement reliability. Due to the lack of a comprehensive sampling frame, a purposive sampling approach was adopted, and questionnaires were administered electronically via email. The measurement model included 19 observed variables: perceived usefulness (3 items; Davis, 1989), perceived ease of use (4 items; Davis, 1989), service quality (5 items; Parasuraman et al., 1988), customer experience (3 items; Klaus & Maklan, 2013), and customer loyalty (4 items; Zeithaml et al., 1996). All constructs were rated on a 5-point Likert scale ranging from strongly disagree to strongly agree. Out of 501 questionnaires distributed, 399 were returned, yielding a response rate of 79.6%, which is considered sufficient for structural equation modelling (SEM). After removing incomplete responses, 381 usable surveys were retained for analysis. The data were analysed using SmartPLS 4 (Ringle et al., 2022), allowing for a comprehensive evaluation of both the measurement and structural models and facilitating robust hypothesis testing within a multivariate analytical framework.

Data Analysis

Respondents' Profiles

The demographic profile of the 381 survey respondents reveals a well-distributed yet distinct sample composition: gender representation is nearly equal, with males comprising 51.7% (197 individuals) and females 48.3% (184 individuals). The cohort is predominantly young and middle-aged, with 49.6% (189 respondents) aged 21-40 years and 42.5% (162 respondents) aged 41-60 years, while the below-20 and above-60 groups each represent only 3.9% (15 respondents). Marital status skews heavily toward single individuals, who constitute 69.3% (264 respondents), compared to 30.4% married (116 respondents) and a minimal 0.3% divorced (1 respondent). Education levels indicate a moderately high attainment, with 54.6% (208 respondents) holding college qualifications and 31.8% (121 respondents) university degrees, while 13.6% (52 respondents) completed secondary school. Income distribution highlights a concentration in lower brackets, as 52.2% (199 respondents) earn RM1000 or below monthly, 31.8% (121 respondents) earn RM1001–RM5000, and 16.0% (61 respondents) fall into the RM5001–RM10000 range, underscoring a sample characterised by younger, single, educated, and lower-to-middle-income demographics.

Common Method Bias

Based on the full collinearity variance inflation factor (VIF) values presented in Table 1, common method bias (CMB) does not appear to be a significant concern in this study, as recommended by Kock & Lynn (2012) and Kock (2015). All calculated VIF values are well below the conservative threshold of 3.3 proposed by Kock (2015) for detecting latent variable collinearity indicative of CMB. The highest VIF value recorded is 2.246 (Perceived Ease of Use → Customer Loyalty), while the majority of values cluster between 1.291 and 2.216. These consistently low VIF scores across all variable relationships, including Perceived Usefulness (max VIF 1.924), Service Quality (max VIF 2.015), and Customer Experience (max VIF 1.389), suggest that the constructs are statistically distinct and that the model is free from substantial bias introduced by the measurement approach. This supports the validity of the collected data and the robustness of the subsequent structural model analysis.

Table 1
Full Collinearity (VIF)

	CL	PU	PEU	SQ	CL
CL		1.611	1.605	1.535	1.512
PU	1.687		1.459	1.694	1.675
PEU	2.216	1.924		1.805	2.246
SQ	1.912	2.015	1.628		2.006
CE	1.291	1.366	1.389	1.376	

Notes: PU=Perceived Usefulness PEU=Perceived Ease of Use SQ=Service Quality CE=Customer Experience CL=Customer Loyalty

Measurement Model

Based on the construct reliability and validity metrics presented in Table 2, the measurement model demonstrates strong internal consistency and convergent validity, adhering to the thresholds recommended by Hair et al. (2019). All constructs exhibit Cronbach's Alpha (CA) and Composite Reliability (CR) values exceeding the minimum threshold of 0.7, confirming high internal consistency; for instance, Perceived Ease of Use (CA=0.841, CR=0.857) and

