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Mobile Financial Service Adoption Among Elderly Consumers: The Roles of Technology Anxiety, Familiarity, and Age

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Abstract

The rapid growth of mobile financial services provides significant opportunities for enhancing digital financial inclusion among older adults. However, elderly consumers often lag in adoption and sustained usage due to psychological barriers (e.g., technology anxiety) and factors related to prior experience and comfort with technology (e.g., technology familiarity). This study investigates how technology anxiety and technology familiarity influence elderly consumers' continuance intention toward mobile banking, while examining age as a moderator by comparing younger older adults (aged 60–69) and older adults (aged 70+). Using data from an online survey of 488 elderly mobile banking users in South Korea, we conducted hierarchical regression analyses. The results show that technology anxiety negatively affects continuance intention, whereas technology familiarity positively enhances sustained usage. Moreover, age significantly moderated these relationships: adults aged 70+ were notably more sensitive to both technology anxiety and familiarity, highlighting distinct age-related psychological differences. These findings underscore the importance of targeted digital literacy initiatives, age-friendly fintech interfaces, and personalized support strategies. This study contributes to the fintech literature by integrating psychological dimensions into traditional technology adoption frameworks and emphasizing age-specific differences. Practically, fintech providers and policymakers should adopt tailored strategies to effectively address elderly consumers' unique psychological needs, promoting sustained adoption and narrowing the digital divide in financial technology engagement.

Keywords: mobile financial services; elderly consumers; technology anxiety; technology familiarity; continuance intention

JEL Classification: D12; G50; J14

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1. Introduction

1.1. Background and Challenges

The rapid advancement of fintech, particularly mobile payment technologies and digital banking services, has fundamentally reshaped how consumers manage financial transactions, fostering significant opportunities for digital financial inclusion [1,2]. Mobile banking, as a key fintech innovation, facilitates efficient financial transactions and personal financial management, positioning itself as a crucial tool for enhancing financial accessibility and inclusion. Despite the substantial convenience and efficiency offered by these

services, elderly consumers—a rapidly growing demographic in many economies—remain significantly underserved. Elderly consumers generally show lower adoption rates and weaker sustained engagement with mobile financial services, leading to critical concerns regarding their exclusion from the rapidly evolving digital financial landscape [3–5].

Prior research on mobile financial service adoption has typically emphasized general adoption factors such as perceived usefulness, ease of use, trust, and security, often overlooking critical psychological barriers uniquely affecting elderly consumers [6,7]. While transaction security and privacy protection significantly influence consumer confidence [8,9], psychological and cognitive factors, especially technology anxiety and technology familiarity, remain markedly underexplored within fintech adoption contexts for elderly populations. Recent studies highlight that technology anxiety may not only hinder elderly consumers' initial adoption of fintech solutions but can also significantly reduce their intention to continue usage, even when trust has been established [10,11]. However, there are mixed findings regarding the exact role and magnitude of technology anxiety's influence on elderly consumers' fintech adoption, indicating the need for targeted empirical investigation [12].

Technology anxiety, defined as an individual's discomfort or apprehension when interacting with digital technologies [13], represents a substantial psychological barrier impacting elderly consumers' adoption of mobile financial services. Elderly consumers frequently express concerns about transactional errors, identity theft, financial fraud, and complex user interfaces, discouraging sustained fintech engagement [5,14]. Conversely, technology familiarity—the ease and confidence individuals have when using digital tools—is strongly linked to enhanced self-efficacy and reduced psychological resistance toward fintech adoption among elderly consumers [15–17]. Recent empirical research further emphasizes that regular digital interactions enhance elderly consumers' acceptance and continued fintech engagement, suggesting familiarity as a crucial factor to overcome initial psychological barriers [18].

1.2. Research Objectives and Contributions

Prior fintech literature frequently treats elderly consumers as a homogeneous group, overlooking important age-related variations in their digital engagement and psychological readiness [19,20]. However, empirical evidence reveals significant differences between older adults aged 60–69 and those aged 70 and above. Younger older adults typically demonstrate greater adaptability, digital familiarity, and lower technology anxiety than older older adults, reflecting generational differences in technology exposure, digital financial literacy, and perceptions of security and reliability [21–24]. Thus, it is crucial to investigate the moderating role of age in the relationships between psychological determinants—technology anxiety and familiarity—and elderly consumers' sustained engagement with mobile financial services. Recent comparative studies confirm that demographic variables such as age significantly moderate psychological and cognitive influences on fintech adoption, highlighting the need for targeted fintech strategies explicitly tailored to different older adult subgroups [12].

Therefore, the primary objective of this study is to examine how technology anxiety and technology familiarity influence elderly consumers' continuance intentions toward mobile financial services and to explore the moderating effect of age on these relationships. Specifically, this study addresses two key research questions: (1) How do technology anxiety and familiarity affect elderly consumers' mobile banking continuance intentions? (2) How does age moderate these relationships? By explicitly examining these questions, this study provides nuanced insights into age-specific differences in fintech adoption, contributing

valuable theoretical and practical insights into elderly consumer behavior within the fintech domain.

In doing so, this research contributes theoretically by integrating psychological and cognitive factors into traditional technology adoption models (e.g., TAM and UTAUT), enhancing the understanding of fintech adoption among older adults. Practically, the findings offer actionable insights for fintech providers, financial institutions, and policymakers aiming to develop tailored digital literacy initiatives, age-friendly user interface designs, and targeted support systems to enhance elderly consumers' sustained fintech engagement.

It should be noted, however, that the current study explicitly examines psychological dimensions—specifically anxiety and familiarity—without directly measuring cognitive abilities. Therefore, interpretations regarding cognitive barriers or cognitive performance should be regarded as speculative, highlighting the need for future research incorporating explicit assessments of cognitive factors.

This paper is organized as follows: Section 2 reviews relevant literature and theoretical frameworks, identifying research gaps and presenting hypotheses. Section 3 describes the methodology employed in the study. Section 4 presents empirical results, while Section 5 discusses theoretical contributions, practical implications, and limitations. Finally, Section 6 summarizes key findings and provides future research directions.

2. Literature Review

2.1. Mobile Financial Services and the Digital Divide Among Elderly Consumers

The integration of mobile financial services has significantly reshaped consumer payment behaviors, enhancing transactional convenience, efficiency, and security [1,2]. Mobile banking and payment services are now central to digital financial transactions, supporting seamless financial activities and promoting broader financial inclusion [25,26]. In particular, mobile banking has facilitated essential financial tasks, such as fund transfers, bill payments, and personal financial management, thereby embedding fintech solutions deeply into consumers' daily financial practices [27,28].

