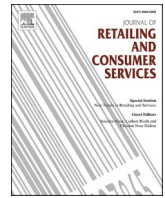








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## A longitudinal big data approach to theorizing consumers' continuance intention to use loyalty apps

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### ABSTRACT

In an increasingly competitive fintech landscape, the ability to sustain user satisfaction and continuance intention beyond initial adoption is emerging as a resolute frontier. However, most prior studies have modeled continuance intention through survey-driven approaches and rarely explore organically expressed feedback in loyalty-centric fintech settings. This paper explores the nuances of post-adoption behaviors within fintech loyalty applications by analyzing the multilingual reviews posted by users on the app store as a way to mine their collective voice, or User Generated Content (UGC). Employing a sequential mixed-methods approach, we integrated confirmatory regression modeling of continuance behavior with topic modeling, sentiment analysis, hierarchical clustering, and Latent Dirichlet Allocation (LDA). Our analysis on 5669 app reviews revealed a dynamically-configured constellation of service quality, information quality, system quality, perceived usefulness, and evolving perceptions of risk. These elements enable user satisfaction and increase intention to continue using the service. It is worth mentioning that perceived risk silently acts as a dispositional control factor that can significantly erode loyalty away from positive user experiences. Merging classical theoretical approaches with unstructured user feedback enhances our understanding of loyalty within fintech in practice. This research provides a comprehensive framework to establish trust, satisfaction, and continuance use. These insights will enable developers, managers, and policy makers to forge resilient connections with users in a trust-scarce, value-starved, experience-saturated environment where lasting competitive advantage resides. We recommend that fintech loyalty platforms embed real-time feedback systems, visible security cues, and performance-aligned incentives to translate satisfaction into sustained user engagement.

### 1. Introduction

The convergence of financial technology (fintech) and customer loyalty features has redefined consumer-brand interactions across digital economies. Loyalty-enabled fintech platforms, offering personalized rewards, discounts, and seamless transactional experiences, are increasingly becoming central to building customer relationship (Barbu et al., 2021). These fintech applications not only attract users with immediate financial incentives but also aim to cultivate long-term satisfaction through convenience, gamification, and personalized benefits. As fintech app ecosystems become more crowded and competitive,

loyalty features increasingly struggle with high user drop-off rates after the initial trial period, because in such a landscape, if the service experience does not meet users' expectations, they would cease utilizing it (Savitha et al., 2022). This is further exacerbated by the fact that increasing competition and the convenience of digital technology provide customers with diverse options, and they can easily switch to other FinTech services at low cost (Wang et al., 2019). Research shows that more than 70 % of mobile app users abandon platforms within the first 90 days (Kidman et al., 2024), and in the case of fintech based loyalty platforms, attrition can cripple program profitability by severing recurring customer touchpoints. The divergence is even more

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pronounced because users' reasons for churn are not always captured by traditional survey tools, leaving out subtle but influential factors such as negative experiences, unmet expectations, perceived risks, or breakdowns in perceived usefulness (Bellary et al., 2024; Appiah and Agblewornu, 2025). Despite emerging research in areas like mobile payments (Laksamana et al., 2023) and open-banking-apps (Desiraju et al., 2024), comprehending the continuous use of fintech application, markedly echo towards loyalty platforms, remains underrepresented in the literature.

Saudi Arabia offers a particularly compelling and timely context for investigating loyalty app continuance behaviors. As part of its Vision 2030 digital transformation agenda, the Kingdom has assertively advanced its fintech infrastructure, with digital wallets and loyalty-driven fintech services rapidly gaining traction among both consumers and merchants. The Saudi loyalty program market is projected to reach USD 1.37 billion by 2029, growing at a 13 % CAGR from 2025's market worth of USD 0.84 billion, driven by government digitization mandates, a young mobile-first population, and the expansion of payment-linked reward systems (Research and Markets, 2025). Fintech companies are diversifying their loyalty strategies, embedding them in digital wallets, e-payment apps, and personalized merchant offers, thus intensifying competition and elevating user expectations. Among emerging players, WalaPlus stands out as a novel entrant to the Saudi fintech ecosystem. It offers businesses a tool for loyalty-driven promotions while simultaneously serving as a platform that bridges consumers and merchants (FintechSaudi, 2024). Yet, despite this momentum, platforms such as WalaPlus face persistent challenges around user disengagement after initial adoption, echoing global concerns over app abandonment and loyalty concerns (Huang et al., 2023).

In Fintech loyalty-app contexts, where users frequently share sensitive payment data and rely on reward systems for tangible value, concerns over risk, whether related to data breaches, app instability, or unreliable redemption. It can erode satisfaction even when core services function adequately. Moreover, while system quality, information clarity, and support responsiveness continue to shape perceived value, users' cognitive assessments are ultimately synthesized through a central paradigm (Abed and Alkadi, 2025). This paradigm is user satisfaction, which intercedes the decision to continue or abandon app usage (Bergmann et al., 2023). While initial adoption drivers have been widely studied through frameworks like the Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA) and Unified Theory of Acceptance and Use of Technology (UTAUT) (Kumar and Rani, 2024; Sharma et al., 2024; Venkatesh et al., 2012), there is significantly less understanding of what underpins users' ongoing use of with platforms. Yet, sustaining user satisfaction is the linchpin of these platforms' success, as it directly fuels long-term user value, strengthens merchant retention, and magnifies the network effects essential for expansion (Lemon and Verhoef, 2016).

Research consistently shows that users of smartphone-based financial services stick around when they feel the tools work well, are trustworthy, leave them satisfied, and keep delivering reliable performance, especially as firms roll out personalized perks and rewards (Shiau et al., 2020; Wang et al., 2019). Day-to-day decisions still pivot on how easy the service is to use, how quickly it lets people pay or bank on the go, and whether it feels secure enough to protect sensitive information (Laksamana et al., 2023; Liu et al., 2021). In markets marked by cultural differences and strict data rules, lingering doubts about privacy and platforms trustworthiness, plus the specter of fraud, repeatedly shape whether customers keep coming back after the first download (Qatawneh et al., 2024; Roh et al., 2024). Theoretical lenses such as Expectation Confirmation Theory (Savitha et al., 2022) and the IS Success Model (Chand et al., 2025) give researchers useful maps for thinking about post-adoption life (Abed and Alkadi, 2025), yet real-world evidence on how users voice their praise-or-gripes through everyday channels like app store reviews remains surprisingly thin. Insights yielded from past survey research are resourceful, hitherto, often

fail to capture how consumers experience technology in real time, specifically when post-adoption behaviors are shaped by subtle breakdowns in perceived value, trust, or satisfaction (Yi et al., 2024). On the other hands, these survey methods can also introduce recall bias, filter out less digitally engaged users, or miss experiential pain points that users might not articulate directly (Chakraborty et al., 2024). Moreover, continuance behaviors unfold over time and within platform-specific contexts, yet few studies have examined naturally occurring feedback across actual user journeys.

In light of these limitations, post-adoption feedback expressed through user-generated content (UGC) orchestrates a compelling alternative (Yi et al., 2024). App-store reviews, social media comments, and other unsolicited digital traces offer access to how users actually experience satisfaction, disconfirmation, and perceived risk during real use. Although recent studies have begun to usher in the use of UGC to explore post-adoption feedback. Such literature continues to privilege feature-level sentiments over behavioral mechanisms. Researchers have mined app reviews to examine intentions to promote mobile banking apps (Basu et al., 2024), explore user recommendation behavior in payment apps (Verkijika and Neneh, 2021), assess perceived satisfaction in voice assistants (Kumar et al., 2024), and extract privacy-related concerns in mobile usage (Zhang et al., 2025). Other studies, such as Wang et al. (2024) and Bellary et al. (2024), adopted hybrid UGC-survey designs where UGC was initially mined to identify experiential constructs, but the final analysis relied entirely on PLS-SEM using survey data, limiting theoretical continuity between user narratives and model validation.

This methodological fragmentation, where UGC is treated as an exploratory prelude rather than part of an integrated analytic arc, continues to constrain explanatory depth in post-adoption research (Yi et al., 2024). Despite growing interest in UGC research, a fundamental conceptual gap persists: continuance intention has yet to be systematically theorized or modeled through organically expressed user experience. Prior work offers limited conceptual clarity regarding a systematic trajectory that begins with inductive analysis of user-generated content, advances through theory-informed construct development, and culminates in empirical validation via confirmatory techniques. Among the discussed studies, loyalty-based fintech platforms are largely absent from UGC-based modeling of post-adoption behavior. To date, no stream of inquiry grounded in either structured surveys or emergent UGC data methodologies has articulated an empirically substantiated account of continuance intention within loyalty-driven fintech ecosystems. This omission leaves both theory and practice underserved. As scholars lack an integrated mixed-method model and practitioners are left without behavioral insight to design loyalty mechanisms that sustain consumer engagement.

This study addresses these gaps by using multilingual, unsolicited app reviews to model how users articulate contentment and perpetuation towards loyalty-centric fintech applications. In doing so, it offers an empirically grounded and behaviorally expressive view of continuance that existing survey-based and UGC-mining approaches have yet to provide. Guided by these gaps, this study poses the following research questions:

RQ1: What are the factors that influence the satisfaction and continuance intention of users of fintech loyalty application?

RQ2: How do these factors interact to shape users' decisions to continue using fintech loyalty application?

To answer these questions, this study adopts a sequential mixed-methods approach to develop a framework identifying key factors that influences user satisfaction and continuance intention in fintech loyalty applications, thus contributing to information systems research (Basu et al., 2024; Bellary et al., 2024). Data were collected from user-generated app-store reviews, and variables were extracted using data-driven techniques such as Latent Dirichlet Allocation (LDA) topic

modeling (Kar and Dwivedi, 2020; Kushwaha et al., 2021). Applying a triangulation-based methodology, theoretical constructs were first selected from existing literature. In the next step, multilingual UGC related to loyalty applications was preprocessed using natural language processing methods and analyzed to build the conceptual model through exploratory analysis. In the final phase, the model was validated using practical empirical evidence through confirmatory regression analysis.