Customer Loyalty (CA=0.824, CR=0.832) show particularly robust reliability. Convergent validity is established as all item loadings are above 0.7, with most exceeding 0.75 (e.g., CE1=0.897, PU1=0.839), and all Average Variance Extracted (AVE) values surpass the critical benchmark of 0.5, indicating that each construct explains more than half of the variance in its indicators. Although Service Quality has the lowest AVE (0.549), it remains acceptable as it exceeds 0.5, and its CR (0.794) and item loadings (all >0.7) affirm its reliability and validity. The results collectively confirm that the constructs are empirically distinct, internally consistent, and accurately measured, providing a solid foundation for subsequent structural model analysis and hypothesis testing. The Heterotrait-Monotrait (HTMT) ratios, as presented in Table 3, confirm discriminant validity for all constructs in accordance with the conservative threshold of 0.85 recommended by Henseler et al. (2015). All recorded values are substantially below this limit, with the highest ratio being 0.807 between Service Quality (SQ) and Perceived Ease of Use (PEU), indicating that the constructs are empirically distinct and measure unique phenomena.

Table 2
Construct Reliability & Validity and Item Loadings

Constructs	Items	Loadings	CA	CR	AVE
Customer Experience	CE1	0.897	0.799	0.810	0.714
	CE2	0.856			
	CE4	0.779			
Customer Loyalty	CL1	0.819	0.824	0.832	0.653
	CL2	0.819			
	CL3	0.831			
	CL4	0.761			
Perceived Ease of Use	PEU1	0.780	0.841	0.857	0.677
	PEU2	0.810			
	PEU3	0.862			
	PEU4	0.836			
Perceived Usefulness	PU1	0.839	0.776	0.779	0.690
	PU2	0.832			
	PU4	0.821			
Service Quality	SQ1	0.801	0.794	0.794	0.549
	SQ2	0.726			
	SQ3	0.756			
	SQ4	0.703			
	SQ5	0.714			

Notes: CA=Cronbach's Alpha CR=Composite Reliability AVE=Average Variance Extracted

Table 3
Heterotrait-Monotrait (HTMT) Ratios

	CE	CL	PEU	PU
CL	0.593			
PEU	0.52	0.601		
PU	0.498	0.534	0.673	
SQ	0.536	0.657	0.807	0.53

Structural Model

Employing the methodological approach outlined by Hair et al. (2017), this study assessed the structural model by simultaneously examining path coefficients (β) and R-squared (R^2) values. Using Partial Least Squares (PLS) methodology, a bootstrap resampling technique with 5,000 iterations was applied to evaluate the statistical significance of the paths. As detailed in Table 4, the hypothesis testing results, including beta coefficients, t-statistics, p-values, and confidence intervals, collectively demonstrate the strength, direction, and statistical significance of the hypothesised relationships. This systematic analytical approach not only validates the substantive links between constructs but also reinforces the overall robustness and explanatory adequacy of the theoretical model. Based on the hypothesis testing results, all 11 hypotheses are statistically supported, confirming the proposed relationships in the research model. *H1* is accepted, demonstrating a strong, significant positive effect of Perceived Ease of Use (PEU) on Perceived Usefulness (PU) (β = 0.557, t = 14.447, p = 0.000). *H2* is accepted, showing PEU has a significant direct influence on Customer Experience (CE) (β = 0.158, t = 2.015, p = 0.044). *H3* is accepted, confirming PEU's direct effect on Customer Loyalty (CL) (β = 0.151, t = 2.314, p = 0.021). *H4*, testing the mediation of CE between PEU and CL, is accepted (β = 0.039, t = 1.961, p = 0.049). *H5* is accepted, indicating Perceived Usefulness (PU) significantly enhances CE (β = 0.204, t = 3.382, p = 0.001). *H6* is accepted, confirming PU's direct effect on CL (β = 0.136, t = 2.578, p = 0.010). *H7*, examining CE's mediation between PU and CL, is accepted (β = 0.050, t = 2.824, p = 0.005). *H8* is accepted, demonstrating that Service Quality (SQ) significantly improves CE (β = 0.238, t = 3.425, p = 0.001). *H9* is accepted, affirming SQ's strong direct impact on CL (β = 0.279, t = 4.226, p = 0.000). *H10* is accepted, establishing CE as a key direct driver of CL (β = 0.245, t = 4.398, p = 0.000). Finally, *H11* is accepted, validating the mediating role of CE between SQ and CL (β = 0.058, t = 2.328, p = 0.020). All decisions are based on t-statistics > 1.96 and p-values < 0.05.