Despite these advancements, elderly consumers remain hesitant to engage with mobile financial services fully, limiting their participation and resulting in a persistent digital divide within financial services [20,29]. Prior studies have identified multiple barriers, such as technology anxiety, limited technology familiarity, perceived security risks, and usability challenges, which are significant inhibitors of elderly consumers' sustained adoption of mobile financial solutions [30,31]. The COVID-19 pandemic further amplified these barriers, increasing psychological impacts such as heightened anxiety and isolation among older adults. This situation highlighted the critical need for accessible and user-friendly mobile financial solutions explicitly tailored for elderly populations [32,33].

During the pandemic, elderly consumers experienced increased vulnerability to financial fraud through digital channels, further demonstrating their difficulty in safely adapting to digital financial environments [34]. Increased social isolation and heightened anxiety resulting from the pandemic underscored the urgency of addressing elderly consumers' psychological and cognitive barriers to mobile financial service adoption, emphasizing the need for fintech platforms designed explicitly to accommodate older adults' needs and limitations [35].

Traditional technology adoption frameworks, such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), emphasize perceived usefulness and ease of use as primary predictors of consumer acceptance [36,37]. However, recent studies suggest that psychological factors—particularly technology anxiety and technology familiarity—are equally crucial determinants, especially among elderly consumers [16,38]. For instance, recent evidence indicates that elderly

users who regularly interact with digital technologies experience lower anxiety and higher engagement, suggesting that consistent digital interactions significantly enhance their continued fintech usage [39,40].

Furthermore, inadequate digital literacy and poorly designed technology interfaces pose significant barriers that disproportionately affect elderly consumers' effective adoption of fintech services. Previous research underscores the necessity for age-centric user experience (UX) design improvements to mitigate usability challenges and enhance elderly consumers' digital financial engagement [40–42].

Despite growing recognition of these issues, previous fintech adoption studies typically focus on younger or general consumer populations, neglecting elderly-specific psychological and cognitive barriers. This limitation is reinforced by international studies highlighting significant age-related digital divides and cautious adoption patterns among older populations across demographic and socioeconomic contexts [43].

To address these gaps, this study explicitly investigates how technology anxiety and technology familiarity influence elderly consumers' intentions toward sustained usage of mobile financial services. Additionally, the current study uniquely analyzes how age moderates these psychological relationships, examining distinct differences between older adults aged 60–69 and those aged 70 and above. Given prior insights indicating that privacy concerns, security perceptions, and cognitive challenges significantly affect elderly consumer's fintech adoption decisions [44,45], a detailed understanding of these factors is critical for promoting inclusive fintech solutions.

By providing nuanced insights into elderly consumers' psychological and cognitive determinants, this research aims to make substantial theoretical and practical contributions. Theoretically, it expands traditional technology acceptance frameworks by integrating psychological factors and explicitly addressing elderly-specific adoption patterns. Practically, the findings offer actionable guidance for fintech providers, financial institutions, and policymakers to develop targeted strategies such as tailored digital literacy programs, simplified and accessible fintech interfaces, and personalized user support systems, ultimately enhancing elderly consumers' sustained engagement with mobile financial services.

2.2. Theoretical Foundations of Mobile Financial Adoption Among Elderly Consumers

The TAM suggests that individuals' intentions to adopt new technologies are primarily influenced by perceived usefulness—the belief that using the technology enhances their performance—and perceived ease of use—the belief that using the technology requires minimal effort [36]. The UTAUT further extends the TAM by introducing additional factors, such as performance expectancy, effort expectancy, social influence, and facilitating conditions, as determinants of users' intentions to adopt and continue using technologies [37]. Although these technology adoption frameworks have been extensively applied across various contexts, their applicability to elderly populations remains limited, given older adults' unique psychological and cognitive characteristics [19,20].

Recent studies extending the TAM have shown that perceived usefulness, ease of use, and observability significantly shape elderly consumers' attitudes toward mobile financial services, enhancing their intentions to adopt and continue using such services [46]. Trust has also emerged as a crucial factor, significantly affecting elderly users' perceptions of usefulness and ease of use, and highlighting the importance of perceived risks and security concerns in mobile financial adoption decisions among older adults [46,47].

UTAUT-based studies similarly underscore critical determinants of elderly consumers' adoption behaviors. Performance expectancy significantly influences UK older adults' intentions to adopt mobile banking, with perceived cybersecurity risk emerging as a particularly salient concern [48]. In a Malaysian context, effort expectancy, facilitating conditions,

social influence, hedonic motivation, and performance expectancy positively impacted older adults' adoption intentions, while resistance to change negatively influenced their behaviors [49]. Such findings emphasize the psychological complexity and differentiated needs of elderly fintech users.

Additionally, Self-Efficacy Theory suggests that elderly users' confidence in their technological capabilities critically affects their adoption behaviors [50]. Empirical studies consistently support the significant role of technological self-efficacy in enhancing elderly users' intentions to adopt and continue using mobile financial services. Higher self-efficacy positively influences elderly consumers' perceived usefulness and sustained usage of online financial services [51]. Similarly, elderly consumers with higher technological self-efficacy demonstrate increased engagement with digital financial tools, further emphasizing self-efficacy as a critical psychological determinant for elderly fintech adoption [52].

Despite these theoretical developments, existing fintech adoption studies rarely address elderly consumers' unique cognitive and emotional dimensions, limiting the applicability of widely adopted frameworks such as the TAM and UTAUT. Elderly populations require an understanding that integrates demographic, personal, socio-environmental, and digital usage characteristics specific to their unique contexts [18,53]. Recent evidence also indicates that elderly users' regular digital interactions significantly enhance their acceptance of fintech services, highlighting the importance of understanding their lived digital experiences in facilitating continuous adoption [18].

This study addresses these theoretical gaps by explicitly integrating technology anxiety and technology familiarity as key psychological determinants within the traditional technology adoption frameworks. By empirically examining how these psychological factors influence elderly consumers' continuance intentions and incorporating age as a moderating variable, this research provides a more comprehensive understanding of elderly consumers' fintech adoption behaviors. The integration of the TAM, UTAUT, and Self-Efficacy Theory, combined with specific psychological factors, represents a significant theoretical contribution. Practically, this approach offers actionable insights for fintech providers, financial institutions, and policymakers to enhance digital financial inclusion among elderly populations effectively.

2.3. Psychological Barriers: The Role of Technology Anxiety

Technology anxiety, defined as an individual's apprehension or discomfort experienced when interacting with digital technologies [13], represents a significant psychological barrier affecting elderly consumers' adoption of mobile financial services. Older adults frequently perceive mobile financial applications as complex, error-prone, and insecure, intensifying anxiety and reducing their willingness to adopt and continuously use these services [5,14]. Specific concerns such as transactional errors, financial fraud, identity theft, and data privacy further amplify elderly consumers' reluctance toward sustained engagement with mobile financial solutions [54,55].

Empirical studies consistently demonstrate that heightened technology anxiety negatively influences elderly consumers' intentions toward adopting mobile banking services. Technology anxiety is significantly reducing the intention to adopt mobile financial applications, highlighting anxiety's role in weakening the relationship between intention and actual adoption behaviors [3]. Notably, anxiety levels differ considerably among elderly user segments, challenging the assumption that anxiety uniformly affects all elderly consumers. This suggests the necessity for targeted strategies to effectively address varied anxiety levels among different older adult groups [3].

