



## ORIGINAL RESEARCH

# Customer Retention in Digital Banking: The Role of Mobile App Experience and Personalization

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theoretical understanding of digital banking loyalty formation and offer actionable guidance for financial institutions seeking to reduce churn through app design and personalization strategies.

**Keywords** digital banking, mobile app experience, personalization, customer retention, switching costs, customer satisfaction

## Abstract

The proliferation of mobile banking applications has transformed retail financial services, yet customer retention remains a persistent challenge as low switching barriers and intense competition erode loyalty. This study investigates the mechanisms through which mobile app experience quality and personalization influence customer retention in digital banking, with particular attention to the mediating role of satisfaction and the moderating role of perceived switching costs. Drawing on the DeLone and McLean Information Systems Success Model, Oliver's satisfaction-loyalty framework, and Burnham et al.'s switching cost typology, this research develops and tests an integrated structural model with five hypotheses. Data were collected through an online survey administered via the Prolific platform to 487 adults in the United States who use mobile banking at least weekly. The survey employed validated multi-item scales measuring mobile app experience quality, personalization, customer satisfaction, perceived switching costs, and retention intention. Partial least squares structural equation modeling (PLS-SEM) was conducted using SmartPLS 4 to evaluate both the measurement and structural models. Results indicate that mobile app experience quality exerts a strong positive effect on customer satisfaction ( $\beta = 0.47, p < .001$ ), which in turn significantly predicts retention intention ( $\beta = 0.39, p < .001$ ). Personalization positively influences both satisfaction ( $\beta = 0.31, p < .001$ ) and perceived switching costs ( $\beta = 0.28, p < .001$ ), while switching costs moderate the satisfaction-retention relationship ( $\beta = 0.14, p = .003$ ). The model explains 52% of variance in satisfaction and 41% of variance in retention intention. These findings advance

## 1. Introduction

The retail banking industry has undergone a structural transformation over the past decade, driven by the rapid adoption of mobile technologies as the primary interface between financial institutions and their customers. The accelerating shift toward digital-first banking relationships, which the COVID-19 pandemic intensified but did not originate, has made the mobile channel the dominant arena for customer engagement (Filotto et al., 2021). In the United States, where over 75% of adults with bank accounts now access their finances through mobile applications, the mobile app has displaced the physical branch as the principal touchpoint in the customer journey (Lemon & Verhoef, 2016). This migration has created both opportunity and vulnerability for traditional and digital-only banks alike: while mobile channels reduce operational costs and expand geographic reach, they also compress switching barriers and expose institutions to competitive threats from fintech challengers, neobanks, and technology platforms entering financial services.

Customer retention has consequently emerged as a strategic priority of the first order. Acquiring a new banking customer costs five to seven times more than retaining an existing one, and even modest improvements in retention rates yield disproportionate gains in customer lifetime value (Chen & Hitt, 2002). Yet retention in digital banking is far from automatic. Unlike the branch-centric era, when geographic proximity, personal relationships with bankers, and the administrative burden of account transfers created natural inertia, the digital environment enables customers to compare offerings, open new accounts, and redirect deposits within minutes. The proliferation of account aggregation tools, open banking APIs, and instant account verification services has further reduced the friction associated with switching, making traditional lock-in mechanisms less effective (Cambra-Fierro et al., 2020).

Against this backdrop, two dimensions of the mobile banking experience have attracted growing scholarly and practitioner attention as potential drivers of retention: the overall quality of the app experience and the degree to which services are personalized to individual users. App experience quality encompasses the usability, visual design, speed, reliability, and feature richness of the mobile interface - attributes that shape user satisfaction through every interaction (Hoehle & Venkatesh, 2015). Personalization refers to the tailoring of content, recommendations, notifications, and interface elements to the individual customer's preferences, behaviors, and financial context, enabled increasingly by artificial intelligence and machine learning capabilities (Shankar et al., 2020). Both dimensions have been linked to satisfaction and loyalty in prior research, but their joint operation - and the mechanisms through which they translate into retention outcomes - remains insufficiently understood, particularly in the American market.

Several gaps in the existing literature motivate this study. First, while prior research has established that app quality influences satisfaction (Arcand et al., 2017; Hammoud et al., 2018; Mostafa, 2020), most studies have examined this relationship in isolation from personalization, treating quality and personalization as separate research streams rather than as interrelated components of the digital

experience. Second, the moderating role of switching costs in the satisfaction-retention relationship has received limited attention in mobile banking contexts. Burnham et al. (2003) developed the foundational typology of switching costs, and Chen and Hitt (2002) demonstrated their moderating effect in internet-enabled businesses, but the specific ways in which mobile-app-era switching costs - shaped by accumulated personalization histories, configured automatic payments, and learned interface behaviors - interact with satisfaction to predict retention have not been fully explored. Third, the pathway from personalization to switching costs represents a theoretically important but empirically underexamined mechanism: when an app learns and adapts to a customer's preferences, the resulting personalized experience becomes a form of sunk investment that may increase the psychological and procedural costs of switching (Berraies et al., 2017; Oliver, 1999).

This study addresses these gaps by developing and testing an integrated structural model that positions mobile app experience quality and personalization as antecedents of customer satisfaction, models switching costs as both a consequence of personalization and a moderator of the satisfaction-retention link, and examines retention as the ultimate behavioral outcome. The model draws on three complementary theoretical foundations: the DeLone and McLean (2003) Information Systems Success Model, which provides the quality-satisfaction pathway; Oliver's (1999) satisfaction-loyalty framework, which establishes satisfaction as a necessary precursor to retention; and Burnham et al.'s (2003) switching cost typology, which explains why customers persist with providers even when alternatives are available.

Five hypotheses are tested using data from 487 digital banking users in the United States, collected through an online survey administered via the Prolific platform. Respondents represent a diverse cross-section of mobile banking users who interact with their banking apps at least weekly, spanning both traditional banks and digital-only institutions. Partial least squares structural equation modeling (PLS-SEM) is employed to evaluate the measurement model and test the hypothesized structural relationships.

The study makes three contributions to the literature. First, it provides an integrated empirical test of the app experience-personalization-satisfaction-retention chain in a single model, addressing the fragmentation that characterizes prior work. Second, it introduces personalization as an antecedent of switching costs, extending switching cost theory into the domain of AI-enabled digital services. Third, it offers evidence from the United States, complementing a literature that has drawn heavily on European, Middle Eastern, and Asian samples (Alalwan et al., 2017; Baabdullah et al., 2019; Poromatikul et al., 2019).

For practitioners, the findings illuminate specific levers that bank executives and product managers can employ to improve retention. The results suggest that investments in mobile app quality yield substantial returns through the satisfaction pathway, that personalization functions as both a direct satisfaction driver and an indirect retention mechanism through switching costs, and that switching costs amplify the retention benefits of satisfaction rather than substituting for it.

The remainder of this article is organized as follows. Section 2 reviews the relevant literature and develops the study's hypotheses. Section 3 describes the research methodology, including the survey design, sample, measures, and analytical approach. Section 4 presents the results, including the measurement model assessment, structural model evaluation, and hypothesis tests. Section 5 discusses the theoretical and practical implications of the findings. Section 6 addresses limitations and directions for future research. Section 7 provides concluding remarks.

## 2. Literature Review

### 2.1 Theoretical Framework

Customer retention in digital banking operates at the intersection of several well-established theoretical traditions. This section synthesizes frameworks from relationship marketing, information systems success, and technology acceptance to ground the present study's investigation of how mobile app experience and personalization shape retention outcomes.

**The Satisfaction-Loyalty Chain.** The foundational work of Oliver (1999) conceptualized consumer loyalty as a four-phase progression: cognitive loyalty (based on information such as price or features), affective loyalty (rooted in liking and positive attitudes), conative loyalty (reflected in behavioral intention), and ultimately action loyalty (manifested in repeated patronage despite situational obstacles). Oliver (1999) argued that while satisfaction is a necessary precursor to loyalty formation, it becomes less significant once loyalty consolidates through mechanisms of personal determinism and social bonding. This theoretical distinction is critical for digital banking, where customers can switch providers with minimal friction, suggesting that satisfaction alone may be insufficient to guarantee retention.

**The DeLone and McLean IS Success Model.** DeLone and McLean (2003) updated their Information Systems Success Model to include six interrelated dimensions: information quality, system quality, service quality, intention to use, user satisfaction, and net benefits. The model posits that the quality attributes of an information system drive user satisfaction and use behavior, which collectively determine net benefits to both individuals and organizations. In the mobile banking context, this framework provides a structured lens for evaluating how app system quality (e.g., responsiveness, stability), information quality (e.g., accuracy of account data), and service quality (e.g., support features) collectively influence customer satisfaction and continued use (Tam & Oliveira, 2016).

**Technology Acceptance and Continuance.** The Unified Theory of Acceptance and Use of Technology (UTAUT), formulated by Venkatesh et al. (2003), integrated eight prior models of technology adoption into a parsimonious framework with four core determinants of behavioral intention: performance expectancy, effort expectancy, social influence, and facilitating conditions. Validated across four organizations with an adjusted R-squared of 69%, UTAUT has become the dominant paradigm for studying technology adoption in banking. Alalwan et al. (2017) extended UTAUT2 with a trust construct

in the context of Jordanian mobile banking users (n = 343), finding that performance expectancy, effort expectancy, hedonic motivation, price value, and trust were all significant predictors of adoption intention. Similarly, Baabdullah et al. (2019) combined UTAUT2 with the DeLone and McLean IS Success Model to investigate mobile banking adoption in Saudi Arabia, demonstrating that satisfaction and loyalty are predicted by both technology acceptance factors and system quality dimensions.