By doing so, this study offers several contributions to the literature on post-adoption continuance behavior. First, it advances the emerging conversation on loyalty-based fintech applications by conceptualizing them as distinct from conventional financial technologies where continuance is not merely transactional but involves incentive structures, perceived fairness, and emotional satisfaction. Second, it responds to longstanding methodological critiques in technology adoption research by incorporating unsolicited user-generated content as a behavioral lens that enables a more situated and ecologically valid understanding of consumer experience. Third, the study introduces a triangulated approach that integrates topic modeling, theory-informed construct mapping, and confirmatory regression to offer a methodological synthesis that connects exploratory and explanatory aims. Fourth, it contributes to the literature on satisfaction and continuance intention by shifting the unit of analysis from intention to naturally expressed post-adoption sentiment which expands how core constructs such as satisfaction and continuance use are understood and measured. Fifth, it demonstrates how key constructs can emerge organically from user narratives which refine their conceptual boundaries beyond conventional item-driven survey design. Sixth, it introduces functional granularity into fintech continuance research by foregrounding loyalty-based business tools as a distinct sub-sector that encourages greater theoretical precision in digital platform classification. Finally, it advances a user-centered framework for interpreting post-adoption behavior that is responsive to the complexities of digitally mediated and incentive-based service environments.

The remainder of the paper is organized as follows: Section 2 reviews relevant literature; Section 3 outlines the research design and data methodology; Section 4 presents the exploratory findings; Section 5 validates the confirmatory inferences; and Sections 6 and 7 discuss the study's contributions, practical implications, limitations, avenues for future research and conclusion.

## 2. Literature review

### 2.1. Adoption and continuance use of fintech

Fintech applications have emerged with new features in mobile phones and other smart devices and have greatly changed the relationship between consumers and financial services by improving convenience, accessibility, and personalization. The first works regarding the adoption of fintech focused primarily on potential factors that affect the first acceptance and use, applying the Technology Acceptance Model (TAM) or Unified Theory of Acceptance and Use of Technology (UTAUT) model (Kumar and Rani, 2024; Sharma et al., 2024). While these models relied on ease of use, usefulness, performance expectancy, and social influence to establish initial adoption. Adoption alone does not guarantee success, as with the development of the industry, platforms need to be focused on users and their growing concern on integrating understanding around user's full engagement with a business and system as a whole is critical for its success (Abed and Alkadi, 2025; Qatawneh et al., 2024). Different from intention to adopt, continuance intention refers to decisions made by users post-adoption to keep using a particular technology (Liu et al., 2021; Savitha et al., 2022). Unlike adoption behaviors which are guided by novelty or social influence, continuance is determined through satisfaction, confirmation of expectations, perceived value, and trust developed over time.

Recent research further differentiates the motivational drivers behind adoption versus continuance (Bergmann et al., 2023; Ha et al.,

2024). Whereas early adoption often hinges on perceived innovativeness, continued usage depends heavily on service quality, reward fulfillment, transaction reliability, and risk mitigation. Additionally, user-generated content, including app reviews and online ratings, is becoming a crucial market intelligence source for identifying real-world motivators and obstacles to sustained engagement with fintech (Bhuiyan, 2025; Wang et al., 2024; Yi et al., 2024). Thus, it is necessary to redesign some of the established theories on fintech behavior to incorporate post-acceptance heuristics and evolving information.

### 2.2. Theoretical foundations: expectation confirmation theory and IS success model

The foundational understanding of post adoption continuing behavior of users in the context of financial technologies has to rely on well-articulated expectation user experience frameworks. Alongside Expectations Confirmation Theory (ECT), the Information Systems Success Model (ISSM) serves as the strongest cohesive theoretical framework motivating an information system productivity analysis as they provide complementary explanations for sustained user interaction. The foundation of each theory comes from the interrelationship of user satisfaction and continuous system use. ECT is a modification of Oliver's (1980) satisfaction theory on consumers which was later brought into information systems by Bhattacharjee (2001). It concentrates on the influence of post usage evaluations and the intent to use within a framework. According to Bhattacharjee (2001), the decision to retain a system is contingent upon a certain balance of pre-expectations and experience. Expectation hence works as a mediating variable on this framework. It is enhanced when the system makes positive disconfirmation, where performance exceeds expectations. But loses when the contrary holds (Abed and Alkadi, 2025; Kumar et al., 2024). In the context of loyalty applications within fintech, user expectations extend beyond mere functional capabilities. Emotional value additions, driven by factors such as trust, rewards, and other beneficial sentiments, play a critical role in user engagement. As a result, the confirmation process becomes highly dynamic and longitudinally sensitive to change.

Along with ECT model, the Information Systems Success Model includes an analysis of the technology's inherent quality attributes, moving beyond personal expectations. In DeLone and McLean 2003 formulation, system quality, information quality, and service quality have a joint aggregate impact on user satisfaction and sharp-elbowed continuance behavior. Stability and responsiveness are vital in predominantly transactional contexts like fintech (Werth et al., 2023). Any perceived drop in app performance may trigger negative evaluations post adoption and disrupt the precarious equilibrium of trust and satisfaction (Chand et al., 2025). In the same way, accuracy, timeliness, and relevance of information, regarding reward programs, transaction histories, and even privacy policies are vital to the users' assessment of service reliability (Roh et al., 2024). Service quality from customer support also serves to moderate these experiences, proving to be the key to neutralizing user dissatisfaction caused by technical or transactional counterfactuals. While these models have been validated through traditional structured survey-based research, they encounter new issues with rapidly changing digital ecosystems. By nature, fintech loyalty platforms foster continuous and dynamic user interactions where perceptions of satisfaction and risk oscillate based on immediate experiences with the service.

Thus, depending on static metrics does not reflect the dynamic changes in user opinions (Wang et al., 2024). To resolve this, the current research uses ECT and ISSM as the frameworks and adds UGC analysis to highlight user comments that go beyond the standard jeer, thus augmenting the theory with empirical evidence.

### 2.3. Factors influencing fintech use

The dynamics underlying the continuous use of fintech applications

unfold through a complex association of user expectations, experiential satisfaction, perceived value, and evolving risk perceptions. Within the conceptual lens provided by ECT and the ISSM, these dimensions emerge not as isolated drivers but as interconnected forces shaping sustained engagement, as orchestrated in Table 1. Satisfaction, rather than being a mere emotional outcome, reflects the cumulative effect of experience evaluations against pre-adoption expectations. When users find that fintech services deliver on promises related to usability, transactional efficiency, and reward fulfillment, positive experiential confirmation strengthens loyalty and deepens platform reliance (Liu et al., 2021; Savitha et al., 2022). Conversely, discrepancies between expectations and delivered performance risk triggering dissatisfaction, highlighting the fragile nature of user continuance in digitally competitive environments. The perceived enhancement of financial management and lifestyle benefits, often termed perceived usefulness, further reinforces satisfaction. Studies affirm that usefulness extends beyond functionality, encompassing seamless integration into users' financial routines, which magnifies the stickiness of fintech platforms (Laksamana et al., 2023; Shiau et al., 2020). Thus, perceived value creation remains a critical anchor for sustaining engagement beyond initial adoption. From the ISSM perspective, infrastructural quality dimensions exert profound influence. Robust system functionality and technical stability underpin trust in transaction processes, while the precision and clarity of information delivery reinforce perceptions of platform reliability (Chand et al., 2025; Roh et al., 2024). Service quality acts as a strategic arbitrator, enabling platforms to recover user confidence following service failures through responsiveness and empathetic support (Kushwaha et al., 2021; Liu et al., 2021; Yi et al., 2024). Risk perceptions, albeit dormant, loom large over the trajectory of satisfaction. Financial security concerns, data privacy concerns, and lack of transparency erode service perceptions that are, otherwise, favorable (Appiah and Agblewornu, 2025; Ha et al., 2024; Zhao et al., 2024). Meeting these concerns is important for user emotional attachment to fintech platforms.

While existing studies have provided substantial insights into the determinants of fintech adoption and continuance, much of this research remains anchored in structured survey-based methodologies, capturing static perceptions rather than evolving user experiences. Although frameworks such as ECT and the ISSM have effectively explained post-adoption behavior, they have typically done so within controlled empirical setups, often overlooking the organic complexity of real-world interactions. Additionally, factors such as service failures, perceived risk evolution, and emotional satisfaction dynamics are often insufficiently captured through traditional approaches. In this context, UGC emerges as a rich, dynamic data source capable of revealing authentic user sentiments and expectation-performance evaluations at scale. Therefore, to advance the theoretical understanding of fintech continuance behavior, this study proposes a UGC-driven empirical investigation, anchored in the foundational constructs of ECT and ISSM, aimed at uncovering the critical determinants shaping sustained engagement within fintech loyalty ecosystems.

### 3. Research design

To achieve the research objectives, this study employs a sequential mixed-methods design, integrating exploratory and confirmatory phases to systematically investigate the determinants of user satisfaction and continuance intention within the context of mobile loyalty applications in Saudi Arabia. The methodology centers on the analysis of user-generated content (UGC) derived from app users' reviews on the Google Play Store and the Apple App Store. The multilingual composition of the dataset, encompassing reviews in both Arabic and English, necessitates a rigorous preprocessing framework to ensure cross-linguistic consistency, semantic accuracy, and analytical robustness. The research adopts a sequential mixed-methods approach, structured into exploratory and confirmatory stages, to facilitate a robust interplay between inductive discovery and deductive validation. The conceptual framework, as depicted in Fig. 1, is operationalized through a triadic

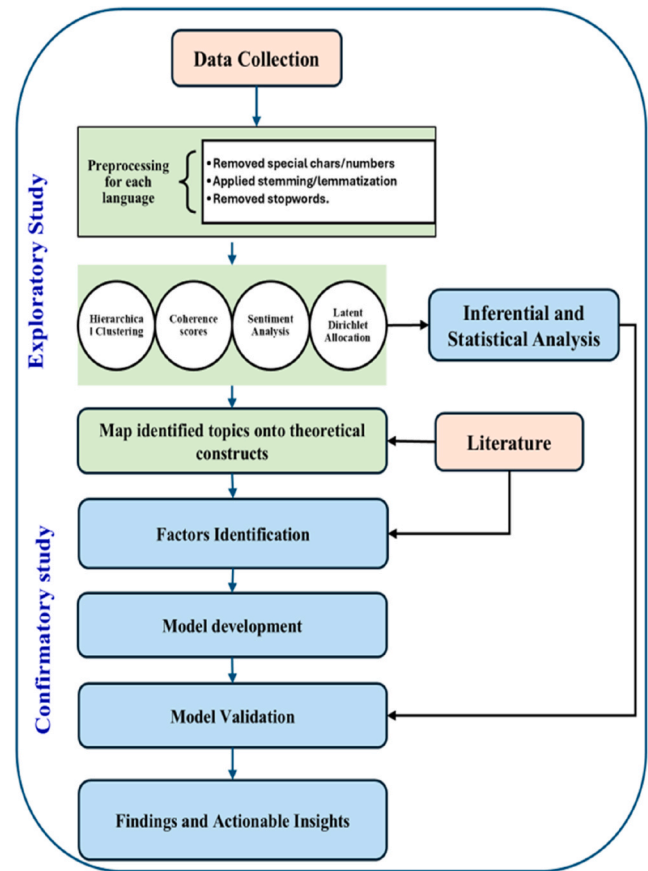


Fig. 1. Sequential approach for validation of the model through bilingual review analysis and theory-driven mapping.