Negative emotional experiences, which are closely linked to technology anxiety, have also been identified as influential factors shaping elderly consumers' trust toward mobile

financial services. Significant age-specific variations in the dimensions of mobile banking experience influencing trust among elderly consumers have been found, underscoring the importance of age-specific emotional and experiential factors [56]. Furthermore, perceived cybersecurity risks strongly influence older consumers' hesitation in adopting mobile banking, reflecting deep-rooted concerns about data security and transaction safety [48].

From a theoretical perspective, Self-Efficacy Theory [50] helps explain why elderly consumers with lower confidence in their technological capabilities experience heightened anxiety and reduced adoption rates. Empirical evidence confirms that elderly consumers with lower technological self-efficacy display higher technology anxiety, thus highlighting self-efficacy as a crucial determinant in mobile financial adoption among older adults [51,52].

Additionally, the COVID-19 pandemic significantly exacerbated elderly consumers' anxiety toward digital financial technologies due to increased social isolation and emotional distress, reinforcing the importance of addressing psychological factors alongside traditional technology adoption predictors [32,35]. Moreover, negative emotional responses, as explained by the PAD Model [57], suggest that heightened anxiety significantly undermines elderly consumers' fintech adoption by amplifying feelings of stress, frustration, and lack of control [58,59].

Recent UI/UX design research further highlights the impact of mobile financial service design and usability on elderly users' anxiety levels. Interfaces poorly adapted to elderly consumers' physical and cognitive needs significantly intensify technology anxiety, leading to increased frustration and adoption barriers [60,61]. Conversely, there are adaptive UI/UX solutions tailored explicitly to elderly consumers with mobile financial applications [62]. Mobile financial interfaces incorporating conversational agents and visual cues also substantially reduce perceived complexity and anxiety, enhancing elderly consumers' overall user experience and continuance intention [63].

Despite growing awareness of technology anxiety's negative impact on elderly fintech adoption, existing studies have not fully explored specific mechanisms or interventions for mitigating anxiety among elderly users. Further research should explore how targeted interface design, emotional support strategies, and tailored educational interventions can effectively reduce technology anxiety and thereby facilitate sustained adoption of mobile financial services.

Therefore, the present study hypothesizes explicitly:

H1. *Technology anxiety negatively influences mobile banking continuance intention among elderly consumers.*

2.4. Psychological Facilitators: The Importance of Technology Familiarity

Technology familiarity, explicitly referring to an individual's accumulated experience and confidence in using mobile financial tools, plays a critical role in mitigating psychological barriers and fostering adoption among elderly consumers [16]. Greater familiarity with mobile financial services significantly reduces uncertainty and enhances trust, which are crucial factors affecting elderly consumers' continued fintech engagement [20,64].

Elderly consumers who have higher levels of digital familiarity are more likely to develop positive attitudes toward mobile financial services, perceiving them as intuitive, efficient, and secure [65,66]. Prior research consistently demonstrates that increased familiarity enhances elderly users' perceived usefulness, ease of use, and overall trust in mobile financial platforms, thereby promoting sustained adoption [66,67].

Recent studies further underscore the importance of familiarity by showing how elderly individuals' previous digital interactions significantly influence their attitudes and

behaviors toward mobile financial services. Regular interactions with digital technologies greatly enhance elderly consumers' acceptance by facilitating familiarity and decreasing perceived risks [18]. Moreover, perceived ease of use, which is directly associated with technology familiarity, emerges as one of the strongest predictors of elderly consumers' intentions to adopt new digital financial services [47].

The role of technology familiarity can also be theoretically supported by Self-Efficacy Theory [50]. Familiarity increases elderly users' technological self-efficacy, thereby reducing perceived complexity and emotional discomfort when interacting with mobile financial services [64,68]. Elderly individuals with greater digital self-efficacy exhibit increased confidence, demonstrating a stronger willingness to adopt and continuously use mobile banking services [51,52].

Recent interface design research highlights the practical importance of enhancing elderly users' technology familiarity through adaptive and user-centered UX designs. For instance, adaptive interfaces that progressively introduce complex functionalities based on users' prior digital interactions significantly increase elderly consumers' familiarity and comfort, ultimately promoting sustained mobile financial service use [62]. Additionally, incorporating conversational agents, visual aids, and supportive environmental cues has been shown to significantly enhance elderly users' familiarity and perceived ease of use in mobile banking applications, improving their overall user experiences [63].

While previous research generally recognizes the significance of technology familiarity, fewer studies explicitly address how familiarity with specific interface features and UX design elements shapes elderly consumers' continuance intentions toward mobile financial services. Traditional technology adoption models often inadequately account for elderly-specific dynamics, highlighting the necessity of explicitly considering sociological, psychological, and aging-specific dimensions, including familiarity, in understanding elderly consumer adoption behaviors [61].

Therefore, additional empirical research is required to explore in greater detail how specific features, interface designs, and user experiences influence elderly users' sustained engagement with mobile financial services. Such research can help fintech providers and interface designers better understand elderly consumers' unique requirements and facilitate the development of targeted strategies to enhance long-term fintech adoption among elderly populations.

Based on this theoretical foundation and existing research, the following hypothesis is proposed:

H2. *Technology familiarity positively influences mobile banking continuance intention among elderly consumers.*

2.5. Age-Related Variations in Mobile Financial Service Adoption

Previous research on mobile financial service adoption often treats elderly consumers as a homogeneous group, overlooking significant variations within this demographic. However, critical differences exist between older adults aged 60–69 and those aged 70 and above in terms of their psychological readiness and digital engagement behaviors toward mobile financial services. Generally, adults in their 60s exhibit greater adaptability, digital familiarity, and lower technology anxiety compared to adults aged 70 and older, who face more pronounced cognitive and psychological barriers [22,24]. These age-related differences are likely due to generational disparities in prior exposure to technology, levels of digital literacy, and varying perceptions of the security and reliability of mobile financial services [21,23].

Recent comparative research further highlights how age moderates the impact of psychological and cognitive variables on mobile financial adoption. For instance, significant age-based variations in the mobile banking experiences that influence elderly consumers' trust have been found, where older adults (aged 65 and above) responded strongly to social dimensions, whereas emotional and sensory experiences influenced younger older adults more (aged 55–64) [56]. These findings underscore the necessity of age-specific interventions and targeted UX designs to improve elderly consumers' trust and sustained engagement with mobile financial services.

The moderating role of age can also be observed in technology anxiety and familiarity. Older adults aged 70 and above often perceive mobile financial services as complex, unreliable, and anxiety-inducing compared to their younger counterparts aged 60–69 [69]. These heightened cognitive and emotional barriers among older adults significantly limit their willingness to adopt and continuously engage with fintech solutions. Conversely, younger older adults typically display greater openness and adaptability, particularly when appropriate usability enhancements and security features are provided [69].