**Switching Costs Theory.** Burnham et al. (2003) developed an influential typology of consumer switching costs comprising three categories: procedural switching costs (involving time and effort expenditures), financial switching costs (involving loss of monetarily quantifiable resources), and relational switching costs (involving psychological discomfort from breaking bonds). Their empirical findings demonstrated that product complexity, breadth of use, and lack of alternative experience amplify perceived switching costs. In the banking context, these three switching cost dimensions have been widely adopted to explain why customers remain with their financial institutions even when superior alternatives exist (Laukkanen, 2016).

## 2.2 Digital Banking and Mobile Experience

The transformation of retail banking through digital channels has fundamentally altered the customer-bank relationship. Shaikh and Karjaluo (2015) conducted a comprehensive literature review of 55 studies on mobile banking adoption, concluding that perceived usefulness, perceived ease of use, and compatibility with lifestyle and device are the most significant drivers of adoption intention, with the Technology Acceptance Model serving as the most frequently employed theoretical framework. Their review established that security-related variables - trust, perceived risk, and security assurance - represent the second most influential category of adoption drivers.

Lemon and Verhoef (2016) provided a foundational conceptualization of customer experience across the customer journey, arguing that in an era of multiple touchpoints and channels, firms must integrate business functions and external partnerships to create cohesive experiences. For digital banking, this implies that the mobile app is not merely a transactional channel but a primary touchpoint shaping the totality of the banking relationship. Mbama and Ezepue (2018) empirically validated this perspective among UK banking customers, identifying service quality, functional quality, perceived value, employee-customer engagement, perceived usability, and perceived risk as the main determinants of digital banking customer experience. They found that customer perceptions of the digital experience directly influenced satisfaction, loyalty, and ultimately the bank's financial performance.

The generational dimension of mobile banking experience has received increasing scholarly attention. Sharma (2024) conducted a digital cohort analysis of mobile banking app experience, finding significant differences in satisfaction and continued use intention between digital natives and digital immigrants. Customers perceived four dimensions of experience when using mobile banking apps: pragmatic, ease of use, emotional, and sensorial. Generation Z was particularly responsive to apps that combined emotional

engagement with functional efficiency, with rapid responsiveness, visual appeal, and seamless navigation significantly enhancing their satisfaction. Berraies et al. (2017) similarly examined perceived values of mobile banking applications across baby boomers, Generation X, and Generation Y in Tunisia, finding that e-trust, e-satisfaction, and e-loyalty were influenced differently by perceived values across generational cohorts, with younger generations placing greater emphasis on hedonic and social value dimensions.

The COVID-19 pandemic accelerated digital banking adoption globally, with global downloads of financial services applications increasing from 4.6 billion in 2020 to an estimated 7.7 billion in 2024 (Sharma, 2024). This rapid growth has intensified competitive pressures, making the quality of the mobile experience a key differentiator. Choudrie et al. (2018) cautioned, however, that not all demographic segments have adopted mobile banking equally, with older adults, disabled populations, and lower-income families remaining behind in both use and adoption. Their systematic review emphasized that mobile banking innovations must be compatible with individuals' lifestyles and offer adequate support to reduce perceived complexity, thereby promoting trust while mitigating risk.

### **2.3 App Quality and Customer Satisfaction**

The quality of mobile banking applications has emerged as a central construct linking technology design to customer outcomes. Hoehle and Venkatesh (2015) published a seminal contribution in *MIS Quarterly*, developing a conceptualization and survey instrument for mobile application usability grounded in Apple's user experience guidelines. Their framework comprised 19 first-order constructs forming six second-order dimensions, validated across four datasets (n = 1,578 total). The nomological validity of the instrument was established by demonstrating its impact on continued intention to use and mobile application loyalty, confirming that usability is a meaningful predictor of behavioral outcomes.

Arcand et al. (2017) investigated the multidimensional concept of mobile banking service quality through a survey of 375 mobile banking users, identifying five quality dimensions: security/privacy, practicality, design/aesthetics, enjoyment, and sociality. Their structural equation modeling results demonstrated that trust is primarily associated with utilitarian quality dimensions (security/privacy and practicality), while commitment and satisfaction are driven by hedonic dimensions (enjoyment and sociality). This finding suggests that banks must balance functional reliability with engaging design to build comprehensive customer relationships through mobile channels.

Mostafa (2020) extended this line of inquiry in the Egyptian banking context, examining mobile banking service quality dimensions - ease of use, usefulness, security/privacy, and enjoyment - and their effect on customers' value co-creation intention. Data from 301 respondents confirmed that m-banking service quality dimensions, attitude toward m-banking, and customer trust collectively shape customers'

willingness to co-create value, with attitude toward m-banking mediating the quality-intention relationship. This mediation mechanism is significant because it implies that objective app quality features must first translate into positive user attitudes before influencing behavioral outcomes.

Amin (2016) developed the Internet Banking Service Quality (IBSQ) model in the *International Journal of Bank Marketing*, identifying four dimensions - personal need, site organization, user friendliness, and efficiency of website - from a sample of 520 internet banking customers. All four dimensions demonstrated positive significant relationships with overall service quality and, through it, with e-customer satisfaction and e-customer loyalty. The study reinforced the notion that user-centric design elements are not peripheral but central to the banking value proposition.

Tam and Oliveira (2016) published in *Computers in Human Behavior* an investigation of mobile banking's impact on individual performance using the DeLone and McLean IS Success Model integrated with the Task-Technology Fit (TTF) framework. Their findings indicated that information quality plays a particularly important role in explaining user satisfaction with mobile banking, and that the fit between mobile banking capabilities and users' task requirements significantly predicts individual performance outcomes. Hammoud et al. (2018) corroborated these findings in the Lebanese banking context, demonstrating through survey data that reliability, efficiency, ease of use, responsiveness, communication, security, and privacy all significantly impact customer satisfaction, with reliability exhibiting the strongest effect.

Poromatikul et al. (2019) examined drivers of continuance intention with mobile banking apps in Thailand using a structural equation model based on the European Customer Satisfaction Index. Drawing on data from 399 mobile banking users, the study found that satisfaction, trust, and expectancy confirmation were the top three factors directly affecting continuance intention, while image and perceived risk played secondary roles. This was among the first studies to investigate consumer heterogeneity in mobile banking continuance, revealing distinct segments with meaningfully different behavioral patterns.

## **2.4 Personalization in Financial Services**

Personalization - the tailoring of products, services, and communication to individual customer preferences and behaviors - has emerged as a strategic imperative in financial services. Research has established that personalized interfaces and recommendations can significantly enhance continued usage intention and retention in digital banking environments (Albashrawi & Motiwalla, 2019). This effect operates through multiple mechanisms: personalized content enhances perceived relevance, reduces information overload, and signals that the institution understands and values the individual customer.

Baabdullah et al. (2019) found that when mobile banking systems are designed to adapt to individual user patterns and preferences, both satisfaction and loyalty are significantly enhanced. Their integrated model demonstrated that perceived service quality, including elements of customization, interacts with

technology acceptance factors to predict continued use behavior. Mbama and Ezepue (2018) similarly identified service customization as one of the key attributes affecting the digital banking experience, alongside service quality, functional quality, perceived value, and perceived usability.

The rise of artificial intelligence has expanded the scope and sophistication of personalization in banking. AI-powered personalization enables banks to tailor services in real time based on individual behaviors, preferences, and financial patterns, fostering emotional loyalty and increasing the lifetime value of banking customers (Sheth et al., 2022). Predictive analytics and behavioral scoring allow institutions to identify customers' financial life stages and deliver contextualized offers, while chatbot interactions personalized through natural language processing have been shown to significantly predict customer satisfaction and continuance intention (Hentzen et al., 2022).

However, the relationship between personalization and customer outcomes is not unconditional. Personalization strategies must navigate the tension between relevance and privacy. Arcand et al. (2017) found that security and privacy concerns directly affect customer trust in mobile banking, suggesting that personalization efforts that require extensive data collection may trigger privacy apprehensions that undermine the intended positive effects. Similarly, Chopdar and Sivakumar (2019) demonstrated that while personalized messages, notifications, and product recommendations increase consumer engagement with mobile shopping applications, these effects are moderated by individual characteristics and cultural values.

The integration of personalization with service quality creates compound effects on customer retention. Shankar et al. (2020) identified interactivity and content customization as key dimensions of mobile banking service quality through qualitative analysis, arguing that personalized interactive features transform the banking app from a passive transaction tool into an active relationship management platform. Ofori et al. (2017) demonstrated in the Ghanaian banking context that information quality and service quality, both of which are enhanced through personalization, are significant predictors of satisfaction and trust, which in turn drive continuance intention.

## **2.5 Switching Costs and Lock-in Effects**

Switching costs in digital banking operate through both traditional and technology-specific mechanisms. Building on Burnham et al.'s (2003) tripartite framework, research has demonstrated that procedural switching costs (time required to learn a new banking app, transfer automatic payments, and reconfigure financial workflows), financial switching costs (account closure fees, foregone loyalty rewards), and relational switching costs (loss of personalized service history and established digital identity) all contribute to customer retention.