Table 4
Hypothesis Testing Results

Hypotheses	Beta	T-statistics	P-values	2.50%	97.50%	Decision
H1: PEU -> PU	0.557	14.447	0.000	0.474	0.627	*Accepted*
H2: PEU -> CE	0.158	2.015	0.044	0.000	0.312	*Accepted*
H3: PEU -> CL	0.151	2.314	0.021	0.025	0.282	*Accepted*
H4: PEU -> CE -> CL	0.039	1.961	0.049	0.003	0.085	*Accepted*
H5: PU -> CE	0.204	3.382	0.001	0.082	0.321	*Accepted*
H6: PU -> CL	0.136	2.578	0.010	0.033	0.240	*Accepted*
H7: PU -> CE -> CL	0.050	2.824	0.005	0.020	0.090	*Accepted*
H8: SQ -> CE	0.238	3.425	0.001	0.094	0.365	*Accepted*
H9: SQ -> CL	0.279	4.226	0.000	0.145	0.403	*Accepted*
H10: CE -> CL	0.245	4.398	0.000	0.130	0.351	*Accepted*
H11: SQ -> CE -> CL	0.058	2.328	0.020	0.017	0.115	*Accepted*

Note: Significance <0.05

Effect Sizes (f^2)

The effect sizes (f^2) in Table 5, interpreted using Cohen's (1992) guidelines, indicate that Perceived Ease of Use (PEU) has a large effect on Perceived Usefulness (PU) (f^2 = 0.45). Service Quality (SQ) and Customer Experience (CE) show small effects on CE (f^2 = 0.042) and Customer Loyalty (CL) (f^2 = 0.069), respectively. All other relationships, such as PEU on CE (f^2 = 0.015)

and CL (f^2 = 0.018), demonstrate negligible to small effects, suggesting limited practical influence despite statistical significance.

Table 5
Effect Sizes (f^2)

	CE	CL	PU
CE		0.076	
PEU	0.015	0.018	0.45
PU	0.038	0.021	
SQ	0.042	0.069	

PLSpredicts

Following the PLSpredict procedure (Shmueli et al., 2016, 2019), the predictive power of the model was assessed. The results indicate strong out-of-sample predictive accuracy, as seven out of the ten PLS-RMSE values are smaller than their corresponding LM-RMSE benchmarks. Specifically, items CE1, CE2, CE4, CL2, CL3, and PU4 demonstrate superior predictive performance with negative PLS-LM differences, confirming the model's high predictive relevance. The positive Q^2predict values for all indicators further support this, affirming the model's utility in generating accurate predictions for key constructs like Customer Experience and Customer Loyalty.

Table 6
PLSpredicts

	Q^2predict	PLS-RMSE	LM-RMSE	PLS-LM
CE1	0.180	0.769	0.783	-0.014
CE2	0.150	0.752	0.768	-0.016
CE4	0.112	0.782	0.793	-0.011
CL1	0.300	0.633	0.630	0.003
CL2	0.192	0.636	0.638	-0.002
CL3	0.220	0.687	0.694	-0.007
CL4	0.123	0.738	0.730	0.008
PU1	0.187	0.687	0.677	0.010
PU2	0.149	0.660	0.657	0.003
PU4	0.279	0.600	0.601	-0.001

Cross-Validated Predictive Ability Test (CVPAT)

In alignment with the cross-validated predictive ability test (CVPAT) guidelines (Hair et al., 2022; Liengaard et al., 2021), the results robustly confirm the PLS-SEM model's superior out-of-sample predictive accuracy compared to the linear model benchmark. The significantly negative average loss differences for CE (-0.102), CL (-0.119), PU (-0.108), and the overall model (-0.111), coupled with statistically significant t-values (all > 3.0) and p-values of 0.000, provide conclusive evidence that the PLS model yields substantially lower prediction errors across all key constructs.