In contrast, technology familiarity's beneficial effects on sustained fintech engagement are notably more pronounced among older adults. Elderly consumers who successfully acquire familiarity with mobile financial technologies demonstrate substantially increased engagement, highlighting the critical role of targeted digital literacy initiatives and supportive interventions aimed at enhancing older adults' technological confidence and adoption behaviors [66,70].

Recent research on UI/UX designs also underscores the significance of tailored interfaces and user experience adapted specifically for age-related cognitive and physical characteristics. Adaptive interfaces that incrementally introduce complex functionalities based on elderly consumers' prior interactions significantly improve familiarity and reduce anxiety, promoting sustained usage among older adults [62]. Moreover, conversational agents and contextually supportive design features significantly enhance older adults' perceived ease of use, trust, and overall satisfaction with mobile banking applications, depending on users' age-specific cognitive needs and digital skills [63].

Further empirical studies highlight specific UI/UX elements critical for elderly user engagement. For instance, Malaysian older adults strongly prefer interfaces that prioritize a "fast loading time" and simplified designs, showing less interest in more complex features like QR code payments [71]. Employing a design-thinking approach, incorporating elderly users' direct feedback into mobile banking application designs significantly improves their user experience and sustained engagement [72]. Additionally, the Kano model demonstrates how adjustable visual elements such as font style and line spacing substantially enhance older adults' comfort and satisfaction when using mobile technologies, highlighting crucial design considerations for facilitating elderly fintech adoption [73].

Despite recognizing these age-related differences, additional research remains necessary to further clarify how technology anxiety and familiarity distinctly influence older adults' sustained intentions to adopt mobile financial services. Addressing this research gap would provide valuable insights into developing targeted strategies explicitly designed to overcome psychological and cognitive barriers, thereby promoting inclusive and sustainable fintech engagement across elderly subpopulations.

Therefore, based on these theoretical arguments and empirical evidence, we hypothesize:

H3. *Age moderates the relationship between technology anxiety and mobile banking continuance intention, such that the adverse effect of technology anxiety is stronger among older adults aged 70 and above compared to younger older adults (aged 60–69).*

H4. *Age moderates the relationship between technology familiarity and mobile banking continuance intention, such that the positive effect of technology familiarity is more substantial among older adults aged 70 and above compared to younger older adults (aged 60–69).*

Figure 1 illustrates the conceptual research model guiding this study, clearly outlining the hypothesized relationships among technology anxiety, technology familiarity, age (moderator), and mobile banking continuance intention.

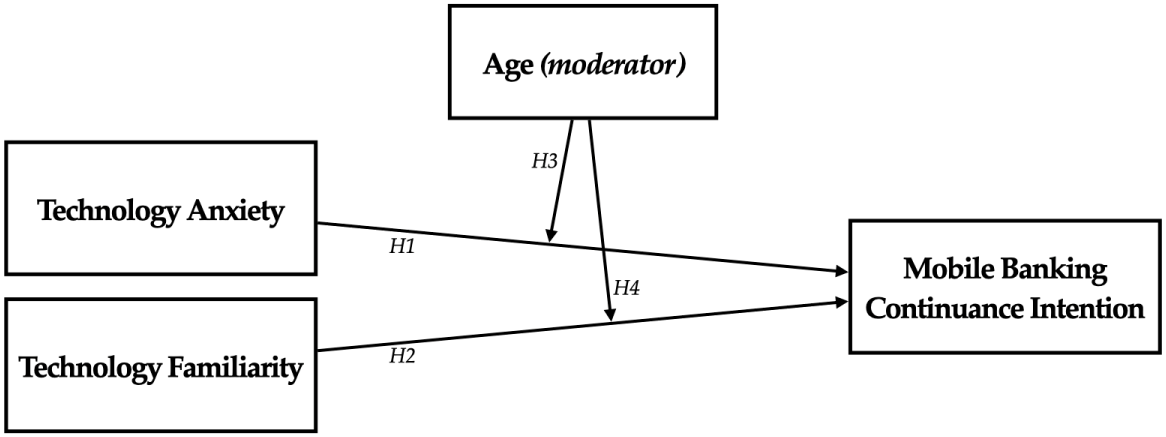


Figure 1. Conceptual research model.

The conceptual research model illustrates the hypothesized relationships among key psychological factors (technology anxiety and familiarity) and elderly consumers' continuance intention toward mobile banking. The model highlights the moderating role of age, proposing that the negative impact of technology anxiety (H1) and the positive impact of technology familiarity (H2) on continuance intention are both moderated by age (H3 and H4). Specifically, older adults aged 70 and above are hypothesized to experience stronger effects from these psychological determinants compared to younger older adults aged 60–69.

3. Materials and Methods

3.1. Participants and Data Collection

This study targeted elderly individuals aged 60 and above who regularly use mobile banking services for financial transactions. Given the increasing reliance on mobile banking technologies among older populations, understanding elderly consumers' psychological and cognitive engagement with these fintech services is critical for promoting digital financial inclusion [1,2].

To capture potential variations in mobile banking behaviors, participants were categorized into two distinct age groups: those in their 60s (60–69 years) and those aged 70 and above. Previous research suggests that older adults aged 60–69 tend to be more adaptable and exhibit greater digital confidence compared to adults aged 70 and older, who typically experience heightened technology anxiety and lower digital familiarity [20,29].

We collected data via an online panel survey administered by Macromill Embrain, a professional research firm in South Korea. Macromill Embrain maintains a panel of over 1.5 million registered respondents, making it highly effective for reaching diverse demographic groups, including elderly populations. The online survey method was particularly appropriate in this context due to its efficiency in rapidly recruiting large, demographically balanced samples of older adults who actively use digital financial services. The survey included screening questions to ensure respondents had prior experience with mobile

banking transactions. Data collection took place from 8 August to 11 August 2023, using stratified quota sampling to balance gender and age representation, ensuring a diverse and representative sample.

An initial sample of 530 respondents completed the survey. After removing incomplete responses and outliers, the final analytical sample comprised 488 elderly consumers. All participants received comprehensive details about the study's purpose and procedures, and provided informed consent by actively selecting the "agree to participate" option. Ethical approval was waived due to the anonymous, voluntary, and minimal-risk nature of the study. Participation was voluntary, and respondents received a small monetary incentive upon completion.

While this study primarily examines mobile banking adoption, its implications extend to broader fintech strategies aimed at enhancing elderly consumers' sustained digital financial participation. Understanding elderly consumers' psychological and cognitive engagement with mobile financial services can significantly inform targeted strategies to promote fintech adoption and continuous usage among older adults.