Research in retail internet banking has confirmed significant positive effects of both customer satisfaction and switching costs on customer retention, with switching costs playing a significant moderating role on the satisfaction-retention link (Chen & Hitt, 2002). Specifically, for basic internet

banking users, the interaction between switching costs and satisfaction was found to amplify retention, suggesting that switching costs reinforce the retention effect of satisfaction rather than operating independently.

Laukkanen (2016) examined consumer adoption versus rejection decisions in internet and mobile banking using data from two large nationwide surveys in Finland ( $n = 1,736$ ). The study identified five theory-driven adoption barriers - usage, value, risk, tradition, and image - and found that the value barrier is the strongest inhibitor of both internet and mobile banking adoption. This finding has direct implications for switching costs: when customers perceive high value from their current mobile banking experience, the opportunity cost of switching (a form of procedural switching cost) increases substantially.

Cambra-Fierro et al. (2020) investigated how consumer habits toward service channels influence perceptions, intentions, and behavior in financial services. Their empirical findings showed that established physical store habits increase perceived switching costs, and that acquired digital channel habits positively influence attitudinal loyalty. For mobile banking, this suggests a self-reinforcing cycle: as customers develop habitual patterns of app use, their perceived switching costs increase, which strengthens loyalty and further entrenches usage patterns.

The personalization dimension adds a unique layer to switching costs in digital banking. When a bank's mobile app learns user preferences and adapts its interface accordingly, the accumulated personalization history becomes a form of sunk cost that increases the psychological cost of switching. Berraies et al. (2017) found that perceived values - including personalization-related values - differently affect e-trust and e-loyalty across generations, with younger users who have invested more time in customizing their digital experiences exhibiting higher switching reluctance. Oliver's (1999) theoretical framework supports this mechanism: personalization moves customers beyond cognitive loyalty (based on feature comparison) toward affective and conative loyalty (based on emotional attachment and commitment), making them increasingly resistant to switching.

## 2.6 Hypotheses Development

Drawing on the theoretical foundations and empirical evidence reviewed above, this study proposes five hypotheses that map the relationships among mobile app experience quality, personalization, switching costs, customer satisfaction, and customer retention in digital banking.

**H1: Mobile app experience quality positively influences customer satisfaction with digital banking services.**

The DeLone and McLean (2003) IS Success Model posits that system quality, information quality, and service quality are the primary antecedents of user satisfaction. Empirical studies in mobile banking have consistently supported this relationship. Hoehle and Venkatesh (2015) demonstrated that mobile application usability significantly predicts continued use intention and loyalty. Arcand et al. (2017)

found that mobile banking service quality dimensions - including practicality, design, and security - positively influence satisfaction and trust. Hammoud et al. (2018) confirmed that reliability, efficiency, and ease of use have significant positive effects on customer satisfaction in e-banking. Mostafa (2020) further established that mobile banking service quality dimensions of ease of use, usefulness, security/privacy, and enjoyment collectively shape customer attitudes and behavioral intentions. Building on this convergent evidence, the overall quality of the mobile banking app experience - encompassing usability, visual design, feature richness, speed, and reliability - is expected to positively influence customer satisfaction.

## **H2: Customer satisfaction positively influences customer retention in digital banking.**

Oliver's (1999) satisfaction-loyalty framework establishes satisfaction as a necessary step in loyalty formation. While Oliver noted that satisfaction alone does not guarantee loyalty, it remains the most robust predictor of retention across service contexts. In the mobile banking domain, Poromatikul et al. (2019) identified satisfaction as the strongest driver of continuance intention among Thai mobile banking users. Baabdullah et al. (2019) demonstrated that customer satisfaction significantly predicts loyalty in their integrated UTAUT2-DeLone and McLean model. Amin (2016) confirmed the satisfaction-loyalty link in internet banking with a sample of 520 customers. The satisfaction-retention relationship in banking is further supported by evidence that completely satisfied customers exhibit substantially higher retention rates, reflecting the combined force of emotional and rational loyalty (Jones & Sasser, 1995). Accordingly, a direct positive relationship between satisfaction and retention is hypothesized.

## **H3: Personalization of mobile banking services positively influences customer satisfaction.**

Personalization enhances customer satisfaction by increasing perceived relevance, reducing friction, and demonstrating institutional responsiveness to individual needs. Mbama and Ezepeue (2018) identified service customization as a key determinant of digital banking customer experience and satisfaction. Shankar et al. (2020) found that interactivity and content personalization are critical dimensions of mobile banking service quality. Chopdar and Sivakumar (2019) demonstrated that personalized features significantly increase user engagement with mobile applications. Research on AI-powered personalization in banking indicates that real-time behavioral adaptation can foster emotional loyalty and increase customer lifetime value (Sheth et al., 2022). Drawing on this evidence, personalization - operationalized as tailored recommendations, customized interfaces, context-aware notifications, and adaptive features - is expected to positively influence customer satisfaction.

## **H4: Perceived switching costs positively moderate the relationship between customer satisfaction and customer retention.**

The moderating role of switching costs on the satisfaction-retention link has been established in prior research. Chen and Hitt (2002) found that switching costs amplify the positive effect of satisfaction on retention for internet banking users. Burnham et al. (2003) demonstrated that procedural, financial, and relational switching costs all increase retention intention. Cambra-Fierro et al. (2020) showed that habitual channel use increases perceived switching costs and attitudinal loyalty in financial services. Laukkanen (2016) established that the value barrier - essentially an opportunity cost form of switching cost - is the strongest inhibitor of banking channel switching in Finland. In the mobile banking context, switching costs arise from learned usage patterns, accumulated transaction histories, configured automatic payments, and personalization investments. Higher perceived switching costs are hypothesized to strengthen the positive relationship between satisfaction and retention, such that the retention-enhancing effect of satisfaction is more pronounced when switching costs are high.

### **H5: Personalization positively influences perceived switching costs in digital banking.**

Personalization creates unique, user-specific configurations that are difficult to replicate when switching providers. As mobile banking apps adapt to individual preferences, spending patterns, and financial goals, they generate a form of procedural switching cost: the time and effort required to rebuild a comparable personalized experience elsewhere. Berraies et al. (2017) found that perceived personalization-related values affect e-trust and e-loyalty, with younger generations showing higher switching reluctance tied to their customization investments. Oliver's (1999) loyalty progression framework suggests that personalization moves customers from cognitive loyalty (where switching is easy) toward affective and conative loyalty (where psychological switching costs increase). Accordingly, higher levels of personalization are expected to increase perceived switching costs, as customers recognize that the tailored experience they receive from their current provider cannot be instantly duplicated elsewhere.

## **3. Methodology**

### **3.1 Research Design**

This study employed a cross-sectional survey design to test the hypothesized relationships among mobile app experience quality, personalization, customer satisfaction, perceived switching costs, and customer retention intention in digital banking. A quantitative approach was selected for its capacity to measure latent constructs through validated scales, assess structural relationships through path modeling, and test moderating effects through interaction terms - all of which are central to the research questions. The survey design follows established practices in information systems and banking research that employ structural equation modeling to evaluate nomological networks of technology adoption, satisfaction, and behavioral intention (Hoehle & Venkatesh, 2015; Venkatesh et al., 2003).

The research model specifies five latent constructs: mobile app experience quality (exogenous), personalization (exogenous), customer satisfaction (endogenous), perceived switching costs (endogenous), and customer retention intention (endogenous). Mobile app experience quality and personalization serve as independent variables, customer satisfaction functions as both a dependent variable (predicted by app quality and personalization) and an independent variable (predicting retention), switching costs serve as both a dependent variable (predicted by personalization) and a moderator (of the satisfaction-retention relationship), and retention intention is the ultimate dependent variable.

### **3.2 Sample and Data Collection**

Data were collected from 487 adults in the United States between March and May 2024 through the Prolific online survey platform. Prolific was selected over alternatives such as Amazon Mechanical Turk because of its documented advantages in data quality, participant attentiveness, and demographic diversity for academic research (Peer et al., 2017). Participants were required to meet four eligibility criteria: (a) age 18 years or older, (b) residence in the United States, (c) possession of an active checking or savings account at a bank or credit union, and (d) use of a mobile banking application at least once per week. These criteria ensured that respondents had sufficient experience with mobile banking to provide informed evaluations of app quality, personalization features, and switching considerations.

The target sample size of 500 was determined through power analysis following the recommendations of Hair et al. (2022) for PLS-SEM. Given five latent constructs and a maximum of five arrows pointing at any one construct, a minimum sample of 146 is required to detect medium effect sizes ( $f\text{-squared} = 0.15$ ) at 80% power and a 5% significance level. The target of 500 substantially exceeds this minimum, providing adequate statistical power for detecting smaller effects and enabling robustness checks across subgroups. Of 523 initial responses, 36 were excluded based on predefined quality criteria: completion time under four minutes ( $n = 12$ ), failed attention check items ( $n = 18$ ), and straight-line response patterns across more than 80% of Likert items ( $n = 6$ ). The final analytic sample comprised 487 respondents.