Table 1  
Factors and theories used in Fintech use studies.

Construct	Key Studies	Theoretical Base	Focus Insight
Expectation Confirmation	Savitha et al. (2022); Liu et al. (2021)	ECT and ISSM	Matching or exceeding user expectations strengthens satisfaction and continuance
Perceived Usefulness	Shiau et al. (2020); Laksamana et al. (2023)	ECT	Higher perceived benefits from fintech services promote continuance
System Quality	Chand et al. (2025); Roh et al. (2024)	ISSM	Reliable, stable app performance reinforces trust and continued use
Information Quality	Chand et al. (2025); Roh et al. (2024)	ISSM	Accurate and clear information strengthens satisfaction
Service Quality	Chand et al. (2025); Yi et al. (2024)	ISSM	Responsive and effective support services foster loyalty
Perceived Risk	Zhao et al. (2024); Appiah and Agblewornu (2025)	Risk-Trust Framework	Concerns about security and privacy inhibit continuance
User Satisfaction	Abed and Alkadi (2025); Shiau et al. (2020)	ECT and ISSM Extensions	Satisfaction acts as a key mediator between performance and continuance

methodological structure: data collection, exploratory analysis, and confirmatory investigation. The primary data source comprises UGC extracted from reviews of prominent loyalty applications of WalaPlus, such as WalaPlus and WalaOne, which are widely used in Saudi Arabia. These reviews, sourced from the Google Play Store and the Apple App Store, reflect diverse user experiences and provide a rich dataset for analysis. The bilingual nature of the dataset requires a sophisticated preprocessing pipeline, including natural language processing (NLP) techniques tailored for Arabic and English, to address linguistic variations and ensure analytical validity. By conducting separate analyses of Arabic and English reviews, the study captures culturally specific user sentiments and linguistic nuances, thereby enriching the methodological frameworks for multilingual application research.

The exploratory phase employs an inductive, data-driven methodology to uncover emergent themes, patterns, and factors influencing user satisfaction and loyalty. Leveraging qualitative content analysis and topic modeling, this phase systematically extracts insights from unstructured user feedback, enabling the identification of context-specific variables that may not be adequately addressed by existing theoretical models. This approach is particularly valuable in the Saudi Arabian context, where cultural factors, such as collectivism and trust in digital platforms, may uniquely shape user behavior. The exploratory findings provide a foundation for hypothesis generation, informing the subsequent confirmatory phase.

In the confirmatory phase, the insights derived from the exploratory stage are systematically evaluated against established theoretical frameworks to assess their generalizability and relevance within the domain of digital loyalty platforms. During this final stage, a confirmatory approach is employed to construct and validate a theoretical model. This method is utilized when researchers have a clear understanding of the research problem and seek to test specific hypotheses to derive theoretically grounded conclusions from empirical data. Drawing on insights from the literature review and the exploratory phase, a confirmatory analysis is conducted to rigorously test and validate the proposed hypotheses.

This research design not only adheres to rigorous methodological standards but also advances the field through its integration of cross-linguistic analytics, culturally informed data analysis, and a replicable mixed-methods framework. By providing a comprehensive model for analyzing multilingual digital service platforms, the study contributes to both theoretical advancements in user behavior research and practical implications for the design and management of loyalty applications in diverse cultural contexts. The methodological framework is designed to be adaptable, offering a blueprint for future studies exploring user-generated content in other multilingual digital ecosystems. The following section elaborates on the procedures and outcomes of both the exploratory and confirmatory studies.

#### 4. Exploratory study

In the initial phase of the exploratory study, a systematic approach was developed to gather review data, followed by preprocessing to prepare it for in-depth analysis. Next, an analytical method was outlined to investigate the pre-processed dataset. Finally, the findings from the exploratory study were compiled and presented.

##### 4.1. Research method

This study employs a content analysis-driven approach using UGC collected from the Google Play Store and Apple App Store. In contrast to prior studies relying on social media analytics (e.g., Twitter), this study exclusively considers review-based app store content. Such data represents real-time, unsolicited user experiences and opinions, making it a reliable source for deriving insights into user satisfaction and behavioral intent. The methodological workflow in the exploratory study is divided into two major sub-stages: (1) data collection and processing, and (2)

exploratory analysis using NLP techniques.

##### 4.2. Data collection and preprocessing

In the context of our exploratory study on user connectedness with loyalty applications, the Google Play Store and Apple App Store emerged as particularly suitable platforms for data collection. These app stores serve as primary digital touchpoints where users share unsolicited, experience-driven feedback about their interactions with mobile applications. As a repository of real-time and organic user experiences, app store reviews offer a rich source of user-generated content (UGC) that reflects authentic sentiments, behavioral patterns, and app-related concerns (Motger et al., 2024; Suprayogi et al., 2018).

To capture diverse user perspectives, we focused specifically on the WalaPlus applications as it appears in both the Google Play Store and the Apple App Store in Saudi Arabia. A Python-based scraping framework was developed to systematically extract publicly available reviews from both platforms. Our scraping criteria prioritized review content along with associated metadata, including the review text, star rating, timestamp, and platform of origin.

A total of 5669 user reviews were collected, including 4638 in Arabic and 1031 in English, featuring content in both languages. The inclusion of bilingual reviews allowed for a more comprehensive representation of the user base and facilitated cross-linguistic comparison. Arabic reviews were predominantly authored by native speakers, while English reviews reflected a broader range of linguistic fluency. This dataset, characterized by informal and unstructured language, served as the foundation for subsequent preprocessing and analysis using NLP techniques in the exploratory phase of the study.

##### 4.3. Data analysis

The output from the preprocessing stage includes cleaned and structured user reviews, along with associated metadata, obtained from loyalty applications such as WalaPlus and PluOne. Drawing from established methodologies in digital analytics, this study adapts content analysis techniques to effectively summarize the multilingual review texts (Alzamel and Alajmi, 2025; Fahim et al., 2024). In this study, content summarization is achieved through Topic Modeling using Latent Dirichlet Allocation (LDA), hierarchical clustering, and sentiment analysis. These techniques are applied to identify underlying topics, detect word-level associations, and group semantically related terms. The resulting patterns support the formulation of hypotheses concerning the key factors influencing user satisfaction and the intention to continue using loyalty applications. This process aids in generating hypotheses to address the research objectives effectively.

Sentiment analysis is employed to evaluate users' attitudes and perceptions toward the applications. This approach classifies review texts into positive, neutral, or negative sentiment categories and measures the degree of subjectivity expressed in each review (Tunca et al., 2023). Based on a semantic NLP framework, this study utilizes a lexicon-based method, consistent with established techniques in sentiment analysis research (Aqlan et al., 2023; Pratama et al., 2019). For English reviews, the VADER and TextBlob packages are used (Aqlan et al., 2023; Borg and Boldt, 2020), while Arabic reviews are analyzed using the XLM-RoBERTa model from Hugging Face (Chauhan et al., 2025; Masaling and Suhartono, 2024). The application of language-specific tools ensures accurate interpretation of sentiment across the multilingual dataset. After processing, each review is assigned a polarity score ranging from  $-1$  (strongly negative) to  $+1$  (strongly positive), along with a subjectivity score from 0 (objective) to 1 (subjective) (Bahadure et al., 2024). These sentiment indicators are analyzed in relation to themes emerging from topic modeling and clustering to uncover user concerns, satisfiers, and deterrents that impact satisfaction levels and app usage intentions. Prior to analysis, reviews were automatically categorized by language using the langdetect package.

Preprocessing steps included removal of special characters and digits, tokenization, stemming, lemmatization, and stopword elimination using language-specific resources. For English, the PorterStemmer was applied, while Arabic reviews were processed using the ISRI Stemmer and a curated stopword list. These steps resulted in two parallel, noise-minimized text pipelines.