3.2. Measures

The study constructs were measured using validated scales adapted from prior research. Each item was rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Reliability was assessed using Cronbach's alpha (α), with a threshold of 0.70, indicating acceptable internal consistency. Representative survey items for each variable are provided below, followed by aggregate variable descriptions. The complete questionnaire is available upon request from the corresponding author. Descriptive statistics and reliability coefficients for all variables are presented in Table 1.

Table 1. Descriptive statistics and reliability coefficients of key variables (N = 488).

Variable	M (SD)	Cronbach's α
Technology Anxiety	1.77 (0.68)	0.932
Technology Familiarity	3.91 (0.83)	0.956
Perceived Usefulness	4.34 (0.64)	0.946
Perceived Ease of Use	3.80 (0.77)	0.926
Mobile Usage Capability	3.90 (0.78)	0.931
Mobile Banking Continuance Intention	4.28 (0.70)	0.944

Notes: M = mean, SD = standard deviation (in parentheses); N = number of observations.

The results indicate strong internal consistency across all constructs, with Cronbach's alpha values exceeding 0.90. The mean score for technology anxiety (M = 1.77, SD = 0.68) suggests relatively low anxiety regarding mobile banking among elderly consumers in our sample. Conversely, technology familiarity (M = 3.91, SD = 0.83) indicates a moderate level of prior experience and confidence specifically with mobile banking services.

Perceived usefulness (M = 4.34, SD = 0.64) and perceived ease of use (M = 3.80, SD = 0.77) were rated relatively high, supporting the idea that elderly consumers generally perceive mobile banking positively. The mobile usage capability score (M = 3.90, SD = 0.78) suggests respondents' substantial competency in digital tasks relevant to mobile banking. Finally, mobile banking continuance intention was also high (M = 4.28, SD = 0.70), indicating strong intent for sustained mobile banking usage.

3.2.1. Technology Anxiety

Technology anxiety was measured using a modified PAD model [57], adapted to specifically capture elderly consumers' emotional discomfort associated with using mobile banking services [14]. Representative items include:

- "I feel nervous when using mobile banking for digital transactions."
- "I feel stressed when attempting to complete a financial transaction using mobile banking."

3.2.2. Technology Familiarity

In this study, technology familiarity specifically refers to elderly consumers' accumulated experience, comfort, and perceived confidence in using mobile banking applications and related financial services [16,65]. Representative items include:

- "I am comfortable using mobile banking for digital transactions."
- "I confidently navigate digital payment options in mobile banking apps."

3.2.3. Perceived Usefulness and Perceived Ease of Use

Perceived usefulness and perceived ease of use were measured using validated scales adapted from the TAM [36] and the UTAUT [37]. Representative items include:

- Perceived usefulness: "Using mobile banking improves my digital financial transactions."
- Perceived ease of use: "Mobile banking services are easy to navigate."

3.2.4. Mobile Usage Capability

Mobile usage capability was measured with a scale adapted from [15], assessing elderly consumers' proficiency and confidence in managing digital tasks specifically relevant to mobile banking. Representative items include:

- "I can manage security settings on my smartphone for safe digital transactions."
- "I can handle various online payment methods in mobile applications."

3.2.5. Mobile Banking Continuance Intention

Mobile banking continuance intention was measured using a scale adapted from [74], assessing elderly consumers' intentions to sustain their use of mobile banking services. Representative items include:

- "I intend to continue using mobile banking for online and digital transactions."
- "I will actively use mobile banking as my primary financial service tool."

3.2.6. Control Variables

Control variables included demographic characteristics (age, gender, education level, household income, and mobile banking usage frequency), collected to account for potential confounding effects in the analysis.

3.3. Descriptive Statistics of Participants

The descriptive statistics of the study participants are summarized in Table 2.

The mean age of respondents was 67.62 years (SD = 5.25), with a nearly equal gender distribution (male: 48.6%, female: 51.4%). The sample was generally well-educated, with 49.2% of participants holding a college degree or higher. Regarding financial status, the average monthly household income was approximately KRW 4,478,200 (SD = 2,456,500 KRW), suggesting that most elderly consumers in the sample had incorporated digital financial tools into their daily routines. However, usage frequency varied considerably: 38.7% reported using mobile banking one to three times per week, while 5.7% used it less than once every three months. These findings indicate that while many elderly consumers actively engage with mobile banking, some remain infrequent users.

Table 2. Descriptive statistics of participants (N = 488).

	Total Sample (N = 488)
Gender (%)	
Male	48.6
Female	51.4
Age (M, SD)	67.62 (5.25)
Education (%)	
High school graduate	39.3
College graduate	49.2
Postgraduate degree	11.5
Household income (KRW 10 k, M, SD)	447.82 (245.65)
Household Type (%)	
Single-person household	10.7
Couple household	46.5
Household with children	40.0
Other	2.9
Mobile Banking Usage (Without Assistance, %)	
Yes	97.1
No	2.9
Freq. of Mobile Banking Usage (%)	
4–6 times a week	17.4
1–3 times a week	38.7
1–3 times a month	38.1
Less than once every three months	5.7
Num. of Mobile Banking Apps Installed on Device (M, SD)	3.66 (2.22)

Notes: M = mean, SD = standard deviation; N = number of observations.

It should be noted that individuals with lower educational levels were underrepresented in our sample. Therefore, caution should be exercised when generalizing these findings to elderly populations with lower educational backgrounds. This limitation is discussed further in Section 5.3.

3.4. Data Analysis

We conducted all statistical analyses using SPSS 30.0. First, descriptive statistics summarized participants' demographic characteristics and key study variables. To identify significant differences between two age groups (aged 60–69 vs. aged 70 and above), we performed independent samples *t*-tests for continuous variables. Additionally, one-way ANOVA was conducted to assess variations in key variables based on participants' demographic characteristics.

Next, we performed hierarchical multiple regression analyses to test the study's hypotheses. We introduced interaction terms into the regression models specifically to examine the moderating effects of age on the relationships between technology anxiety, technology familiarity, and mobile banking continuance intention. Statistical significance for all analyses was evaluated at a threshold of $p < 0.05$.

4. Results

4.1. Differences in Key Variables by Participant Characteristics

Table 3 presents detailed comparisons of key variables (technology anxiety, technology familiarity, perceived usefulness, perceived ease of use, mobile usage capability, and mobile banking continuance intention) based on participant characteristics such as gender, age group, education level, household type, monthly income, mobile banking usage frequency, and number of mobile banking apps installed.

Table 3. Differences in key variables by participant characteristics (N = 488).