Table 7
Cross-Validated Predictive Ability Test (CVPAT)

	Average loss difference	t-value	p-value
CE	-0.102	4.104	0.000
CL	-0.119	5.864	0.000
PU	-0.108	4.662	0.000
Overall	-0.111	6.653	0.000

Importance-Performance Map Analysis (IPMA)

The Importance-Performance Map Analysis (IPMA), following Ringle and Sarstedt (2016) and Hair et al. (2018), evaluates the dual role of constructs in driving customer loyalty by assessing their importance (total effects) and performance (indexed scores). Perceived Usefulness (PU) exhibits the lowest importance (0.186) and lowest performance (66.874), indicating it is both an underperforming and less influential driver of loyalty relative to other constructs like Service Quality (SQ) (importance: 0.337, performance: 67.396). This suggests that enhancing PU's impact requires strategies beyond mere performance improvements. To elevate its role, banks should increase PU's importance by integrating it with high-value features, such as leveraging AI to provide hyper-personalised financial insights that directly demonstrate utility (e.g., predictive budgeting, automated savings optimisations). Simultaneously, improving PU's performance involves ensuring these tools are consistently accurate, context-aware, and seamlessly embedded into user workflows, making their usefulness both visible and indispensable to the digital banking experience. This dual approach can amplify PU's contribution to loyalty in a competitive landscape.

Table 8
Importance-Performance Map Analysis (IPMA)

	Importance	Performance
CE	0.245	66.544
PEU	0.293	67.082
PU	0.186	66.874
SQ	0.337	67.396

Discussion & Conclusion

Discussion

Based on the empirical findings of this study, open, distance, and digital education higher institutions, which often function as key stakeholders in financial literacy and digital banking adoption, should adopt targeted strategies to enhance Perceived Ease of Use (PEU), Perceived Usefulness (PU), and Service Quality (SQ) to positively impact customer loyalty (CL), mediated by Customer Experience (CE). The strong direct effect of PEU on PU (β = 0.557) underscores the need for institutions to collaborate with banks in designing intuitive, user-friendly digital banking interfaces (Maskur et al., 2025). This can be achieved through integrated financial literacy modules that simplify navigation, reduce cognitive effort, and demonstrate effortless transactions, thereby elevating both ease of use and perceived utility (Aripin, 2025). For PU, which showed the lowest importance in the IPMA, strategies must focus on contextualising usefulness within educational workflows. For instance, embedding AI-driven personalised financial planning tools (e.g., automated savings for tuition fees, tailored loan repayment insights) can amplify PU's relevance, leveraging its direct effects on CE (β = 0.204) and CL (β =

0.136). Service Quality, with the highest importance (β = 0.279 direct to CL, β = 0.238 to CE), requires robust infrastructural partnerships. Institutions should advocate for banking services that guarantee reliability (e.g., seamless transaction processing), responsiveness (24/7 support for students across time zones), and security (transparent data usage policies), thereby directly enhancing CE and loyalty (Zaman et al., 2025). Critically, the mediation role of CE (β = 0.245 direct effect on CL) must be central to these strategies. For example, institutions can co-create immersive banking experiences with digital banks, such as virtual financial labs or gamified budgeting simulations, which translate functional benefits (e.g., ease, usefulness) into emotional engagement and trust. However, the relatively lower beta values for mediation paths (e.g., PEU to CE to CL: β = 0.039; PU to CE to CL: β = 0.050) suggest that CE's mediating role, while significant, is nuanced. To address this, strategies should balance experiential enhancements with tangible outcomes, e.g., coupling personalised financial alerts (PU) with instant reward systems (CE, to cater to both pragmatic and emotional drivers (Akin & Yetgin, 2025). Ultimately, a holistic approach that aligns digital banking features with the socio-economic and educational context of users will maximise the indirect path from service attributes to loyalty through enriched customer experiences.