Subsequently, the review texts are broken down into individual words, and similar words are grouped into clusters using a hierarchical clustering method to identify patterns in word associations. This approach reveals how words relate to one another within reviews, grouping terms with similar meanings into clusters to better understand the underlying themes. Hierarchical clustering was used in conjunction with LDA topics to visualize relationships among the most coherent

topics. The hierarchical clustering algorithm operates in two steps: first, it identifies pairs of words with high similarity, and second, it merges clusters of similar words. In the present study, clustering is used to reveal patterns in word co-occurrence and enhance interpretation of topic structures extracted via LDA. In the final stage of content analysis, a LDA-based topic modeling approach is employed to extract latent topics or themes from user reviews of loyalty applications. LDA, a widely used machine learning technique that identifies hidden thematic structures within large sets of unstructured text. An initial LDA model with 100 topics was reduced to 35 based on coherence scores to retain only the most interpretable and semantically rich themes. These topics were subsequently mapped to predefined theoretical constructs using bilingual keyword lists and pandas-based string operations, ensuring

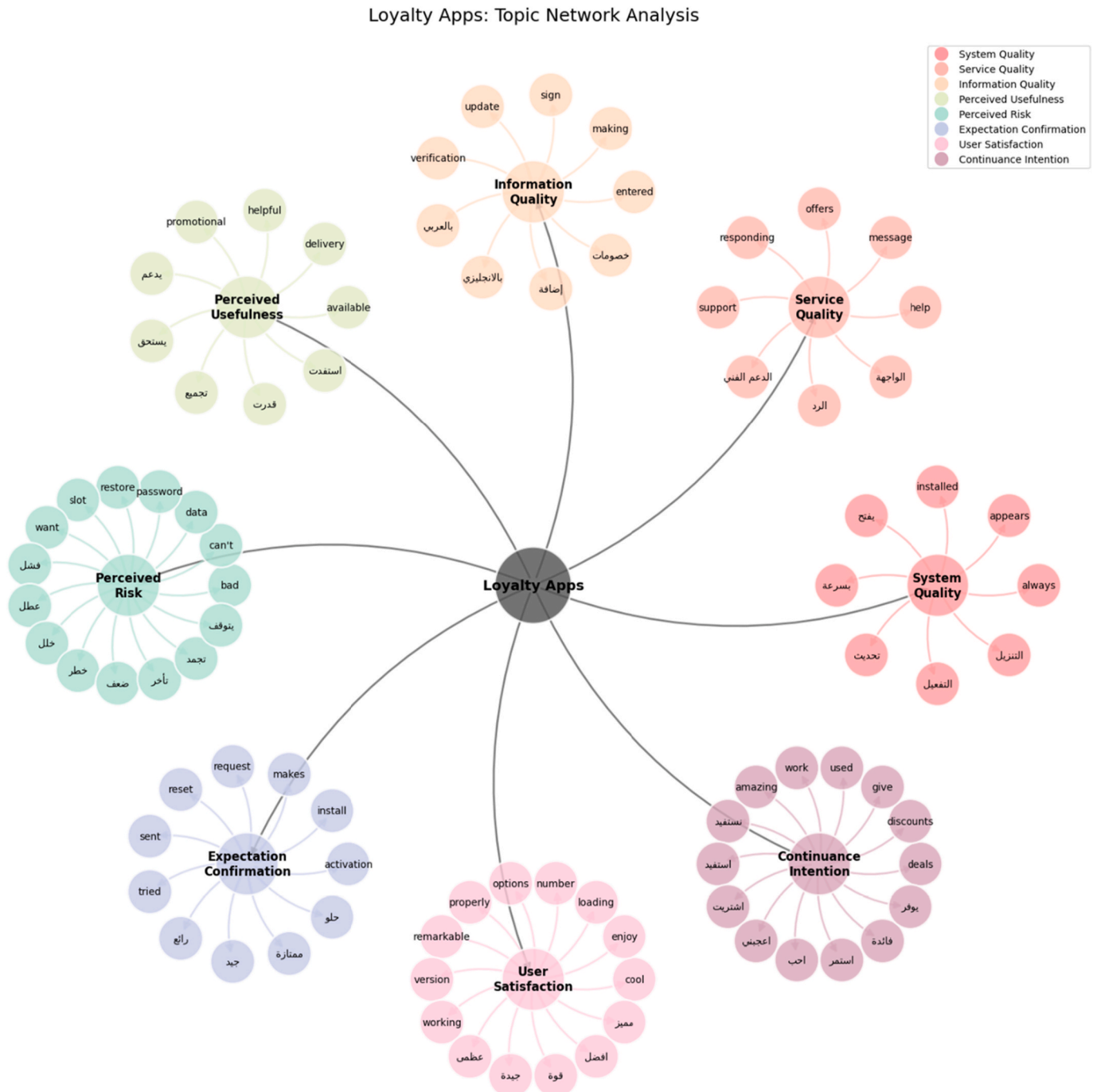


Fig. 2. Topic network showing bilingual keyword clusters mapped to constructs influencing loyalty app usage.

consistency with the study's conceptual framework.

#### 4.4. Exploratory findings

This study analyzes user-generated reviews from loyalty applications to uncover the key factors shaping user satisfaction and the intention to continue using these apps. Leveraging bilingual data from English and Arabic reviews, we applied NLP and unsupervised machine learning techniques to extract interpretable patterns. These exploratory insights formed the empirical basis for developing and validating our conceptual model. We began by implementing agglomerative hierarchical clustering to examine the semantic relationships among frequently occurring words. This method grouped terms based on co-occurrence similarity, resulting in a dendrogram (Appendix-A) that visualizes their contextual proximity. Terms that appeared closer on the tree branches, such as "membership," "offers," and "rewards" alongside their Arabic counterparts like "الانضمام" and "العروض", highlighted thematic linkages related to app features and value offerings. Similarly, words like "cool," "enjoy," and "remarkable" clustered with Arabic expressions such as "رائعة" and "أحببت", indicating shared user sentiments tied to satisfaction. These groupings provided an initial understanding of how users describe their experiences across both languages.

To identify deeper thematic structures and validate thematic consistency, we LDA to both the English and Arabic review datasets. Starting with 100 topics for each language, we refined these to 35 per language based on coherence scores, retaining only the most semantically consistent themes. The output was further analyzed through a topic network (Fig. 2), where top-ranked keywords were mapped to eight theoretical constructs frequently associated with technology use and user behavior. The topic network analysis illustrates how bilingual terms converge around constructs such as *Information Quality*, which was marked by words like *update*, *verification*, *entered*, and Arabic terms such as "تمت" and "تحديث", pointing to data completeness and accuracy. *Service Quality* emerged through terms like *support*, *offers*, *message*, and "الرد" and "المساعدة", reflecting expectations around responsiveness. *System Quality* included mentions of *installed*, *appears*, *always*, along with Arabic terms like "تحميل" and "فشل", highlighting technical performance issues.

*Perceived Usefulness* was indicated by references to *available*, *delivery*, *helpful*, and "مفيدة", reflecting the practical benefits of app features. *Perceived Risk* captured concerns about reliability and data security through words like *bad*, *restore*, and Arabic terms such as "مشكلة" and "خطر". The construct of *Expectation Confirmation* was associated with words like *reset*, *activation*, *sent*, and Arabic expressions such as "عاد" and "طلب", relating to whether the app fulfilled initial user expectations. Expressions of *User Satisfaction* were reflected in emotionally positive terms such as *enjoy*, *cool*, *working*, *remarkable*, and Arabic counterparts like "رائعة" and "أحببت". Finally, *Continuance Intention* was associated with sustained engagement through words like *used*, *give*, *discounts*, and Arabic terms like "استخدم", "العروض", and "استمرار". Together, these bilingual topic clusters offer a robust, conceptually aligned understanding of the dimensions that inform satisfaction and continued use of loyalty applications. The integration of clustering and LDA thus provided a strong foundation for model formulation and hypothesis development in the subsequent phase of the study.

#### 5. Confirmatory study

In this study, the first hypotheses were developed from literature associated with research questions. After the model was developed, we suggested methods to confirm the hypothesis. Finally, we presented the results of the confirmatory study.

#### 5.1. Model development

##### 5.1.1. Factors associated with user satisfaction

Perceived usefulness is a central construct and a practical attribute of the Technology Acceptance Model (TAM), which helps us to understand why people use technology (Davis, 1989). It has two main components: ease of use and perceived usefulness. These beliefs help us understand users' behavior, attitude, and intention. These beliefs posit that human behavior can be best explained through these two beliefs (Sohn, 2017). Research across different technological fields highlights how behavioral beliefs, specifically perceptions of usefulness, play a significant role in predicting outcomes (Ovčjak et al., 2015). Some scholars also indicated that usefulness perception, also called performance expectancy (Ovčjak et al., 2015). The degree to which a user thinks that utilizing a specific technology would improve his or her performance at work is known as perceived usefulness. In this study, we define it as the degree to which a user feels that using loyalty application will help them achieve their goals, such as saving time, and obtaining value through its features, services, and benefits. The key components of this mobile app are to provide users with exclusive rewards and discounts, a streamlined process, and to reduce the time required to access services and benefits.

In studies related to the functional technical services, researchers emphasized solely the perceived usefulness during their analyses, which yielded significant findings. For instance, research into e-learning behaviors underscored the importance of perceived usefulness and its effect on satisfaction (Daneji et al., 2019). Tavitiyaman et al. (2022) uncovered a connection between perceived usefulness and behavioral intention regarding hotel service technologies. User experience has a positive correlation with the satisfaction (Liu et al., 2025; Zhang et al., 2024).

In marketing literature, satisfaction is the feeling you get when needs or desires related to a product or service have been fulfilled (Zhou and Chang, 2024). User satisfaction is often considered an important component while assessing the effectiveness of mobile apps (Kumar et al., 2024). A notable study conducted by Gelderman (1998) unearthed a positive relationship between user satisfaction and IS performance. They emphasized the reliability and the link between usage and satisfaction. Yousof et al. (2021) unveiled that user satisfaction and application usability are correlated. These theoretical and empirical arguments lead to the following hypothesis.

**H1.** Perceived usefulness of the WalaPlus mobile applications is positively related to the user's satisfaction.

The information quality of the loyalty app serves as a signal to the users that the information provided by the app is accurate, complete, relevant, and meets the needs and expectations of the users. This conceptualization of the information quality is in line with Rieh's (2002) definition of it as recent, accurate, and useful, aligning with the level of knowledge that the user deems appropriate. Users prefer this kind of information as it reduces time, information processing time, and effort. Thus, high quality information helps users to make better decisions and reduce the risk of the consumer related to the privacy concerns arising from use and unauthorized access (Kim et al., 2021). So, when a user interacts with a mobile application like WalaPlus (which focuses on employee benefits, discounts, and well-being programs), the quality of information presented directly impacts their ability to understand, utilize, and derive value from the app's features and offerings. Thus, the high-quality information in the loyalty app, characterized by accuracy, completeness, relevance, timeliness, ease of understanding, and security, reduces uncertainty and empowers users to make informed decisions. Conversely, poor information quality can lead to frustration, confusion, mistrust, and ultimately, dissatisfaction with the application and the services it provides. DeLone and McLean (2003) claimed that high-quality information leads to the user's satisfaction with the system, which then leads to continuance intention. Regarding the loyalty app, if the information about offers, discounts, well-being programs, and their

terms and conditions is accurate, up-to-date, and easy to understand, users will be satisfied with the app experience. Empirically, the relationship between the information quality and users' satisfaction is confirmed by Kim et al. (2021). Therefore, we hypothesize that