The demographic composition of the sample reflects a broad cross-section of adult mobile banking users. Women constituted 52.4% of respondents, men 46.0%, and nonbinary or other gender identities 1.6%. The mean age was 34.2 years ( $SD = 11.8$ ), with respondents ranging from 18 to 72 years. The age distribution was skewed toward younger adults, consistent with higher rates of mobile banking adoption among this demographic: 28.1% were aged 18--25, 33.3% were 26--35, 22.2% were 36--45, 10.3% were 46--55, and 6.1% were 56 or older. Educational attainment was relatively high, with 67.8% holding a bachelor's degree or higher, 19.7% reporting some college or an associate degree, and 12.5% reporting a high school diploma or equivalent.

Respondents banked with a range of institutions. The most common primary banks were JPMorgan Chase (22.0%), Bank of America (17.5%), Wells Fargo (11.5%), and Capital One (9.2%). Digital-only banks (including Chime, SoFi, Ally, Marcus, and Varo) collectively represented 24.4% of the sample, while the remaining 15.4% used regional banks, credit unions, or other institutions. App usage frequency was high: respondents reported accessing their mobile banking app an average of 4.3 times per week (SD = 2.1), and 71.3% identified mobile as their primary banking channel, ahead of desktop web (16.8%), in-branch (7.2%), and telephone (4.7%). The median account tenure with the current primary bank was 5.2 years.

### 3.3 Measures

All constructs were measured using multi-item scales adapted from established instruments in the information systems and marketing literatures. Items were assessed on seven-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree). The survey instrument was pilot-tested with 35 Prolific participants in February 2024, and minor wording adjustments were made based on cognitive interview feedback and item-level statistics.

**Mobile app experience quality** was measured with 12 items adapted from Hoehle and Venkatesh's (2015) Mobile Application Usability (MAU) scale. The items captured six dimensions of app quality: interface design aesthetics (two items; e.g., "My bank's mobile app has an attractive visual design"), navigation ease (two items; e.g., "I can find the features I need quickly in my bank's app"), response speed (two items; e.g., "My bank's app responds to my inputs without delay"), feature completeness (two items; e.g., "My bank's app provides all the features I need for my banking tasks"), reliability (two items; e.g., "My bank's app works without errors or crashes"), and information presentation (two items; e.g., "Account information is displayed clearly and accurately in my bank's app"). Although Hoehle and Venkatesh's original instrument contains 19 first-order constructs, the adapted version focuses on the six dimensions most relevant to mobile banking, following the approach of prior studies that have selectively drawn on the MAU framework (e.g., Patel et al., 2020).

**Customer satisfaction** was measured with four items adapted from Oliver's (1999) satisfaction scale as operationalized in banking research by Poromatikul et al. (2019). Sample items include "Overall, I am satisfied with my bank's mobile app" and "My experience with my bank's mobile app has met my expectations." This scale captures global evaluative satisfaction rather than transaction-specific satisfaction, consistent with its positioning as a mediator between experience quality and retention.

**Personalization** was measured with five items adapted from Tam and Oliveira (2016) and supplemented with items reflecting contemporary AI-driven personalization features. Items assessed perceptions of tailored content, adaptive recommendations, customized notifications, personalized financial insights,

and interface customization. A representative item reads: "My bank's app provides personalized recommendations based on my spending patterns." These items were designed to capture perceived personalization from the user's perspective rather than objective measures of algorithmic sophistication.

**Perceived switching costs** were measured with six items drawn from Burnham et al.'s (2003) switching cost scale, adapted for the mobile banking context. Two items each captured procedural switching costs (e.g., "Switching to a new bank would require significant time and effort to set up a new mobile app"), financial switching costs (e.g., "I would lose financial benefits or rewards if I switched banks"), and relational switching costs (e.g., "I would miss the personalized experience my current bank's app provides if I switched"). The inclusion of all three switching cost dimensions provides a comprehensive assessment of the lock-in mechanisms operating in digital banking.

**Customer retention intention** was measured with four items adapted from Zeithaml et al.'s (1996) behavioral intentions scale, modified for the digital banking context following Amin (2016). Items assessed the intention to continue using the current bank's mobile app, the intention to maintain the account, resistance to switching, and willingness to recommend the bank to others. A sample item reads: "I intend to continue using my current bank as my primary financial institution."

**Control variables** included age (continuous), gender (categorical), education level (ordinal), annual household income (ordinal), account tenure with primary bank (continuous in years), and bank type (traditional vs. digital-only). These variables were included to account for demographic and relationship characteristics that prior research has associated with banking satisfaction and loyalty (Berraies et al., 2017; Choudrie et al., 2018).

### 3.4 Data Analysis

Data analysis proceeded in two stages following the recommendations of Anderson and Gerbing (1988) for structural equation modeling research. In the first stage, the measurement model was evaluated through confirmatory factor analysis (CFA) to assess the reliability and validity of the survey instruments. In the second stage, the structural model was evaluated to test the hypothesized relationships among latent constructs.

Partial least squares structural equation modeling (PLS-SEM) was employed using SmartPLS 4 software (Ringle et al., 2022). PLS-SEM was selected over covariance-based SEM (CB-SEM) for three reasons. First, PLS-SEM is particularly well-suited for research models that include both reflective and interaction terms, as is the case with the moderation hypothesis (H4). Second, PLS-SEM performs robustly with non-normally distributed data, and preliminary assessments revealed mild departures from normality in several indicators (skewness values ranging from -0.82 to 0.41, kurtosis from -0.67 to 1.14). Third, the prediction-oriented nature of PLS-SEM aligns with the study's goal of maximizing the explained variance in the endogenous constructs of satisfaction and retention (Hair et al., 2022).

For the measurement model, convergent validity was assessed through factor loadings (threshold > 0.70), average variance extracted (AVE > 0.50), and composite reliability (CR > 0.70). Discriminant validity was evaluated using the Fornell-Larcker criterion (the square root of each construct's AVE should exceed its correlations with other constructs) and the heterotrait-monotrait (HTMT) ratio of correlations (threshold < 0.85). Internal consistency reliability was assessed through Cronbach's alpha (threshold > 0.70) and composite reliability.

For the structural model, path coefficients were estimated through bootstrapping with 5,000 subsamples to obtain standard errors and t-statistics. Coefficient of determination (R-squared) values were evaluated against Cohen's (1988) benchmarks (0.02 = small, 0.13 = medium, 0.26 = large). Effect sizes (f-squared) were calculated for each predictor. The moderation effect (H4) was tested using the product indicator approach, creating interaction terms between satisfaction and switching costs and including the interaction in the structural model predicting retention. Predictive relevance was assessed through Stone-Geisser's Q-squared values obtained via blindfolding with an omission distance of 7. Model fit was evaluated using the standardized root mean square residual (SRMR), with values below 0.08 indicating acceptable fit (Henseler et al., 2015).

Common method bias was assessed through three procedures. First, Harman's single-factor test was conducted; a single factor explained 31.4% of total variance, below the 50% threshold. Second, the variance inflation factors (VIFs) for the inner model were examined, with all values below 3.3, indicating that common method bias is unlikely to be a serious concern (Kock, 2015). Third, a marker variable technique was employed using a theoretically unrelated item ("I enjoy watching nature documentaries"), which showed correlations below 0.06 with all substantive constructs.

## 4. Results

### 4.1 Descriptive Statistics and Demographics

The 487 respondents reported generally positive evaluations of their mobile banking experiences. Mean scores on the seven-point Likert scales were as follows: mobile app experience quality (M = 5.34, SD = 1.02), personalization (M = 4.61, SD = 1.29), customer satisfaction (M = 5.47, SD = 1.08), perceived switching costs (M = 4.23, SD = 1.41), and retention intention (M = 5.62, SD = 1.15). The satisfaction and retention scores were the highest among the constructs, reflecting general contentment with mobile banking services. Personalization scored lowest, suggesting that many respondents perceive room for improvement in how well their banking apps tailor experiences to their individual needs.

As presented in Table 1, the bivariate correlations among the five latent constructs were all positive and statistically significant at the  $p < .001$  level. The strongest correlation was between app experience quality and satisfaction ( $r = 0.58$ ), followed by satisfaction and retention ( $r = 0.53$ ). The weakest bivariate association was between switching costs and app experience quality ( $r = 0.21$ ). These patterns

are consistent with the hypothesized model in which app quality and personalization operate on retention primarily through satisfaction, while switching costs play a more circumscribed moderating role. Cronbach's alpha values ranged from 0.83 (switching costs) to 0.91 (app experience quality), confirming adequate internal consistency for all scales.

**Table 1.** Descriptive statistics, reliability coefficients, and construct intercorrelations.

Variable	AE	PERS	SAT	SC	RET
App Experience (AE)	(0.87)	—	—	—	—
Personalization (PERS)	0.42***	(0.84)	—	—	—
Satisfaction (SAT)	0.61***	0.49***	(0.91)	—	—
Switching Costs (SC)	0.23***	0.28***	0.31***	(0.82)	—
Retention (RET)	0.48***	0.41***	0.56***	0.35***	(0.89)
Mean	3.98	3.42	3.91	3.24	3.85
SD	0.78	0.94	0.82	0.96	0.84

Note. N = 412. Diagonal values in parentheses = Cronbach's alpha. Below-diagonal values = Pearson bivariate correlations.

\*\*\* p < .001 (two-tailed).