	Technology Anxiety		Technology Familiarity		Perceived Usefulness		Perceived Ease of Use		Mobile Usage Capability		Mobile Banking Continuance Intention	
	M (SD)	**t/F**	**M (SD)**	**t/F**	**M (SD)**	**t/F**	**M (SD)**	**t/F**	**M (SD)**	**t/F**	**M (SD)**	**t/F**
Gender												
Male	1.74 (0.66)	−0.945	3.95 (0.81)	1.016	4.36 (0.61)	0.484	3.83 (0.76)	0.668	4.05 (0.73)	4.197 ***	4.31 (0.69)	1.152
Female	1.80 (0.69)		3.87 (0.84)		4.33 (0.66)		3.78 (0.79)		3.76 (0.81)		4.24 (0.71)	
Age Group												
60s	1.69 (0.62)	−3.182 **	4.01 (0.76)	3.230 **	4.40 (0.62)	2.513 *	3.87 (0.73)	2.546 *	4.02 (0.76)	4.090 ***	4.38 (0.64)	3.912 ***
70s and above	1.89 (0.74)		3.76 (0.90)		4.25 (0.65)		3.69 (0.82)		3.72 (0.79)		4.12 (0.77)	
Education												
High school graduate	1.90 ^{b} (0.71)	6.300 **	3.71 ^{a} (0.83)	10.495 ***	4.27 ^{a} (0.64)	3.611 *	3.62 ^{a} (0.77)	10.189 ***	3.65 ^{a} (0.78)	17.038 ***	4.14 ^{a} (0.65)	9.579 ***
College graduate	1.70 ^{a} (0.66)		4.01 ^{b} (0.83)		4.36 ^{ab} (0.65)		3.89 ^{b} (0.77)		4.06 ^{b} (0.76)		4.32 ^{b} (0.75)	
Postgraduate degree	1.61 ^{a} (0.53)		4.18 ^{b} (0.66)		4.52 ^{b} (0.55)		4.04 ^{b} (0.66)		4.09 ^{b} (0.65)		4.57 ^{c} (0.52)	
Household Type												
Household with children	1.76 (0.64)	0.261	3.93 (0.82)	−0.387	4.40 (0.54)	−1.645	3.81 (0.77)	−0.186	3.90 (0.81)	0.097	4.36 (0.63)	−2.226 *
Other	1.78 (0.70)		3.90 (0.83)		4.30 (0.69)		3.80 (0.78)		3.90 (0.76)		4.22 (0.74)	
Monthly Income (KRW 10k)												
KRW ≤ 200k	1.91 ^{b} (0.69)	3.223 *	3.79 ^{a} (0.80)	2.190	4.26 ^{a} (0.64)	2.889 *	3.69 ^{a} (0.77)	1.879	3.63 ^{a} (0.82)	7.304 ***	4.14 ^{a} (0.70)	4.926 **
KRW 200k–400k	1.74 ^{ab} (0.68)		3.86 ^{ab} (0.89)		4.28 ^{a} (0.75)		3.78 ^{ab} (0.81)		3.86 ^{b} (0.77)		4.19 ^{ab} (0.77)	
KRW 400k–600k	1.82 ^{b} (0.74)		3.95 ^{a} (0.80)		4.40 ^{ab} (0.50)		3.80 ^{ab} (0.76)		4.02 ^{bc} (0.78)		4.35 ^{bc} (0.67)	
KRW 600k+	1.63 ^{a} (0.53)		4.06 ^{b} (0.75)		4.47 ^{b} (0.53)		3.94 ^{b} (0.72)		4.09 ^{c} (0.70)		4.46 ^{c} (0.58)	
Mobile Banking Usage (Without Assistance)												
Yes	1.74 (0.66)	−7.769 ***	3.95 (0.81)	5.813 ***	4.36 (0.63)	3.803 ***	3.83 (0.77)	8.586 ***	3.93 (0.77)	4.346 ***	4.30 (0.69)	4.539 ***
No	2.75 (0.47)		2.69 (0.48)		3.71 (0.60)		2.90 (0.38)		3.02 (0.72)		3.45 (0.52)	
Freq. of Mobile Banking Usage												
4–6 times a week	1.53 ^{a} (0.56)	23.319 ***	4.34 $_{d}$ (0.71)	29.7580 ***	4.55 ^{c} (0.64)	16.022 ***	4.16 ^{c} (0.79)	16.573 ***	4.19 ^{c} (0.78)	14.876 ***	4.51 ^{c} (0.70)	31.102 ***
1–3 times a week	1.61 ^{a} (0.55)		4.07 ^{c} (0.72)		4.45 ^{c} (0.57)		3.88 ^{b} (0.69)		4.03 ^{c} (0.75)		4.49 ^{c} (0.49)	
1–3 times a month	1.93 ^{b} (0.71)		3.68 ^{b} (0.82)		4.22 ^{b} (0.62)		3.66 ^{b} (0.76)		3.72 ^{b} (0.75)		4.08 ^{b} (0.71)	
Less than once every three months	2.48 ^{c} (0.84)		3.03 ^{a} (0.78)		3.79 ^{a} (0.68)		3.16 ^{a} (0.75)		3.33 ^{a} (0.63)		3.46 ^{a} (0.88)	
Num. of Mobile Banking Apps Installed on Device												
1–2 apps	1.94 ^{b} (0.77)	10.007 ***	3.64 ^{a} (0.87)	15.801 ***	4.23 ^{a} (0.64)	4.843 **	3.64 ^{a} (0.80)	5.754 **	3.62 ^{a} (0.83)	20.926 ***	4.05 ^{a} (0.78)	17.525 ***
3–4 apps	1.72 ^{a} (0.63)		4.02 ^{b} (0.73)		4.37 ^{b} (0.57)		3.90 ^{b} (0.72)		3.99 ^{b} (0.67)		4.34 ^{b} (0.60)	
5+ apps	1.62 ^{a} (0.56)		4.11 ^{b} (0.79)		4.45 ^{b} (0.68)		3.87 ^{b} (0.78)		4.14 ^{b} (0.74)		4.49 ^{c} (0.63)	

Notes. M = mean, SD = standard deviation (in parentheses). Group differences were analyzed using independent sample *t*-tests (for two-group comparisons) and one-way ANOVA (for multi-group comparisons). The null hypothesis for these analyses assumes no difference between groups for the measured variables. Post hoc comparisons were conducted using Duncan's test. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

As shown in Table 3, age was a significant determinant of mobile banking behaviors among elderly consumers. Younger older adults (aged 60–69) exhibited significantly lower technology anxiety (M = 1.69, SD = 0.62) and higher technology familiarity (M = 4.01, SD = 0.76) compared to older adults aged 70 and above (anxiety: M = 1.89, SD = 0.74; familiarity: M = 3.76, SD = 0.90, all $p < 0.01$). This suggests that early exposure to digital technologies fosters greater confidence and reduced anxiety regarding mobile financial services.

Education also significantly influenced mobile banking adoption. Participants with postgraduate degrees showed lower technology anxiety (M = 1.61, SD = 0.53) and higher technology familiarity (M = 4.18, SD = 0.66) compared to those with only a high school education ($p < 0.01$). Additionally, higher income was associated with higher perceived usefulness and ease of use regarding mobile banking services ($p < 0.01$), indicating that economic factors also play a role in shaping elderly consumers' perceptions of fintech services.