**H2.** Information quality of the WalaPlus apps is positively related to the user's satisfaction.

Service quality is generally understood as a customer's personal judgment of how good, excellent, or superior a service experience is overall (Zeithaml et al., 1996). With the advent of new technology and social structures, companies now seek to gain a competitive advantage by providing superior service quality to satisfy and retain their customers (Hsu and Lin, 2023). We define service quality as user's perception of the app's ability to deliver rewards, discounts, and personalized content in a reliable, responsive, and user-friendly manner, while also providing a sense of trust. We employed expectation confirmation theory to explore the relationship between the service quality of the app and users' satisfaction. This theory posits that customer satisfaction is influenced by the perceived discrepancy between the expectations and experience (Oliver, 1980). This theory has been widely applied to many contexts, including websites and mobile applications (Mamakou et al., 2023). Users have expectations regarding the loyalty app's ability to deliver personalized content, recommendations, rewards, discounts, and overall experience. If the app is easy to navigate, loads quickly, delivers personalized content, and provides the necessary information through customer support services, then users are more likely to be satisfied. If the app fails to deliver these expectations, then it can lead to customer dissatisfaction (Mamakou et al., 2023). Several studies have investigated the relationship between service quality and customer satisfaction in the context of the online business environment and mobile applications. For instance, recently, Zhou et al. (2021) confirmed that the service quality of the mobile banking apps is positively related to the user's satisfaction. Based on the preceding discussion we hypothesize that

**H3.** The Service quality of the WalaPlus apps is positively related to customer satisfaction.

When a system is reliable, dependable, useful, and gives a timely response, then it is said to be a quality system (DeLone and McLean, 2003). Scholars have defined system quality as features containing interactivity, access, navigation, hyperlinks, website innovativeness, and ease of use (Mohammad Salameh et al., 2018). In loyalty applications such as WalaPlus and WalaOne, which provide access to a wide range of employee benefits and lifestyle offers, user experience is shaped by the system quality. System quality in the loyalty application refers to its reliability, ease of navigation, ease of use, and absence of errors. So, when users believe that the application works technically well and is easy to use, their satisfaction increases, and this is supported by the information success model developed by DeLone and McLean (2003), which identifies system quality as a key antecedent of user satisfaction. Empirical studies confirm that higher system quality correlates with greater satisfaction in digital service environments. For instance, Petter et al. (2008) demonstrated that perceived system quality significantly predicted user satisfaction in information system use. Similarly, Almarashdeh (2016) found that system reliability and interface usability were critical for user satisfaction in mobile-based service applications. The following hypothesis is then advanced

**H4.** The system quality of the WalaPlus mobile applications is positively related to user satisfaction.

Confirmation expectation theory (CET) posits that how users form their satisfaction based on whether their expectations match reality (Hossain and Quaddus, 2012). This theory remained popular among researchers and scholars in measuring satisfaction in the information technology field. This theory assesses the pre-behavioral expectations, confirmation/disconfirmation, and satisfaction (Alnaser et al., 2023).

Eren (2021) asserted that satisfaction is the basis of user behavior and can be evaluated through users' expectation/confirmation and service performance. In the context of IT products and services, numerous studies have explored various theoretical models to deepen the understanding of post-adoption behavior and examine individual user responses. To investigate user satisfaction, particularly in relation to mobile applications, recent research has increasingly focused on themes that align with the present study. For instance, Hsu and Lin (2015) propose their framework that incorporates the CET model and establishes that confirmation and user satisfaction are associated with each other in mobile applications. Likewise, Bhattacharjee (2001) verified the relationship between confirmation expectation and online banking customers' satisfaction in their landmark paper. Scholars have also reaffirmed the validity of CET in IT products and services (Hsu and Lin, 2015). For instance, in mobile apps, users first try the product and then purchase the product, such as downloading the app. Users form initial expectations before downloading an app. After using it, their experience shapes their perception of its performance. This leads to a comparison against their initial expectations, and whether those expectations are met (confirmed) or not (disconfirmed) ultimately determines their satisfaction level with the app (Hsu and Lin, 2015). So, based on these arguments, we also hypothesize that

**H5.** Expectation confirmation is positively related to the user's satisfaction

#### 5.1.2. Relationship between the expectation confirmation and perceived usefulness

ECT theory, as stated earlier, was originally developed by Oliver, 1980, who asserts that users develop initial expectations about a product or a service. Upon usage, they compare their expectations with their actual experience. If the performance of the product or system exceeds their expectations, they find it useful. In the context of WalaPlus apps, the mobile application that provides users with personalized rewards, discounts, and promotions. Users see the apps as worthwhile and handy, largely based on how well it satisfies or exceeds their needs for convenience and reliability.

Perceived usefulness, as defined by Davis (1989), refers to the degree to which an individual anticipates that using a specific system or app will enhance their daily productivity and usefulness. When loyalty app users find the app that offers seamless access to discounts and promotions, timely notifications, and dependable services, they are more likely to perceive it as useful. In the comparison, when there is a discrepancy between what users expect and what the app delivers, perceived usefulness may decline. Empirically, Aslam and Ham (2019) in mobile social commerce confirmed this relationship. Recently, Rahi et al. (2021) also provide evidence for this relationship in the context of internet banking users. Accordingly, we posit that

**H6.** Expectation confirmation of the WalaPlus apps is positively related to the perceived usefulness.

#### 5.1.3. Relationship between perceived risk and users' satisfaction and user continuance intention to use

Perceived risk can be conceptualized as the confluence of outcome uncertainty and outcome severity (Nguyen-Phuoc et al., 2021). Within consumer behavior, perceived risk is understood as a synthesis of two key dimensions: the probability of an event occurring (chance) and the magnitude of the potential negative consequences resulting from the decision (danger) (Kogan and Wallach, 1964). Perceived risk is a multi-dimensional concept (Sohn, 2024), and researchers have identified several dimensions of perceived risk, including performance risk, social risk, time risk, Psychological risk, and physical risk (Stuck et al., 2021). Performance risk (the app failing to deliver promised benefits), social risk (negative social consequences from using the app), time risk (time wasted on app issues), psychological risk (stress or frustration), and physical risk (privacy concerns) (Kleijnen et al., 2007).

Analyzing the concept of perceived risk can offer significant understanding into evaluating user satisfaction and their intention to use a system by gauging the potential for negative experiences. This analysis carries substantial implications for user satisfaction levels (Pizam et al., 2024). In the context of loyalty apps, which facilitates employee benefits and offers, any perceived risk related to app performance, such as technical malfunctions, security breaches, or incorrect benefit information, could significantly decrease user satisfaction. Users experiencing uncertainty or negative outcomes from interactions with the app are likely to become dissatisfied, thus undermining their overall positive perception (Pizam et al., 2024). Thus, reducing the perceived risk through enhancing app security, reliability, and transparency can enhance the users' satisfaction. Empirically, the negative relationship between perceived risk and consumer intention to use a p2p app is confirmed by Belanche et al. (2022). Likewise, the privacy and security risk are found to be negatively associated with the user's satisfaction in m shoppers (Gao et al., 2015). Chopdar and Sivakumar (2019) also propounded that perceived risk is negatively associated with the continuance intention and continuance usage in mobile shopping applications in India. Consequently, the following hypotheses are proposed.

- H7. Perceived risk is negatively associated with user's satisfaction
- H8. Perceived risk is negatively associated with user's continuance intention in WalaPlus mobile applications

5.1.4. Relationship between users' satisfaction and continuance intention

In the mobile apps' context, users' satisfaction can be conceptualized as an overall emotional response and attitude towards their experience with the app, including performance, usability, features, and value (Zhao and Bacao, 2020). Achieving user satisfaction and effectively meeting or exceeding user expectations are the two most critical elements in building mobile applications (Yahya et al., 2023). Service providers aim to boost satisfaction by utilizing user review feedback on app-related issues such as performance, usability, and reliability. Al Amin et al. (2021) asserted that the sustainability of mobile applications depends on continued usage rather than initial adoption. Therefore, it can be argued that when mobile applications meet or exceed users' expectations, they are more likely to be pleased with their experiences. Arguably, the users who are pleased with their experiences will become more motivated to continue using those apps (Akdin et al., 2022). In this regard, many researchers maintained that satisfaction is a strong

predictor of the continuance intention (Hepola et al., 2020). The positive relationship between the satisfaction and continuance intention has been confirmed in the context of the e-commerce and m-commerce (Wang et al., 2019). For instance, Bhattacharjee et al. (2008) confirmed that satisfaction is a transaction-specific effect based on usage experience and positively impacts the continuance of IT intention. Moreover, previous research in the field of e-commerce suggests that customer satisfaction shaped by the perceived value obtained positively affects the intention to make repeat purchases from the same online platforms (Lin, 2012). Building on the theoretical underpinnings and empirical support, we formulate the following hypothesis:

- H9. Users' satisfaction with the WalaPlus mobile applications positively affects their continuance intention to use.

Based on the hypotheses developed from Expectation Confirmation Theory (ECT) and the Information Systems Success Model (ISSM), the proposed research model as shown in Fig. 3 illustrates the relationships between satisfaction, perceived usefulness, perceived risk, and continuance intention in the context of fintech loyalty applications.

5.2. Research method

Using topic model analysis, we first calculated a coefficient for each user review based on word scores. This score then served as input for regression analysis to develop and test our hypothesis. Next, each review was categorized under the most relevant topics, and a score was assigned using a Likert scale. Finally, our empirical analysis utilized a database containing user IDs, the topics linked to their reviews, review sentiment (polarity and subjectivity), and the number of likes.