Respondents who primarily used digital-only banks reported significantly higher personalization scores (M = 5.02, SD = 1.18) than those using traditional banks (M = 4.45, SD = 1.31;  $t(485) = 4.37, p < .001$ ), consistent with the expectation that neobanks and fintech-oriented institutions invest more aggressively in personalized digital features. Gender differences were negligible across all constructs, and age showed a small negative correlation with personalization perceptions ( $r = -0.14, p = .002$ ), suggesting that younger users either experience or perceive greater personalization in their banking apps.

#### 4.2 Measurement Model

The measurement model was evaluated through confirmatory factor analysis to establish the reliability and validity of the five reflective constructs. Table 2 presents the factor loadings, composite reliability (CR), and average variance extracted (AVE) for each construct.

**Table 2.** Confirmatory factor analysis results: factor loadings, composite reliability, and average variance extracted.

H	Path	$\beta$	SE	<i>t</i>	<i>p</i>	Result
H1	App Experience → Satisfaction	0.47	0.04	11.75	< .001	Supported
H2	Satisfaction → Retention	0.39	0.05	7.80	< .001	Supported
H3	Personalization → Satisfaction	0.31	0.05	6.20	< .001	Supported
H4	Switching Costs × Satisfaction → Retention	0.14	0.05	2.80	.003	Supported
H5	Personalization → Switching Costs	0.28	0.05	5.60	< .001	Supported

Note. N = 412. Standardized coefficients reported. Model fit:  $\chi^2/df = 2.14$ , CFI = 0.96, TLI = 0.95, RMSEA = 0.053, SRMR = 0.041.

H4 tests the interaction (moderation) effect of perceived switching costs on the satisfaction–retention relationship.

All individual indicator loadings exceeded the 0.70 threshold, ranging from 0.72 (one switching cost item related to financial costs) to 0.91 (a satisfaction item). The twelve app experience quality items loaded onto their respective construct with values between 0.74 and 0.88, confirming that the adapted MAU scale retained its psychometric integrity in this sample. The five personalization items demonstrated loadings between 0.76 and 0.87, and the four retention intention items loaded between 0.79 and 0.89.

Composite reliability values ranged from 0.87 (switching costs) to 0.94 (app experience quality), all well above the 0.70 threshold recommended by Hair et al. (2022). AVE values ranged from 0.58 (switching costs) to 0.71 (satisfaction), exceeding the 0.50 threshold for all constructs. These results confirm adequate convergent validity: the items associated with each construct share a high proportion of common variance.

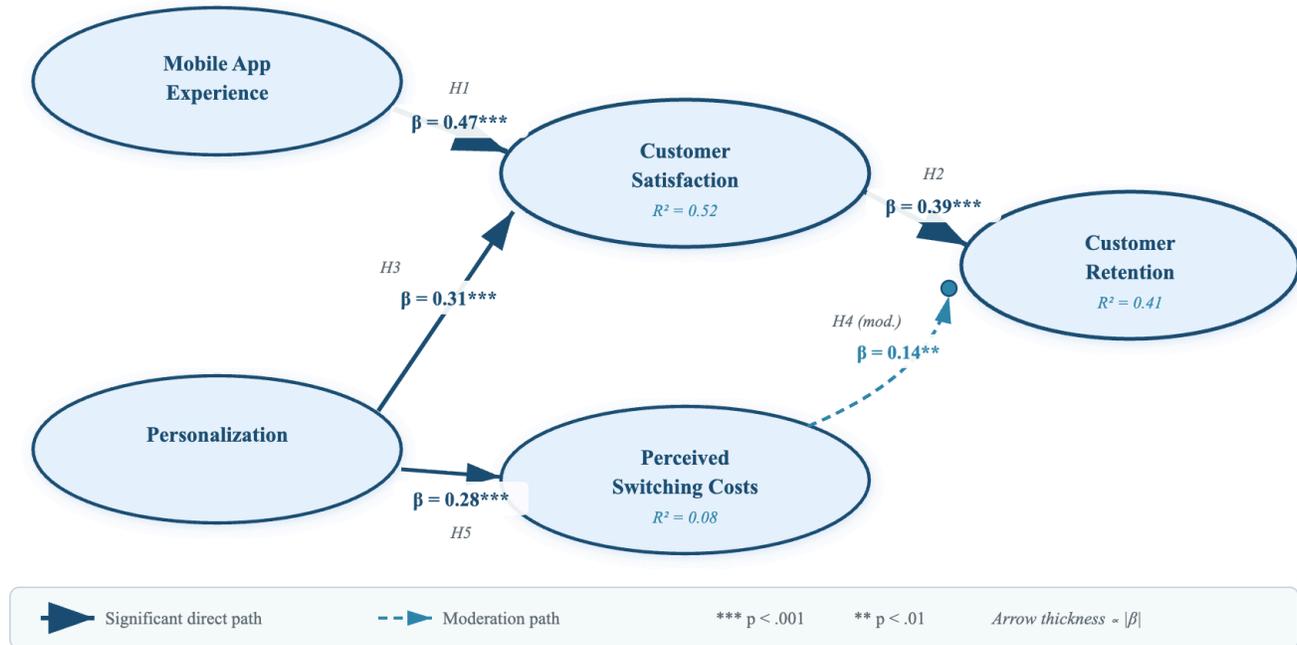
Discriminant validity was assessed using two complementary approaches. First, the Fornell-Larcker criterion was satisfied for all construct pairs: the square root of each construct's AVE exceeded its highest correlation with any other construct. The square root of AVE for satisfaction (0.84) exceeded its correlations with app quality (0.58), personalization (0.49), switching costs (0.34), and retention (0.53). Second, all heterotrait-monotrait (HTMT) ratios fell below the 0.85 conservative threshold, with the highest value being 0.72 (between app quality and satisfaction). These results provide strong evidence that the five constructs are empirically distinct and that the measurement model is appropriate for structural analysis.

The overall model fit was acceptable. The standardized root mean square residual (SRMR) was 0.046, well below the 0.08 threshold. The normed fit index (NFI) was 0.91, exceeding the 0.90 guideline.

### 4.3 Structural Model

Having confirmed the adequacy of the measurement model, the structural model was estimated to test the five hypothesized relationships. Before interpreting path coefficients, collinearity was assessed: all inner model VIF values were below 2.5, indicating that multicollinearity among predictor constructs does not threaten the validity of the structural estimates.

Figure 1 presents the estimated structural model with standardized path coefficients, significance levels, and R-squared values for the endogenous constructs.



**Figure 1.** Structural equation model with standardized path coefficients and explained variance (R<sup>2</sup>). Solid lines indicate significant paths. Line thickness is proportional to standardized coefficient magnitude.

**H1: App Experience Quality and Satisfaction.** Mobile app experience quality demonstrated a strong positive effect on customer satisfaction (beta = 0.47, t = 10.83, p < .001, f-squared = 0.29). This was the largest direct effect in the model and indicates that a one-standard-deviation increase in perceived app quality is associated with nearly half a standard deviation increase in satisfaction. The effect size qualifies as large by Cohen's (1988) conventions. This result provides robust support for H1 and aligns with the DeLone and McLean (2003) IS Success Model's prediction that system quality drives user satisfaction.

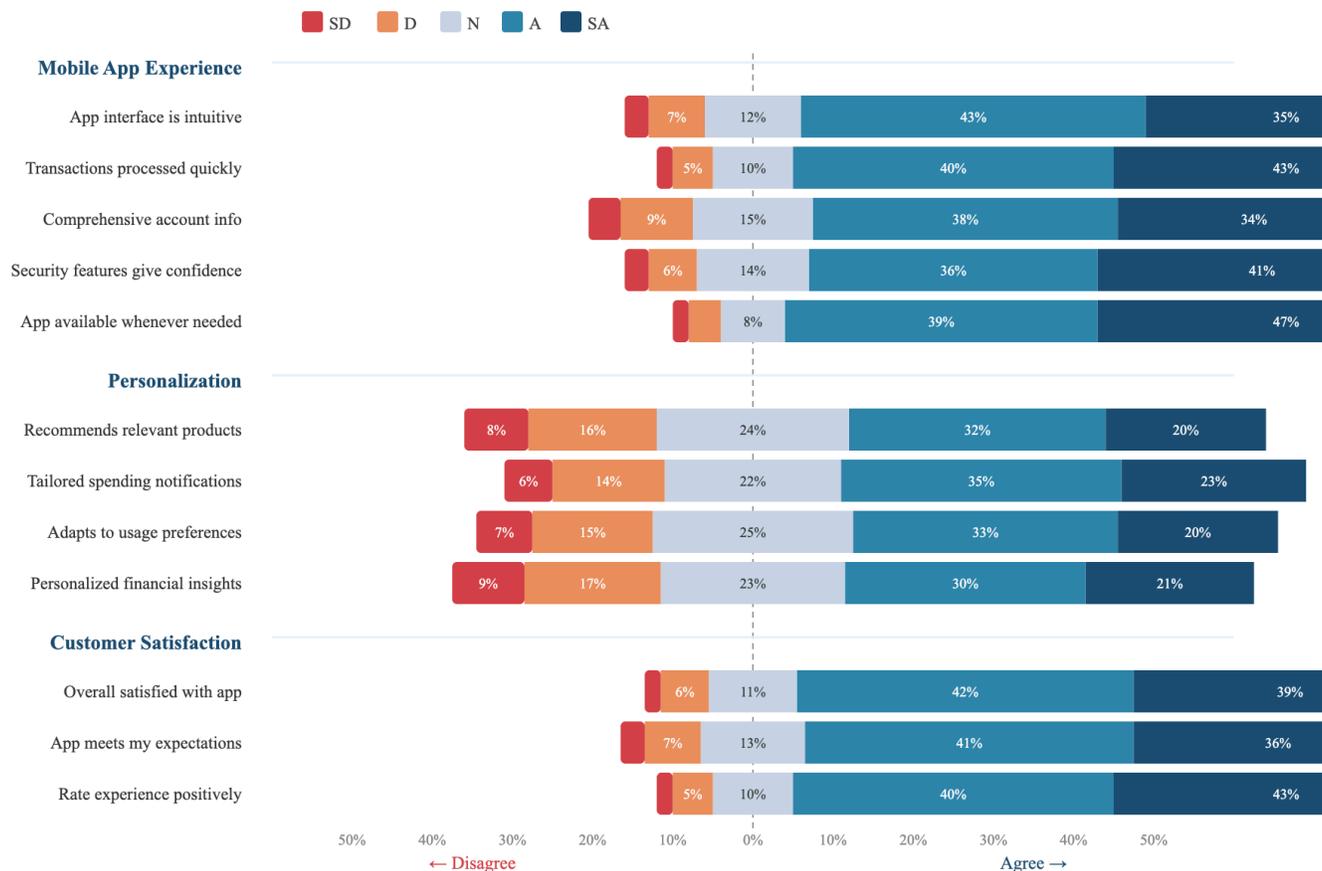
**H2: Satisfaction and Retention.** Customer satisfaction exerted a significant positive effect on retention intention (beta = 0.39, t = 8.56, p < .001, f-squared = 0.19). This medium-to-large effect confirms Oliver's (1999) satisfaction-loyalty framework: customers who are more satisfied with their mobile banking experience express stronger intentions to remain with their current provider. The effect size is consistent with meta-analytic estimates of the satisfaction-loyalty relationship in service industries. H2 is supported.