Superscripts (a, b, c, d) indicate significant differences between groups in Duncan's multiple-comparison tests; groups with different superscripts significantly differ at $p < 0.05$. Furthermore, the frequency of mobile banking usage strongly correlated with technology anxiety and continuance intention. Frequent mobile banking users (4–6 times per week) reported significantly lower anxiety (M = 1.53, SD = 0.56) and higher continuance intention (M = 4.51, SD = 0.70) compared to infrequent users (less than once every three months, all $p < 0.001$). These findings indicate that frequent engagement with mobile banking fosters greater comfort and proficiency, underscoring the importance of promoting regular usage to enhance elderly consumers' long-term fintech adoption.

4.2. Correlation Between Key Variables

Table 4 presents the correlation matrix among key study variables, including technology anxiety, technology familiarity, perceived usefulness, perceived ease of use, mobile usage capability, and mobile banking continuance intention.

Table 4. Correlations matrix of key variables.

	Technology Anxiety	Technology Familiarity	Perceived Usefulness	Perceived Ease of Use	Mobile Usage Capability	Mobile Banking Continuance Intention
Technology Anxiety	1.000					
Technology Familiarity	−0.653 ***	1.000				
Perceived Usefulness	−0.577 ***	0.715 ***	1.000			
Perceived Ease of Use	−0.667 ***	0.838 ***	0.701 ***	1.000		
Mobile Usage Capability	−0.524 ***	0.684 ***	0.538 ***	0.600 ***	1.000	
Mobile Banking Continuance Intention	−0.616 ***	0.725 ***	0.709 ***	0.635 ***	0.639 ***	1.000

*** $p < 0.001$.

The correlation analysis revealed that technology anxiety exhibited significant negative correlations with all other key constructs: technology familiarity (r = −0.653, $p < 0.001$), perceived usefulness (r = −0.577, $p < 0.001$), perceived ease of use (r = −0.667, $p < 0.001$), mobile usage capability (r = −0.524, $p < 0.001$), and mobile banking continuance intention (r = −0.616, $p < 0.001$). These results indicate that higher levels of technology anxiety substantially reduce elderly consumers' engagement with and intentions toward sustained usage of mobile financial services.

Conversely, technology familiarity demonstrated strong positive correlations with perceived usefulness (r = 0.715, $p < 0.001$), perceived ease of use (r = 0.838, $p < 0.001$), mobile usage capability (r = 0.684, $p < 0.001$), and especially mobile banking continuance intention

(r = 0.725, $p < 0.001$). These findings suggest that increased familiarity and confidence with mobile banking significantly facilitate sustained adoption and engagement among elderly consumers.

Additionally, mobile usage capability was positively correlated with perceived ease of use (r = 0.600, $p < 0.001$) and mobile banking continuance intention (r = 0.639, $p < 0.001$), suggesting that elderly users' general digital proficiency beyond basic banking tasks positively influences their continued adoption of mobile financial services.

Overall, these correlations provide preliminary support for this study's hypotheses regarding the critical roles of technology anxiety and technology familiarity in elderly consumers' sustained engagement with mobile banking.

4.3. Regression Analysis

We conducted hierarchical regression analyses to test our hypotheses. To examine the moderating effects of age as hypothesized in H3 and H4, we introduced interaction terms between age and the key predictors (technology anxiety and technology familiarity). Table 5 summarizes the results from these moderation analyses.

Table 5. Hierarchical regression results: main effects and moderating role of age on mobile banking continuance intention.

Variables	Baseline Model	Age Moderation: Anxiety Effects	Age Moderation: Familiarity Effects	Full Moderation Model
Intercept	1.356 *** (0.245)	1.390 *** (0.247)	1.489 *** (0.253)	1.818 *** (0.268)
Gender (male = 0)	0.013 (0.040)	0.013 (0.040)	0.014 (0.039)	0.012 (0.039)
Age (60s = 0)	−0.023 (0.041)	−0.143 (0.110)	−0.391 * (0.188)	−1.405 *** (0.350)
Education (high school graduate = 0)	0.002 (0.042)	0.001 (0.042)	0.003 (0.042)	0.002 (0.041)
Monthly Income 200 k–400 k (≤200k = 0)	−0.046 (0.054)	−0.048 (0.054)	−0.040 (0.054)	−0.036 (0.053)
Monthly Income 400 k–600 k (≤200k = 0)	0.009 (0.059)	0.010 (0.059)	0.010 (0.059)	0.015 (0.059)
Monthly Income 600 k+ (≤200 k = 0)	0.030 (0.062)	0.029 (0.062)	0.037 (0.062)	0.042 (0.061)
Mobile Banking Usage Without Assistance (yes = 0)	0.103 (0.125)	0.097 (0.125)	0.128 (0.125)	0.142 (0.124)
Freq. of Mobile Banking Usage 1–3 Times a Month (less than once every three months = 0)	0.194 * (0.092)	0.200 * (0.092)	0.184 * (0.092)	0.193 * (0.091)
Freq. of Mobile Banking Usage 1+ Times a Week (less than once every three months = 0)	0.286 ** (0.095)	0.292 ** (0.095)	0.276 ** (0.095)	0.281 ** (0.094)
Num. of Mobile Banking Apps Installed on Device (1–2 apps = 0)	0.044 (0.043)	0.046 (0.043)	0.043 (0.043)	0.044 (0.042)
Technology Anxiety	−0.162 *** (0.040)	−0.192 *** (0.047)	−0.153 *** (0.040)	−0.253 *** (0.049)
Technology Familiarity	0.224 *** (0.050)	0.227 *** (0.050)	0.180 *** (0.054)	0.126 * (0.056)
Perceived Usefulness	0.379 *** (0.045)	0.380 *** (0.045)	0.385 *** (0.045)	0.394 *** (0.045)
Perceived Ease of Use	−0.079 (0.049)	−0.078 (0.049)	−0.076 (0.049)	−0.067 (0.048)
Mobile Banking Capability	0.187 *** (0.035)	0.185 *** (0.035)	0.1860 *** (0.035)	0.178 *** (0.035)
Age (60s = 0) × Technology Anxiety		0.067 (0.057)		0.258 *** (0.075)
Age (60s = 0) × Technology Familiarity			0.095 * (0.047)	0.237 *** (0.062)
F	61.023 ***	57.343 ***	57.829 ***	56.346 ***
Adj. R^2	0.649	0.649	0.651	0.659

Notes. Unstandardized regression estimates (standard errors in parentheses). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Model descriptions: baseline model includes main effects only. Age Moderation (Anxiety Effects) and Age Moderation (Familiarity Effects) introduce each moderation effect separately. Full Moderation Model includes all interaction terms simultaneously.

Technology anxiety significantly and negatively influenced mobile banking continuance intention ($\beta = -0.162$, $p < 0.001$), supporting H1. Conversely, technology familiarity positively affected continuance intention ($\beta = 0.224$, $p < 0.001$), confirming H2.