The application of the Latent Dirichlet Allocation (LDA) model resulted in the identification of numerous topics. However, incorporating all these topics into multiple regression analyses poses challenges, as not every topic demonstrates a significant influence on the dependent variable. This abundance of topics can introduce noise and multicollinearity, potentially compromising the reliability of the regression outcomes. Therefore, it is essential to implement dimensionality reduction techniques or select only the most pertinent topics to ensure the robustness and clarity of the regression analysis. This issue is common in big data, where high dimensionality is often expected. Nevertheless, in content analysis research, multiple regression is generally considered adequate for empirical investigation and tends to exhibit minimal multicollinearity (Kar and Dwivedi, 2020). In our analysis,

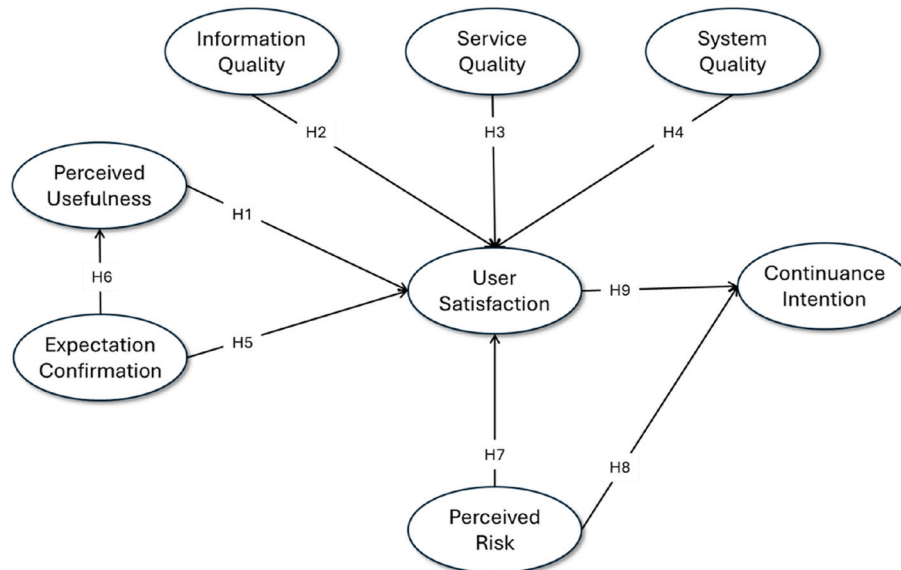


Fig. 3. Research model.

however, some of the extracted topics show limited influence on the dependent variable.

Linear regression analysis is used to examine how the predictor variable relates to the outcome variable. The goal is to reduce the loss function as much as possible, for example, by minimizing the sum of the squared residuals. However, the non-linear method produces better results on a larger data set than the linear methods (Hastie et al., 2009), when the relationship between the predictor and outcome variable is non-linear. To solve this variable selection, Lasso and Ridge methods can be employed Varian (2014). Moreover, Lasso and Ridge regression are used when there is a presence of many variables or a high correlation among the predictor variables. Lasso regression (Least Absolute Shrinkage and Selection Operator) adds a penalty term based on the absolute values of regression coefficients. This effectively forces some coefficients exactly to zero, allowing for clear variable selection (Bedoui and Lazar, 2020). It identifies only the variables that substantially influence the outcome. Ridge Regression adds a penalty term based on the squared values of regression coefficients. Ridge regression shrinks coefficients toward zero but does not set them exactly to zero. Thus, it does not explicitly select variables but reduces multicollinearity (Yang and Wen, 2018).

In their analysis, predictors that vary are standardized by adjusting them so that they each have an average value of zero and a variance of one. This process ensures all variables are equally scaled, preventing any single variable from disproportionately influencing the regression results. To handle the influence of multiple variables simultaneously, methods such as Lasso and ridge regression add a penalty term to the sum of squared residuals. This approach helps control the interrelated effects of multiple predictors. Specifically, Lasso and ridge methods shrink regression coefficients toward zero, thereby effectively simplifying the model by highlighting only those variables that strongly impact the outcome. This property of shrinking coefficients makes these regression methods highly effective for selecting relevant variables and improving overall model efficiency and interpretability. Consequently, this makes the lasso and Ridge regression the best models for the current study (Bedoui and Lazar, 2020).

### 5.3. Confirmatory findings

Based on the Lasso and Ridge regression, we selected regularization to identify the variables that influence user satisfaction, continuance intention, and perceived usefulness. The regularization based on the Lasso and Ridge regression is employed because of multiple feature extraction during LDA. We initially formulated nine hypotheses based on the literature from the chosen theories. We tested each hypothesis separately using Pearson’s chi-square to determine the p-value. We also employed Lasso and Ridge regression to analyze subjectivity and polarity to measure user satisfaction, continuance intention, and perceived usefulness. Table 2 shows the results as Model 1 and Table 3 shows the results of Model 2 for each regression. To verify the hypotheses, we considered factors with a p-value below 0.05. The regression results demonstrated that all hypotheses are supported for both polarity (emotional tone/sentiment) and subjectivity (how objective/subjective a text is). The regression analysis indicates that the relationships between expectation confirmation, information quality, service quality, system quality, and perceived usefulness with customer satisfaction are statistically significant. This suggests that these independent variables meaningfully contribute to variations in customer satisfaction. Likewise, the relationship between the perceived risk and user satisfaction, and continuance intention is also negatively significant by both Lasso and Ridge regression.

We have compiled the model fit statistics in Tables 2 and 3, which includes R-squared values and F-statistics for both polarity and subjectivity. The regression analysis indicates that the independent variables account for approximately 51 % of the variance in polarity and 52 % in subjectivity. This suggests that the model explains a substantial portion

**Table 2**  
Results of model 1 - lasso regression.

<b>Lasso Regression</b>			
	<b>Hypotheses</b>	<b>Model Polarity (Std. Error)</b>	<b>Model Subjectivity (Std. Error)</b>
<b>Path 1</b>	Expectation Confirmation → Perceived Usefulness	0.245 (0.011) significance	0.256 (0.011) significance
	<b>Parameters</b>	<b>Polarity</b>	<b>Subjectivity</b>
	R-squared	0.091	0.097
	F-statistic	174.315	185.001
<b>Path 2</b>	<b>Hypotheses</b>	<b>Model Polarity (Std. Error)</b>	<b>Model Subjectivity (Std. Error)</b>
	Information Quality → User Satisfaction	0.130 (0.027) significance	0.150 (0.028) significance
	System Quality → User Satisfaction	0.076 (0.025) significance	0.139 (0.025) significance
	Service Quality → User Satisfaction	0.025 (0.023) significance	0.027 (0.024) significance
	Perceived Usefulness → User Satisfaction	0.096 (0.026) significance	0.044 (0.026) significance
	Perceived Risk → User Satisfaction	-0.143 (0.027) significance	-0.003 (0.027) significance
	Expectation Confirmation → User Satisfaction	0.319 (0.025) significance	0.316 (0.025) significance
	<b>Parameters</b>	<b>Polarity</b>	<b>Subjectivity</b>
	R-squared	0.51	0.48
F-statistic	239.95	230.79	
<b>Path 3</b>	<b>Hypotheses</b>	<b>Model Polarity (Std. Error)</b>	<b>Model Subjectivity (Std. Error)</b>
	Perceived Risk → Continuance Intention	-0.178 (0.012) significance	-0.067 (0.012) significance
	User Satisfaction → Continuance Intention	0.104 (0.012) significance	0.237 (0.012) significance
	<b>Parameters</b>	<b>Polarity</b>	<b>Subjectivity</b>
R-squared	0.074	0.094	
F-statistic	69.878	89.559	

of the variability in these dependent variables. Consequently, if loyalty apps incorporates all the measured independent variables, the model can predict polarity and subjectivity with reasonable accuracy using Lasso and Ridge regression techniques.

The validated model (Fig. 4) demonstrates that user satisfaction is most sharply impacted by expectation confirmation and information quality. User satisfaction rises significantly when an app provides accurate information and fulfills user expectations. Expectation confirmation also directly affects usefulness perception, reinforcing its role in shaping the user’s overall experience. However, system and service quality contribute, and perceived risk undermines trust and security, lowering satisfaction. Eventually, meeting user expectations increases satisfaction, which drives continual use of the app. This orchestrates the importance of providing accurate information while ensuring user safety, support, and trust.

## 6. Discussions

In this study, we investigated the factors that influence customer satisfaction and continuance intention of the users of the loyalty applications. For this purpose, we employed a sequential mixed method approach (Kar and Dwivedi, 2020), which is supported by a curated dataset derived from user-generated reviews of the loyalty applications on both the Google Play Store and Apple App Store. These reviews serve

**Table 3**  
Results of model 2 – ridge regression.

Ridge Regression			
	Hypotheses	Model Polarity Coef (SE)	Model Subjectivity Coef (SE)
Path 1	Expectation Confirmation → Perceived Usefulness	0.222 (0.024) significance	0.235 (0.024) significance
	<b>Parameters</b>	<b>Polarity</b>	<b>Subjectivity</b>
	R-squared	0.097	0.103
	F-statistic	186.00	198.30
Path 2	<b>Hypotheses</b>	<b>Model Polarity Coef (SE)</b>	<b>Model Subjectivity Coef (SE)</b>
	Information Quality → Customer Satisfaction	0.137 (0.014) significance	0.165 (0.037) significance
	System Quality → Customer Satisfaction	0.067 (0.009) significance	0.139 (0.013) significance
	Service Quality → Customer Satisfaction	0.031 (0.013) significance	0.029 (0.015) significance
	Perceived Usefulness → Customer Satisfaction	0.094 (0.012) significance	0.040 (0.012) significance
	Perceived Risk → Customer Satisfaction	-0.145 (0.012) significance	-0.002 (0.015) significance
	Expectation Confirmation → Customer Satisfaction	0.323 (0.013) significance	0.321 (0.013) significance
	<b>Parameters</b>	<b>Polarity</b>	<b>Subjectivity</b>
	R-squared	0.52	0.50
	F-statistic	253.25	246.46
Path 3	<b>Hypotheses</b>	<b>Model Polarity Coef (SE)</b>	<b>Model Subjectivity Coef (SE)</b>
	Perceived Risk → Continuance Intention	-0.174 (0.020) significance	-0.064 (0.020) significance
	User Satisfaction → Continuance Intention	0.104 (0.015) significance	0.237 (0.015) significance
	<b>Parameters</b>	<b>Polarity</b>	<b>Subjectivity</b>
	F-statistic	72.41	93.64

as a valuable source of unstructured data to extract meaningful insights, revealing the factors associated with customer satisfaction and perceived usefulness that drive continuance intention. Subsequently, a structured literature review was conducted to probe better theoretical reasoning with the currently tested theories to completely understand the reasons behind users' satisfaction and their continuance intention to use the loyalty apps.