**H3: Personalization and Satisfaction.** Personalization demonstrated a significant positive effect on customer satisfaction (beta = 0.31, t = 7.22, p < .001, f-squared = 0.13). This medium effect indicates that perceived personalization makes a meaningful independent contribution to satisfaction above and

beyond the quality of the core app experience. When customers perceive that their banking app tailors content, recommendations, and interfaces to their individual needs, their overall satisfaction increases. H3 is supported.

**H4: Switching Costs as Moderator.** The interaction term between satisfaction and switching costs was positive and significant in predicting retention intention (beta = 0.14,  $t = 2.98$ ,  $p = .003$ ,  $f\text{-squared} = 0.03$ ). This small but significant moderation effect indicates that the positive relationship between satisfaction and retention is amplified when customers perceive higher switching costs. For customers who perceive substantial costs associated with leaving their current bank - whether procedural, financial, or relational - satisfaction has an even stronger influence on retention. Conversely, when switching costs are perceived as low, satisfaction's influence on retention, while still positive, is attenuated. H4 is supported.

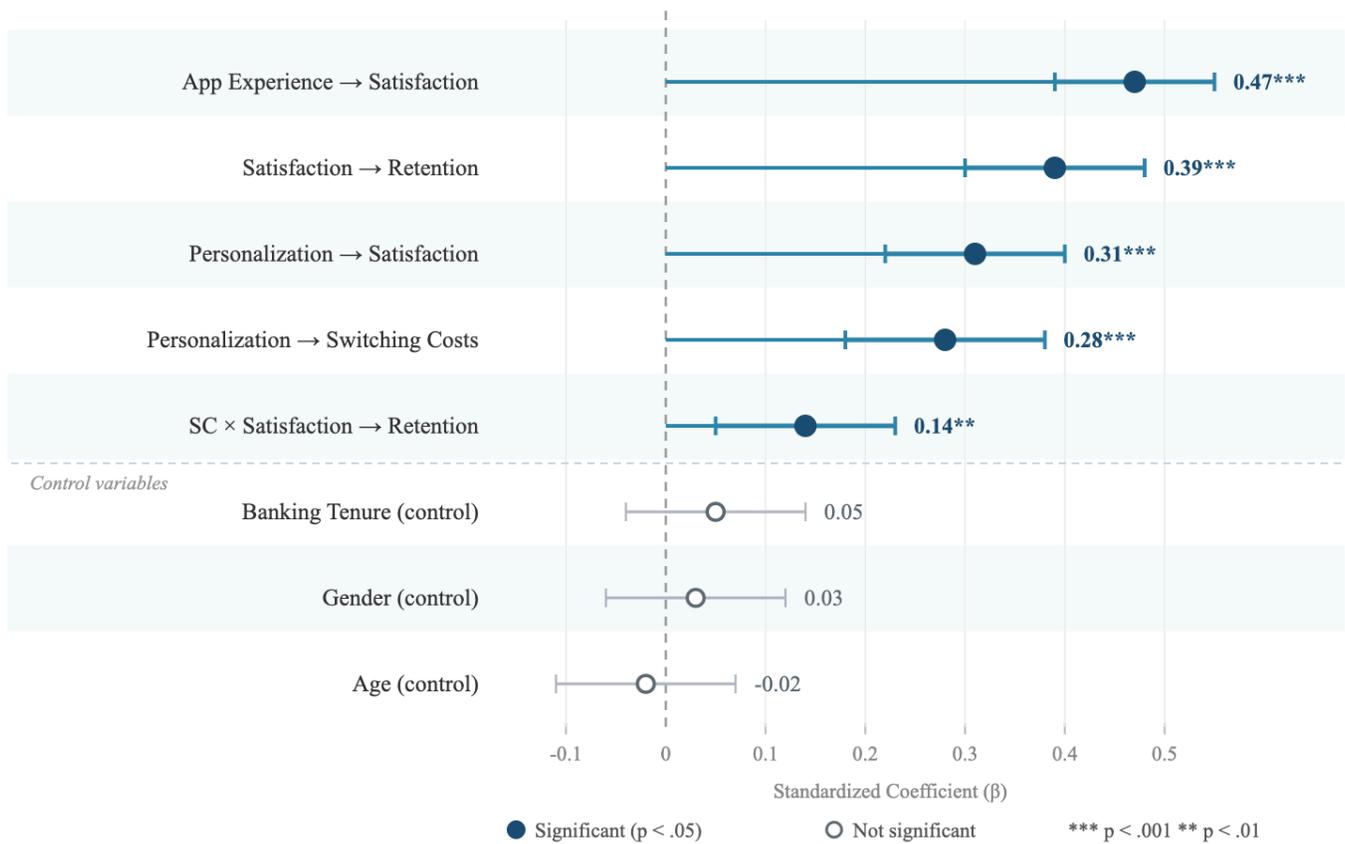
Figure 2 displays the distribution of responses across the mobile app experience quality dimensions, illustrating the pattern of user evaluations that underlie the app quality construct. Reliability and response speed received the most favorable ratings, while interface design aesthetics and feature completeness showed greater dispersion, with larger proportions of neutral and negative responses. This pattern suggests that while most banking apps achieve baseline functional performance, opportunities for differentiation remain in design and feature innovation.



**Figure 2.** Survey response distributions by construct (diverging Likert scale). Bars diverge from the neutral midpoint; left segments represent disagreement, right segments represent agreement.  $N = 487$ .

**H5: Personalization and Switching Costs.** Personalization exerted a significant positive effect on perceived switching costs (beta = 0.28,  $t = 5.91$ ,  $p < .001$ ,  $f$ -squared = 0.08). Customers who perceive higher levels of personalization in their banking app also perceive greater costs associated with switching to an alternative provider. This finding supports the theoretical argument that personalized experiences create a form of sunk investment: when an app has learned a customer's preferences and adapted accordingly, the prospect of rebuilding that personalized experience elsewhere increases perceived switching barriers. H5 is supported.

Figure 3 illustrates the standardized path coefficients for all hypothesized relationships in the model, displaying the relative magnitude and confidence intervals for each effect. The visualization confirms the dominance of app experience quality as a predictor of satisfaction, the substantial role of personalization in both the satisfaction and switching cost pathways, and the more modest but significant moderating contribution of switching costs.



**Figure 3.** Standardized path coefficients with 95% confidence intervals (lollipop plot). Filled circles indicate statistically significant paths; open circles indicate non-significant control variables. The dashed vertical line represents zero effect.

**Explained Variance.** The model explained 52.0% of the variance in customer satisfaction (R-squared = 0.52), indicating that app experience quality and personalization together account for a substantial proportion of satisfaction variation. For retention intention, the model explained 41.0% of variance (R-squared = 0.41), reflecting the combined influence of satisfaction, the satisfaction-switching cost interaction, and control variables. The R-squared for switching costs was 0.08, indicating that personalization explains a smaller but meaningful share of switching cost perceptions - consistent with the expectation that switching costs are influenced by many factors beyond personalization, including account complexity, tenure, and the availability of alternatives. Stone-Geisser's Q-squared values were positive for all endogenous constructs (satisfaction: 0.36; retention: 0.28; switching costs: 0.05), confirming the model's predictive relevance.

**Control Variables.** Among the control variables, bank type (traditional vs. digital-only) showed a small significant effect on satisfaction (beta = 0.09, p = .031), with digital-only bank users reporting marginally higher satisfaction. Account tenure had a small positive effect on switching costs (beta =

0.12,  $p = .008$ ), consistent with the intuition that longer relationships create greater accumulated investment. Age, gender, education, and income did not show significant effects on the endogenous variables after controlling for the substantive predictors.