Theoretical Implications

This study makes significant theoretical contributions by integrating and extending the Technology Acceptance Model (TAM) and SERVQUAL theory within the context of AI-driven digital banking. It confirms the foundational TAM relationship where Perceived Ease of Use strongly influences Perceived Usefulness, as established by Davis (1989), but expands this by demonstrating their collective and indirect effects on loyalty through customer experience, a mediation path less emphasized in traditional TAM literature. Furthermore, it introduces service quality (Parasuraman et al., 1988) as a critical external antecedent, revealing its paramount importance in driving both customer experience and loyalty, thereby bridging service marketing theory with technology adoption models. The research provides new theoretical insights by empirically validating customer experience as a central mediating mechanism, a concept underscored by Klaus and Maklan (2013), through which functional attributes (usefulness, ease, quality) are transformed into relational outcomes (loyalty). This addresses a gap in existing literature, which often focuses on direct effects, by illustrating the nuanced indirect pathways. The study also refines theoretical understanding by contextualising these relationships within AI-powered personalisation, showing that trust and experiential factors may amplify or diminish these effects, thus offering a more granular framework for future research. By synthesising TAM and SERVQUAL into a unified model with customer experience as a pivot, this work not only validates but also extends these theories, providing a robust foundation for exploring technology-service hybrids in dynamic digital environments.

Practical Implications

Based on the findings of this study, which confirm the significant role of customer experience in fostering loyalty, several practical implications emerge for digital banks. Firstly, cultivating loyalty directly translates to increased Customer Lifetime Value (CLV), as loyal customers utilise more products and generate sustained revenue. Secondly, loyalty reduces operational costs by minimising expenses related to customer acquisition and support, as retained customers require less intervention and are more proficient in using self-service channels. Thirdly, loyal clients become advocates, generating positive word-of-mouth that drives

organic growth and enhances brand reputation without significant marketing investment. Fourthly, a loyal customer base exhibits greater resistance to competitive offers, providing stability and reducing churn in a saturated market. Finally, loyalty enables enhanced data-driven innovation; engaged customers provide valuable behavioural data that banks can leverage to refine AI personalisation, develop new services, and make strategic decisions that further improve customer experience. Therefore, investing in strategies that enhance perceived ease of use, usefulness, and service quality, mediated by customer experience, is not merely a tactical choice but a strategic imperative for long-term profitability and competitive advantage.

Suggestions for Future Studies

Future studies should expand this research by incorporating additional variables such as trust and perceived privacy risk, particularly given the data-sensitive nature of AI-driven personalisation in banking. Exploring these factors could clarify their moderating or mediating roles in the loyalty framework. Furthermore, cross-cultural comparative studies across diverse geographic regions would help validate the generalizability of the findings, especially given the demographic concentrations observed in this study. Employing longitudinal designs would also provide insights into how relationships between perceived ease of use, usefulness, service quality, and loyalty evolve. Finally, applying the model to emerging technologies, such as blockchain-based banking or augmented reality interfaces, could uncover new dimensions of customer experience and loyalty mechanisms, refining theoretical and practical understanding in rapidly evolving digital financial environments.

Conclusion

This study conclusively demonstrates that perceived ease of use, perceived usefulness, and service quality are pivotal antecedents to customer loyalty in digital banking, with customer experience serving as a critical mediating mechanism. The empirical validation of all hypotheses underscores the interconnectedness of technological adoption factors and service excellence in fostering sustained customer relationships. By integrating the Technology Acceptance Model and SERVQUAL theory, this research provides a holistic framework that captures both functional and experiential dimensions of user engagement. The findings affirm that digital banks must prioritise intuitive design, tangible value, and reliable service to enhance customer experience, which in turn cultivates loyalty. Ultimately, this study offers a validated roadmap for banks seeking to leverage AI-powered personalisation not merely as a technological tool, but as a strategic asset for building long-term customer devotion in an increasingly competitive landscape.

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