By using a triangulation approach, (Barnum, 2020), we draw on the information success model and confirmation expectation theory to extract the potential factors that influence the users' satisfaction and continuance intention to use the loyalty apps. This literature-based triangulation offers a more holistic and theoretically grounded identification of the important variables before the empirical validation. In the next step, user-generated reviews and data for model verification are selected. Users generate reviews about the app on Google Play Store and Apple App Store, which offer a large scale of variability as these contain data from the customer's actual experiences. One advantage of this data is that it is easily available compared to primary data collection or other data methodologies. In comparison to the primary data, this data is often unstructured and noisy, so data processing and cleaning need to be done to extract their knowledge, opinions, and preferences. After processing data, we used content analysis techniques to analyze text data from user-generated reviews of loyalty apps available on the Play Store and

the App Store. Lastly, Lasso and Ridge regression are used to validate the model.

The findings demonstrate that perceived usefulness, information quality, service quality, system quality, and expectation confirmation significantly and positively influence the users' satisfaction. These results are consistent with prior research in the domain of information systems and service quality. For example, DeLone and McLean's (2003) updated Information Systems Success Model highlights the central role of system quality, information quality, and service quality in shaping user satisfaction. Recently, Hsu and Lin (2023) and Kim et al. (2021) also contended that information quality and service quality is positively relates to the users' satisfaction. In the context of the loyalty mobile apps, the findings suggest that providing accurate information, seamless service quality, and a reliable system increases the users' satisfaction.

Similarly, studies grounded in the Technology Acceptance Model (TAM), such as those by Davis (1989) and Venkatesh and Davis (2000), affirm that perceived usefulness is a key determinant of user satisfaction and continued system use. Furthermore, the significant role of expectation confirmation aligns with the Expectation Confirmation Theory, proposed by Oliver (1980), which posits that satisfaction results when user expectations are met or exceeded by actual performance. Empirical findings by Liu et al. (2025) and Alnaser et al. (2023). Also, reinforce this perspective in the context of subscription payment and AI-based digital banking, emphasizing that expectation confirmation and perceived usefulness jointly influence satisfaction.

The results further indicate that perceived risk is negatively associated with both user satisfaction and the continuous intention to use. This finding aligns with prior research in the domain of mobile services and digital platforms, where perceived risk has consistently been identified as a barrier to user trust and engagement (Featherman and Pavlou, 2003; Kim et al., 2008). In digital environments, particularly mobile applications that involve sensitive personal information or financial transactions, users may feel apprehensive about data privacy, service reliability, or transactional security. Such concerns can directly undermine their overall satisfaction and reduce their willingness to continue using the service. In the context of the loyalty apps, which offers personalized experiences and potentially involves reward-based or subscription-based services, minimizing perceived risk is critical to maintaining user confidence and encouraging long-term usage.

In contrast, the findings also reveal a strong positive relationship between user satisfaction and continuance intention, which is consistent with the Expectation Confirmation Model (Bhattacharjee, 2001) and Technology Acceptance Model extensions (Venkatesh et al., 2003). According to these models, when users experience satisfaction due to their prior use of a system, they are more likely to perceive continued usage as beneficial and are thus more inclined to maintain their engagement. Empirical studies have shown that satisfied users are more likely to overlook minor shortcomings, forgive occasional technical issues, and develop a sense of loyalty toward the platform (Oliver, 1999).

In the specific case of WalaPlus loyalty apps, which operates in a competitive mobile service environment, these findings highlight the importance of creating a frictionless and secure user experience. Reducing perceived risks, such as unclear data policies or inconsistent app performance, can play a pivotal role in enhancing user satisfaction. In turn, satisfied users are more likely to exhibit behavioral loyalty, reflected through repeat usage, positive word-of-mouth, and sustained interaction with the app's services and features.

### 6.1. Theoretical contributions

This study contributes to the advancement of information systems and user behavior theory by integrating Expectation Confirmation Theory (Oliver, 1980), the Information Systems Success Model (DeLone and McLean, 2003), and the Technology Acceptance Model (Davis, 1989) in a novel, user-generated review context. First, previous studies apply these models in structured survey environments in different

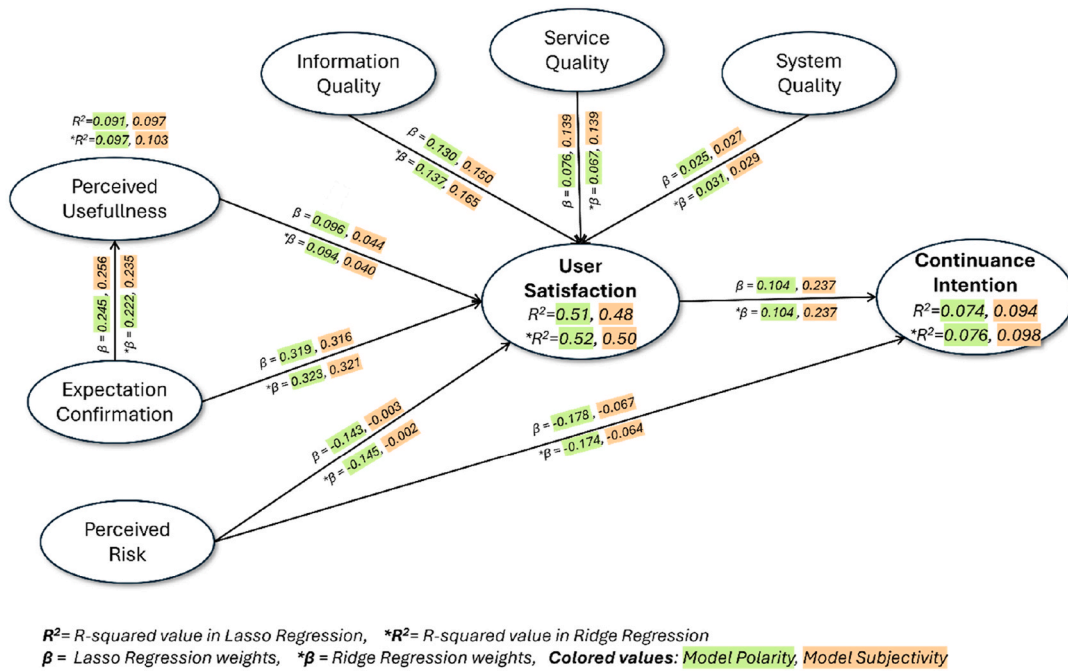


Fig. 4. Validated research framework with Lasso and Ridge regression results.

context, while we employed unstructured textual data through Lasso and Ridge regression. This use of a new methodological approach provides a new lens for theory testing and extends the boundaries of theories into real-time, behaviorally rich settings. Further, a longitudinal design firmly establishes causality and reduce common method variance (Liu et al., 2025).

Second, the fundamental contribution of this paper is the combination of the Information System Success Model and Expected Confirmation Theory to identify factors that focus on continuance intention to use loyalty apps. Earlier studies integrated the ECM with UTAUT2 in the context of continuance usage of mobile apps (Tam et al., 2020) This study provides empirical support for the Information Systems Success Model proposed by DeLone and McLean (2003). The positive impact of information quality, service quality, and system quality on user satisfaction confirms their role in the success of digital platforms such as mobile apps. It underscores that these factors remain important when users interact with digital loyalty platforms. The results extend the model by confirming its value in explaining user satisfaction in the specific context of mobile loyalty applications. The findings support the idea that accurate content, system performance, and responsive services improve the overall satisfaction of the users of loyalty applications. This reaffirms the previous work in the information systems domain that emphasizes these three factors shaping user satisfaction (Hsu and Lin, 2023).

Third, the study reinforces the significance of the expectation confirmation theory (Oliver, 1980) by showcasing that expectation confirmation is directly related to the perceived usefulness and user satisfaction. When users feel that Wala-Plus meets or exceeds their expectations, such as easy navigation, offering timely deals, and valuable content, they then feel more satisfied and consider the application more useful. This also endorses the theoretical view that satisfaction results from the alignment between the initial expectations and actual performance. The results of the study are also aligned with the recent studies on digital banking and subscription-based platforms, which also underscore the combined effects of expected confirmation and perceived usefulness on user satisfaction (Alnaser et al., 2023; Liu et al., 2025). These findings further extend the application of expectation confirmation theory to the context of mobile loyalty applications. They suggest that the alignment between user expectations and actual experiences

plays a crucial role in shaping satisfaction with loyalty apps such as Wala-Plus. This study thus extends the theory's relevance beyond traditional services to include digital loyalty platforms, emphasizing the importance of continuously meeting or exceeding user expectations to enhance satisfaction and perceived usefulness.

Fourth, this research also extends TAM, first developed by Davis (1989) and later expanded by Venkatesh and Davis (2000), by confirming that perceived usefulness is a significant predictor of user satisfaction and continuance intention. This finding supports the assumption that users will continue to use the technology if they perceive it as beneficial in achieving their goal or derive satisfaction from it (Chakraborty et al., 2024). In the backdrop of loyalty apps, usefulness may relate to the convenience of assessing employee benefits, saving money, and enjoying personalized benefits. The results further extend TAM by demonstrating its explanatory power in the domain of mobile loyalty applications, where the user intention to use is influenced by both utility and satisfaction. This study highlights that perceived usefulness remains central for encouraging ongoing engagement with digital loyalty apps, supporting the model's broader relevance in new and evolving technology settings.

Fifth, the study contributes to risk-related research in digital services by providing the negative role of the perceived risk in shaping user satisfaction and continuance intention. This aligns with earlier studies that identify perceived risks, such as concerns over data privacy, financial security, or service reliability, as a major obstacle to user trust and technology adoption (Featherman and Pavlou, 2003). By confirming this relationship in a real-world mobile setting, this study reinforces the relevance of risk perception in shaping user satisfaction and continuance intention. By examining the perceived risk alongside information quality, service quality, and perceived usefulness, this study provides a more nuanced understanding of what drives or hinders satisfaction and continued use in loyalty apps. The results highlight that even when core quality factors are strong, high perceived risk can undermine both satisfaction and continuance intention, demonstrating the need for an integrated approach to digital service design.

Finally, this study also confirms that user's satisfaction is a strong predictor of the continuance intention. The results are consistent with both the Expectation Confirmation Model (Bhattacharjee, 2001) and extended TAM frameworks (Venkatesh et al., 2003). The results suggest

that satisfied users of loyalty apps are more likely to stay engaged with the app and recommend it to others. This supports the broader theoretical claim that satisfaction not only reflects past experiences but also influences future behavioral intentions.