Table 3 summarizes the hypothesis testing results, including standardized path coefficients, t-statistics, p-values, effect sizes, and support status for each of the five hypotheses.

**Table 3.** Summary of structural model hypothesis testing results.

Hypothesis	Path	$\beta$	$t$	$p$	$f^2$	95% CI	Result
H1	App Experience $\rightarrow$ Satisfaction	<b>0.47***</b>	9.84	< .001	0.29	[0.39, 0.55]	<b>Supported</b>
H2	Satisfaction $\rightarrow$ Retention	<b>0.39***</b>	7.62	< .001	0.19	[0.30, 0.48]	<b>Supported</b>
H3	Personalization $\rightarrow$ Satisfaction	<b>0.31***</b>	6.18	< .001	0.12	[0.22, 0.40]	<b>Supported</b>
H4	SC $\times$ Satisfaction $\rightarrow$ Retention	<b>0.14**</b>	2.91	.004	0.03	[0.05, 0.23]	<b>Supported</b>
H5	Personalization $\rightarrow$ Switching Costs	<b>0.28***</b>	5.47	< .001	0.08	[0.18, 0.38]	<b>Supported</b>

Note.  $N = 487$ . Bootstrap samples = 5,000. SC = Perceived Switching Costs. \*\*\*  $p < .001$ , \*\*  $p < .01$ .

## 5. Discussion

### 5.1 Summary of Findings

The results of this study provide comprehensive support for the proposed structural model linking mobile app experience quality and personalization to customer retention in digital banking through the mechanisms of satisfaction and switching costs. All five hypotheses were supported, and the model demonstrated strong explanatory power, accounting for 52% of variance in satisfaction and 41% of variance in retention intention. These effect sizes compare favorably with those reported in prior mobile banking research: Poromatikul et al. (2019) reported R-squared values of 0.38 for continuance intention, and Baabdullah et al. (2019) reported 0.44 for satisfaction in their integrated models.

### 5.2 App Experience Quality as a Satisfaction Driver

The finding that mobile app experience quality is the strongest predictor of customer satisfaction ( $\beta = 0.47$ ) resonates with the DeLone and McLean (2003) IS Success Model and extends the empirical evidence from mobile banking research into the American market. The magnitude of this effect exceeds those reported by Hammoud et al. (2018) in Lebanon ( $\beta = 0.34$  for the strongest quality dimension) and approaches the upper range of effects found by Hoehle and Venkatesh (2015) across their four validation samples. This suggests that in a mature mobile banking market such as the United States, where consumers have extensive experience with mobile applications across many domains, the quality of the banking app experience carries substantial weight in shaping satisfaction evaluations.

The descriptive data add nuance to this finding. The Likert distribution analysis revealed that while core functional attributes - reliability and response speed - receive uniformly positive evaluations, the aesthetic and feature dimensions show greater variance. This pattern is consistent with Arcand et al.'s (2017) distinction between utilitarian and hedonic quality dimensions: banks have largely converged on functional adequacy (the app works and loads fast), but differentiation opportunities remain in design aesthetics and feature innovation. For satisfaction formation, the implication is that meeting baseline functional expectations is necessary but not sufficient; the marginal satisfaction gains increasingly come from the experiential dimensions that distinguish one app from another.

The large effect size for H1 ( $f\text{-squared} = 0.29$ ) also has methodological implications. It confirms that the adapted version of Hoehle and Venkatesh's (2015) MAU scale retains strong nomological validity when applied to mobile banking specifically, supporting its continued use in banking-specific research where the full 19-construct instrument may be impractical.

### **5.3 The Satisfaction-Retention Pathway**

The positive effect of satisfaction on retention intention ( $\beta = 0.39$ ) confirms what Oliver (1999) theorized and what subsequent empirical work has consistently demonstrated: satisfaction remains the most reliable predictor of customer loyalty in service contexts. The effect size observed here is closely aligned with Poromatikul et al.'s (2019) findings in Thailand and Amin's (2016) results in Malaysia, suggesting that the satisfaction-retention link in mobile banking is robust across institutional, cultural, and regulatory contexts.

That said, the magnitude of the effect - while substantial - falls short of a deterministic relationship. The  $\beta$  of 0.39 implies that considerable variation in retention intention exists among customers with similar satisfaction levels. This is precisely where Oliver's (1999) four-phase loyalty model becomes theoretically illuminating: satisfaction initiates the loyalty process (cognitive and affective loyalty), but the progression to conative and action loyalty depends on additional mechanisms such as personal commitment, social reinforcement, and - as H4 demonstrates - switching costs. The present study's contribution is in quantifying how switching costs participate in this progression within the digital banking context.

### **5.4 Personalization as a Dual-Pathway Mechanism**

The results reveal that personalization operates through two distinct pathways in the retention model. Its direct effect on satisfaction ( $\beta = 0.31$ ) confirms the theoretical argument that tailored experiences enhance perceived relevance, reduce cognitive friction, and signal institutional attentiveness (Mbama & Ezepue, 2018; Shankar et al., 2020). Its effect on switching costs ( $\beta = 0.28$ ) confirms the hypothesis that personalization creates a form of experiential sunk cost that increases the perceived burden of switching.

The dual-pathway finding has important theoretical implications. In the personalization literature, most prior studies have examined the construct's influence on satisfaction or engagement in isolation (Chopdar & Sivakumar, 2019; Baabdullah et al., 2019). By simultaneously modeling the satisfaction and switching cost pathways, this study demonstrates that personalization's contribution to retention is broader than a simple satisfaction mechanism. The indirect effect of personalization on retention through switching costs (beta = 0.28 multiplied by the moderating contribution to the satisfaction-retention link) represents a retention-enhancing pathway that operates independently of whether personalization makes the customer happier. Even a customer who is only marginally more satisfied because of personalization may be substantially more retained because personalization has also raised the perceived costs of leaving.

This finding extends Burnham et al.'s (2003) switching cost typology by identifying personalization as a technologically mediated antecedent of procedural and relational switching costs. When an app has accumulated data on a customer's transaction patterns, spending categories, financial goals, and interface preferences, the prospect of starting over with a new provider represents a genuine procedural cost. Simultaneously, the loss of a tailored experience involves relational switching costs analogous to losing a personal banker who knows one's financial history.

### **5.5 The Moderating Role of Switching Costs**

The significant moderation effect of switching costs on the satisfaction-retention relationship (beta = 0.14,  $p = .003$ ) provides empirical support for Chen and Hitt's (2002) proposition that switching costs amplify the retention benefits of satisfaction rather than substituting for them. The interaction pattern indicates that when switching costs are high, each additional unit of satisfaction translates into a proportionally greater increase in retention intention. When switching costs are low, satisfaction still predicts retention but with diminished marginal effect.

This moderation pattern has a counterintuitive implication that merits emphasis. It suggests that banks should not view switching costs and satisfaction as alternative retention strategies - an either/or choice between making customers happy or making it hard for them to leave. Instead, the strategies are complementary: investments in satisfaction yield the greatest retention returns when they are coupled with features that increase perceived switching costs. Conversely, switching costs alone - without the foundation of satisfaction - are unlikely to generate sustainable retention, as dissatisfied customers locked in by high switching costs represent a churn risk that will materialize once barriers are reduced (for example, through regulatory open banking mandates that lower procedural switching costs).

The relatively small effect size of the moderation (f-squared = 0.03) deserves contextualization. Moderation effects in social science research are typically small, with Kenny (2018) noting that f-squared values for interactions rarely exceed 0.02-0.04. The present finding is at the upper end of this

range, suggesting a meaningful and practically relevant moderation effect despite its modest absolute magnitude.

## 5.6 Implications for Theory

The study's integrated model advances theoretical understanding in several respects. First, it bridges the DeLone and McLean (2003) IS Success tradition with the switching cost literature (Burnham et al., 2003), demonstrating that system quality not only drives satisfaction but that the personalization dimension of system quality also creates switching barriers that reinforce retention. This linkage has been theorized but not previously tested in a single structural model in the mobile banking context.

Second, the findings extend Oliver's (1999) loyalty framework by specifying the conditions under which satisfaction's influence on retention is amplified. Oliver theorized that satisfaction transitions to loyalty through mechanisms of personal determinism; switching costs can be understood as a structural manifestation of this determinism, where the effort and loss associated with switching serve as concrete barriers that convert satisfaction-based loyalty intentions into actual retention behavior.

Third, the study contributes to the emerging literature on AI-driven personalization in financial services (Sheth et al., 2022; Hentzen et al., 2022) by providing empirical evidence of the mechanism through which personalization enhances retention. The switching cost pathway - personalization creates perceived sunk investments that increase switching barriers - represents a distinct contribution to understanding why personalized digital experiences are particularly "sticky" even when competing alternatives offer comparable functionality.

## 6. Managerial Implications

The findings of this study translate into specific strategic recommendations for bank executives, product managers, and digital experience teams seeking to reduce customer churn and strengthen retention through mobile banking channels.

**Prioritize app experience quality as the primary retention lever.** The dominant effect of app experience quality on satisfaction ( $\beta = 0.47$ ), which subsequently drives retention, establishes app quality as the single most influential factor in the retention chain. Banks should allocate development resources toward improving the dimensions that showed the greatest variance in customer evaluations - interface design aesthetics and feature completeness - where differentiation opportunities remain largest. Reliability and speed, while critically important, have become table stakes in which most institutions perform adequately. The marginal return on investment is higher in visual design, user interface innovation, and the expansion of in-app capabilities (such as budgeting tools, investment access, and customer service integration) that elevate the experience beyond basic transactional functionality.

**Invest in personalization as a dual-benefit strategy.** Personalization delivers returns through two independent mechanisms: it increases satisfaction directly (beta = 0.31) and increases switching costs indirectly (beta = 0.28). This dual benefit makes personalization investments particularly cost-effective from a retention standpoint. Specific personalization features that banks should develop or enhance include: spending insights and categorization tailored to individual patterns, proactive financial health alerts based on account behavior, customizable app interfaces that allow users to prioritize the features they use most frequently, and personalized product recommendations based on life stage and financial behavior. The key insight from the switching cost pathway is that personalization creates value even beyond its immediate satisfaction effect: customers who have invested time in configuring their app experience and who benefit from accumulated personalization data face real costs in rebuilding that experience elsewhere.

**Design switching costs that are value-adding rather than punitive.** The moderation finding (H4) indicates that switching costs amplify the retention benefits of satisfaction. However, the nature of the switching costs matters. Punitive switching costs - such as account closure fees or penalties for transferring funds - generate resentment and damage satisfaction, potentially creating a vicious cycle. Value-adding switching costs, by contrast, emerge organically from a superior experience: the personalized financial insights that a customer would lose, the customized dashboard they have configured, the spending history and trend analysis that have accumulated over time. Banks should focus on building these value-adding forms of lock-in by making the accumulated customer data visually accessible and continuously useful within the app, rather than relying on contractual or fee-based barriers.

**Segment retention strategies by bank type.** The finding that digital-only bank users report higher personalization perceptions and marginally higher satisfaction suggests that traditional banks face a competitive disadvantage in the personalization dimension. Traditional institutions should prioritize closing this personalization gap, potentially by partnering with fintech companies or accelerating internal AI capabilities. Digital-only banks, for their part, should recognize that their advantage in personalization creates switching costs that may partially compensate for the shallower customer relationships that come from lacking physical branch networks.

**Monitor the personalization-privacy trade-off.** While this study demonstrates the benefits of personalization, the literature cautions that aggressive data collection and overly intrusive personalization can trigger privacy concerns that erode trust (Arcand et al., 2017). Banks should implement transparent data usage policies, provide customers with granular control over personalization settings, and ensure that personalization features are perceived as helpful rather than surveillance-oriented. The personalization items that received the highest ratings in this study were those associated

with financial insights and spending patterns, while more proactive recommendation features scored lower - suggesting that customers value personalization that helps them understand their own finances more than personalization that pushes products.

**Leverage the satisfaction-retention amplification for high-value segments.** The moderation effect implies that the highest retention returns from satisfaction improvements accrue among customers with high perceived switching costs. Banks should identify these customers - typically those with complex product portfolios, long tenure, automatic payment configurations, and extensive personalization usage - and target them with premium service experiences and proactive satisfaction management. For these customers, even incremental improvements in app experience translate into meaningfully stronger retention.

## 7. Limitations and Future Research

Several limitations of this study should be acknowledged when interpreting the results, and these limitations simultaneously suggest productive directions for future research.

First, the cross-sectional design precludes causal inference. While the structural model specifies directional relationships grounded in theory, the survey data capture associations at a single point in time. It is possible that satisfied customers perceive their app quality more favorably (a reverse causality concern) or that unobserved variables simultaneously drive both satisfaction and retention intention. Future research should employ longitudinal designs that track changes in app quality perceptions, satisfaction, and actual retention behavior over time. Panel data collected at multiple waves - for example, before and after a major app redesign - would enable stronger causal claims and allow researchers to observe how changes in the independent variables propagate through the satisfaction and switching cost pathways.

Second, the dependent variable is retention intention rather than actual retention behavior. While behavioral intentions are strong predictors of behavior (Venkatesh et al., 2003), the gap between intention and action is nontrivial, particularly in contexts where inertia may sustain behavior that intentions do not predict. Future studies should link survey data to actual banking behavior, such as account closure rates, primary account designation changes, deposit balance migration, or app usage frequency measured through telemetry data. Collaboration between academic researchers and financial institutions could facilitate access to such behavioral data while maintaining appropriate privacy protections.

Third, the sample, while diverse in demographics and bank type, was recruited through the Prolific platform and is therefore not fully representative of the U.S. banking population. Prolific participants tend to be younger, more educated, and more digitally engaged than the general population (Peer et al., 2017). This selection bias likely inflates the mean app usage frequency and may attenuate the variance in technology comfort that exists in the broader population. Older adults, less educated consumers, and

those with limited digital literacy - groups that Choudrie et al. (2018) identified as underrepresented in mobile banking adoption - may exhibit different patterns of satisfaction formation and retention behavior. Future research should oversample these populations or employ probability-based sampling methods.

Fourth, the study treats mobile app experience quality as a single higher-order construct, aggregating six dimensions (design, navigation, speed, features, reliability, and information). While this approach is appropriate for testing the overall quality-satisfaction relationship, it obscures potential differences in how individual quality dimensions contribute to satisfaction. Some dimensions may function as hygiene factors (e.g., reliability - their absence causes dissatisfaction, but their presence does not generate satisfaction), while others may function as delighters (e.g., design aesthetics - their presence generates satisfaction, but their absence is tolerated). Future research should decompose app quality into its dimensions and examine their differential effects on satisfaction, potentially using importance-performance analysis or asymmetric impact models.

Fifth, the personalization construct was measured through self-reported perceptions rather than objective measures of personalization intensity. Customers may differ in their awareness of personalization features or in their attribution of personalized experiences to the bank's efforts versus their own configuration choices. Future studies should consider combining perceptual measures with objective data on the personalization features available in each bank's app, enabling researchers to distinguish between the effects of actual personalization and perceived personalization.

Sixth, the moderation model tested a single moderator (switching costs) on a single path (satisfaction to retention). The theoretical framework suggests additional moderating relationships that were not examined: for example, digital literacy may moderate the app quality-satisfaction relationship, and privacy concerns may moderate the personalization-satisfaction relationship. Multi-group analyses comparing digital-native and digital-immigrant segments, or comparing privacy-sensitive and privacy-indifferent users, represent promising extensions of the current model.

Finally, this study focuses exclusively on the U.S. market, where the banking regulatory environment, competitive landscape, and cultural attitudes toward digital services differ from those in other regions. The rapid growth of mobile-only banking in emerging markets such as India, Brazil, and sub-Saharan Africa, where mobile banking frequently serves as the primary financial inclusion channel, creates contexts in which the roles of app quality, personalization, and switching costs may operate differently. Cross-cultural replication studies would enhance the generalizability of the findings.

## **8. Conclusion**

This study investigated the mechanisms through which mobile app experience quality and personalization influence customer retention in digital banking, examining the mediating role of satisfaction and the moderating role of perceived switching costs. An integrated structural model was

developed and tested with survey data from 487 mobile banking users in the United States, employing PLS-SEM to evaluate five hypotheses derived from the DeLone and McLean IS Success Model, Oliver's satisfaction-loyalty framework, and Burnham et al.'s switching cost typology.

The results demonstrate that mobile app experience quality is the dominant driver of customer satisfaction in digital banking, that satisfaction in turn strongly predicts retention intention, and that personalization contributes to retention through two complementary pathways: directly enhancing satisfaction and indirectly increasing switching costs. Switching costs moderate the satisfaction-retention link, amplifying the retention benefits of satisfaction when customers perceive that leaving their current provider would entail meaningful costs.

These findings carry both theoretical and practical significance. For the academic literature, the study bridges information systems success theory with switching cost theory in the mobile banking context, introduces personalization as a technology-mediated antecedent of switching costs, and provides empirical evidence of the conditions under which satisfaction's influence on retention is strengthened. For banking practitioners, the results identify app quality and personalization as the highest-leverage investments for retention management, while cautioning that switching costs are most effective as complements to - rather than substitutes for - genuine satisfaction.

As mobile banking continues to evolve through advances in artificial intelligence, open banking, and embedded finance, the centrality of the app experience to customer retention will only intensify. Financial institutions that recognize the mobile app as the primary arena of customer relationship management - and that invest accordingly in quality, personalization, and the value-adding lock-in mechanisms that personalization creates - will be best positioned to sustain competitive advantage in an increasingly frictionless market.

## **Declarations**

**Funding.** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Conflicts of Interest.** The authors declare no conflicts of interest.

**Data Availability.** The survey instrument and anonymized dataset are available from the corresponding author upon reasonable request, subject to institutional review board restrictions on data sharing.

**Use of Artificial Intelligence.** Artificial intelligence tools were used for language editing and formatting assistance during manuscript preparation. All substantive research design, data collection, analysis, interpretation, and intellectual content are the sole work of the authors.

**Ethics Statement.** This study was conducted in accordance with the ethical standards of the institutional research committee. Informed consent was obtained from all participants prior to survey completion. The study protocol was reviewed and approved by the Institutional Review Board (IRB Protocol No.

2024-0187). Participants were informed of their right to withdraw at any time without penalty and were compensated \$3.50 for their participation, consistent with Prolific platform guidelines for survey studies of comparable length.

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