## 6.2. Practical implications

This research has practical implications for developers and product managers in the fintech industry, as well as policymakers involved with loyalty programs. These recommendations support empirical evidence provided by the study that stresses interrelations between system quality, information quality, service quality, expectation confirmation, perceived usefulness, perceived risk, user satisfaction, and continuance intention. Our findings reinforce that system quality has paramount relevance to user satisfaction. The focus of development and technical teams should be on the consistency of high-performing application metrics. These teams can improve core performance indicators such as downtime, crash rates, loading speeds, and transaction latencies through automated monitoring tools. Best practices for minimizing user frustration include proactive system alerts and automated issue resolution protocols that mitigate performance problems promptly.

Additionally, the importance of information quality emphasizes the need for timely communication and proactive engagement for information dissemination through various channels. Content and information managers bear the primary responsibility of organizational communication, which entails precision, etiquette, and strategic timing as well as communication clarity and conciseness at all levels. This can be achieved via regular audits to verify that marketing communications, application descriptions, and promotional materials are aligned with the app's actual functionalities and services. In addition, users' perceptions of the reliability of information are enhanced through the timely delivery of personalized promotions, reward balance updates, and other dynamic content, increasing overall user satisfaction. On other hand, the balance between system uses and satisfaction is centered on the service quality. This balance also details the components as usability, responsiveness, and system navigation. Natural interaction needs to be integrated into every aspect of user experience, which means that all design and product teams have to comply. In order to decrease the mental effort required to perform tasks and the engagement to reward interaction is seamless, iterative usability testing must be performed on a routine schedule. Rewarding interactions and engagement can deem effortless if enhanced navigation and responsiveness visually provide feedback to the user, contact, one button actions, or excessive actions are removed.

Satisfaction is indispensable in cultivating loyalty and retention in the long term, accordingly, plummeting the cost associated with acquiring new users. User loyalty can be built through seamless communication between various stages of user experience design, preemptive problem resolution, and timely assistance. Support bots can be programmed to handle common queries through automated responsive interaction, ensuring convenient and immediate assistance. Through empathetic responsiveness, users receive prompt answers to their specific inquiries, resulting in a heightened sense of satisfaction and loyalty. The study results indicate expectation confirmation along with perceived usefulness to be key factors affecting user satisfaction. Therefore, fintech managers must prioritize alignment between marketing promises and actual delivered functionality. Implementing promise of performance assessments can align consistency between marketed features and user experience. Also, practicums should walk users through showcasing the usefulness of the application right from the first interactions to ensure users understand the benefits and value propositions communicated. This further alignment can be achieved by using real-time feedback through immediate satisfaction comments or short surveys at integral interaction moments to track gaps in user expectations and address them in real time.

Information privacy and security issues, more generally framed as risk concerns, were found to be significant obstacles that detrimentally

impacted satisfaction and continued usage. User fears and concerns can be better addressed through the clearer disclosure of data governance frameworks, privacy policies, and security protocols published by the developers and decision-makers. Some interventions include active screen prompts that show users that imperative protective procedures are being performed during important interactions (e.g., financial payments and submission of personal data), instant acknowledgment of secure transaction shields and prompt signaling. Furthermore, the ability to determine the privacy level in which users can control their accounts through dashboards also minimizes risk and helps foster trust.

Finally, our study challenges prior assertions by establishing a sturdy relationship between user satisfaction and continuance intention. Satisfaction is emphasized not as a mere measure of performance, but as a dynamic metric and a momentous predictor of retention. Subsequently, satisfaction needs to be enhanced perpetually and on an ongoing basis through enhanced user experiences. User satisfaction can also be enhanced through advanced analytics and recommendations driven by machine learning. It will eventually create tailored notifications, customized rewards, and targeted deals that resonate with user behaviors.

## 6.3. Limitations and future research directions

In this research, we employ LDA on the user-generated reviews related to the loyalty mobile apps. Using LDA, we identified the factors associated with the user's satisfaction and continuance intention. Lasso and Ridge regression were employed to validate the hypotheses. Although data were collected through the user-generated reviews available on the Play Store and the Apple Store, other media such as reviews on social media, including X, Facebook, and Instagram, were not considered. This is one of the paper's limitations. Further, during the screening stage, we found many reviews that were other than English and Arabic, which posed a challenge for the researchers in terms of language expertise and computational abilities. So, we removed all the reviews other than English and Arabic and kept them as a new avenue for future researchers. During the pre-processing stage, we removed the noise contained in the reviews (mentions and hyperlinks), which may include some important information. So, to get more in-depth information, this noise should be inspected by future studies. Moreover, in this study, we focused on extracting the factors associated with the users' satisfaction and continuance intention and did not investigate the interrelationship between the factors. This resulted in a 50 % R-squared. By interrelating the extracted factors, the overall performance of the model can be improved.

While this study offers rich insight into user behavior within a single loyalty-based fintech platform, its scope may limit the generalizability of findings across other digital finance services. Platform-specific design, incentive structures, and user demographics may influence how satisfaction and risk perceptions unfold, which future studies should examine across diverse contexts. Nonetheless, the methodological framework developed here provides a replicable foundation for cross-platform validation in subsequent research.

## 7. Conclusion

This study offers more than an additional schematic of continuance intention. It creates space for a deeper engagement with the authentic voices of users. Rather than limiting the analysis to predefined questions or narrowly framed constructs, it responds to spontaneous, multilingual user reviews that emerge in the absence of researcher intervention. By tracing these organic expressions back to foundational behavioral theories, the research preserves the everyday realities of user experience while expanding the scope of theoretical interpretation. This approach moves beyond merely testing established constructs and instead allows us to observe how these ideas take shape, shift, and even fracture within the evolving context of loyalty-driven fintech applications. In particular,

the study reconceptualizes core variables such as risk, usefulness, and service quality. Risk, often reduced to a static checklist item, reveals itself as a subtle but continuous force shaping user satisfaction. Meanwhile, usefulness and service quality, typically viewed as complementary, are shown to compete within the cognitive and emotional space between promised value and lived experience. By combining behavioral theory with machine learning, the study not only advances methodological rigor but also captures the complex realities of user continuance in an environment marked by abundant alternatives and low baseline trust. Rather than presenting continuance as a fixed intention, the findings suggest it is a fluid and contested process. It is more pronounced by reflecting users' ongoing evaluations of credibility, reliability, and service value. This is not simply a case study of single application but a broader insight into the moments when digital platforms must re-earn their place in the daily lives of users.

**CRedit authorship contribution statement**

**Waqas Ahmed:** Writing – original draft, Validation, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Mohammed A. Al-Sharafi:** Writing – original draft, Methodology, Investigation, Conceptualization. **Ali Raza:** Writing – original draft, Methodology, Investigation, Conceptualization. **Shehab Abdulhabib Saeed Al-Zaemi:** Validation, Methodology, Formal

analysis, Data curation. **Mousa Ahmad Al-Bashrawi:** Writing – review & editing, Supervision, Resources, Methodology, Conceptualization. **Yogesh K. Dwivedi:** Writing – review & editing, Supervision, Methodology, Conceptualization.

**Declaration page**

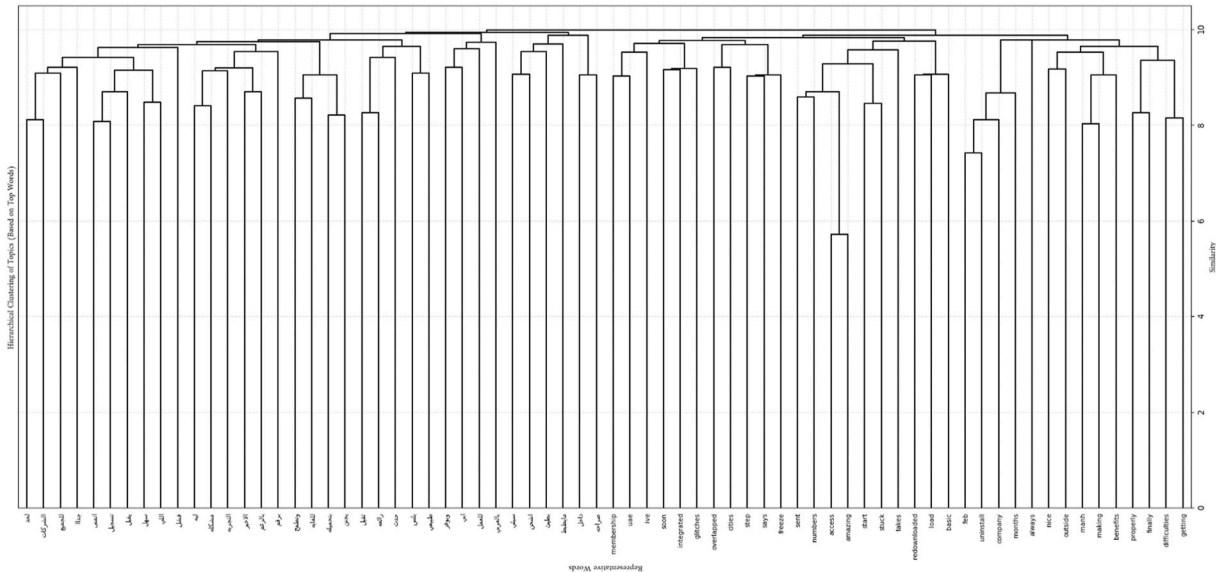
We confirm the following:

1. The submitted manuscript is original, has not been published before, and is not currently being considered for publication elsewhere.
2. All authors have read and approved the final manuscript.
3. There is no conflict of interest to declare.
4. Data supporting the findings of this study are available from the first author upon reasonable request.
5. Ethical approval was not required for this research, as it used publicly available anonymous user-generated data from digital platforms.

**Declaration of competing interest**

The authors declare that they have no known competing interests or personal relationships that could have appeared to influence the work reported in this paper.

**Appendix A**



Appendix-A. Hierarchical clustering dendrogram of top keywords extracted from bilingual user reviews (English and Arabic) of loyalty applications.

**Data availability**

Data will be made available upon request from the first author.

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