Interaction terms examining age moderation yielded significant results:

- The negative effect of technology anxiety was significantly stronger among older adults (aged 70+) compared to younger older adults ($\beta = -0.253$, $p < 0.001$), strongly supporting H3.
- Conversely, the positive effect of technology familiarity was significantly stronger for older adults (aged 70+) compared to younger older adults ($\beta = 0.237$, $p < 0.001$), clearly supporting H4.

Figure 2 provides visual interaction plots illustrating these moderation effects, clearly highlighting the differences in how technology anxiety and technology familiarity influence mobile banking continuance intention across the two age groups.

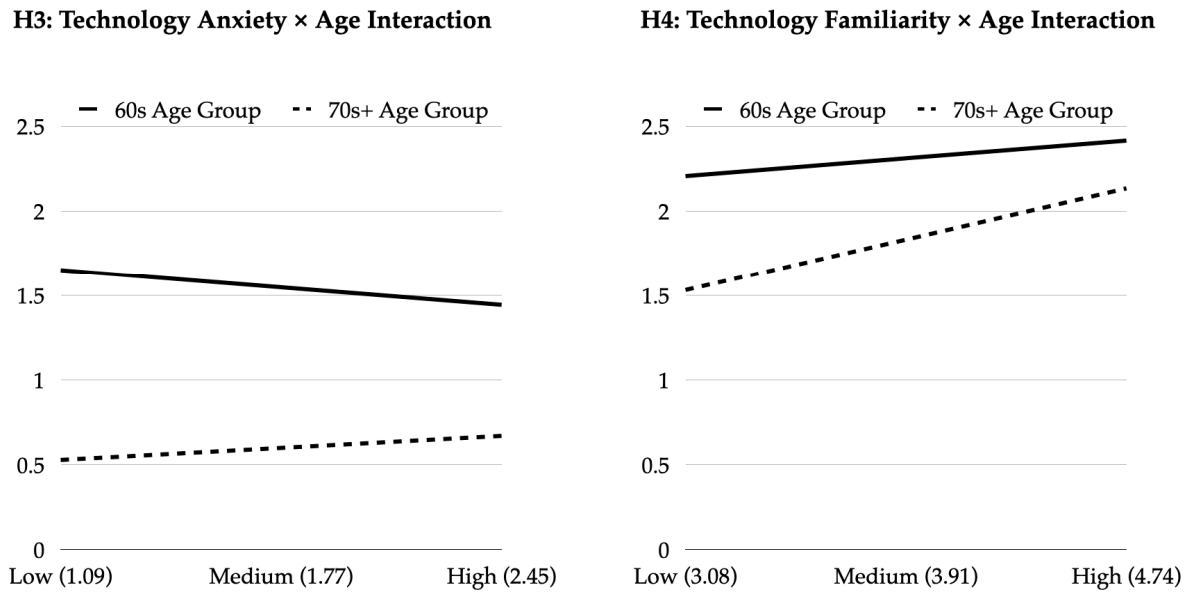


Figure 2. Interaction plots for moderating effects of age on mobile banking continuance intention.

Figure 2 illustrates the interaction effects hypothesized in H3 and H4. The left panel (H3) depicts the moderating role of age on the relationship between technology anxiety and continuance intention, showing a more pronounced negative impact of anxiety for older adults (70+). The right panel (H4) illustrates the moderating effect of age on the relationship between technology familiarity and continuance intention, demonstrating a stronger positive impact of familiarity among older adults (70+). Values represent mean levels of continuance intention at low, medium, and high levels of each predictor.

These results indicate significant age-based differences: older adults experience greater sensitivity to technology anxiety and more substantial benefits from enhanced technology familiarity. Therefore, age-specific interventions to reduce anxiety and enhance familiarity are crucial for fostering sustained fintech engagement among elderly consumer groups.

Finally, we formally tested differences in regression coefficients between the two age groups via the interaction terms included in our regression models. The significant interaction effects (Age × Anxiety, Age × Familiarity) confirm that the regression coefficients significantly differ between younger older adults and older adults, strongly supporting our moderation hypotheses (H3 and H4).

4.4. Subgroup Regression Analysis

We conducted separate regression analyses for younger older adults (aged 60–69) and older adults (aged 70+) to further explore age-related differences in the determinants of mobile banking continuance intention. Table 6 summarizes the subgroup regression results, explicitly comparing predictors of mobile banking continuance intention across the two distinct age groups.

Table 6. Subgroup regression analysis comparing predictors of mobile banking continuance intention by age group.

	60s	70s and Above
Intercept	2.130 *** (0.317)	−0.242 (0.399)
Gender (male = 0)	0.017 (0.051)	0.008 (0.061)
Education (high school graduate = 0)	0.037 (0.054)	−0.025 (0.066)
Monthly Income 200 k–400 k (≤200 k = 0)	−0.054 (0.075)	0.005 (0.077)
Monthly Income 400 k–600 k (≤200 k = 0)	−0.012 (0.080)	0.039 (0.091)
Monthly Income 600 k+ (≤200 k = 0)	0.013 (0.079)	0.120 (0.101)
Mobile Banking Usage Without Assistance (yes = 0)	−0.190 (0.198)	0.240 (0.162)
Freq. of Mobile Banking Usage 1–3 Times a Month (less than once every three months = 0)	0.228 (0.146)	0.129 (0.118)
Freq. of Mobile Banking Usage 1+ Times a Week (less than once every three months = 0)	0.335 * (0.146)	0.219 (0.126)
Num. of Mobile Banking Apps Installed on Device (1–2 apps = 0)	−0.002 (0.057)	0.095 (0.062)
Technology Anxiety	−0.257 *** (0.052)	0.057 (0.065)
Technology Familiarity	0.197 ** (0.067)	0.298 *** (0.073)
Perceived Usefulness	0.274 *** (0.057)	0.570 *** (0.079)
Perceived Ease of Use	−0.080 (0.064)	−0.057 (0.074)
Mobile Banking Capability	0.173 *** (0.044)	0.186 ** (0.059)
F	29.901 ***	38.265 ***
Adj. R^2	0.579	0.731

Notes. Unstandardized regression coefficients (standard errors in parentheses.) *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

For younger older adults (aged 60–69), technology anxiety significantly and negatively predicted mobile banking continuance intention ($\beta = -0.257$, $p < 0.001$). However, among older adults (aged 70+), technology anxiety was not significantly associated with continuance intention ($\beta = 0.057$, p = n.s.). This suggests that technology anxiety strongly discourages sustained mobile banking usage among younger older adults. In contrast, older adults may have already limited or discontinued their engagement with mobile banking due to prior negative experiences or consistently high anxiety levels.

Conversely, technology familiarity was significantly associated with continuance intention for both age groups. However, this positive effect was notably stronger among older adults (aged 70+) ($\beta = 0.298$, $p < 0.001$) than younger older adults ($\beta = 0.197$, $p < 0.001$). This implies that while familiarity with mobile banking positively influences all elderly users, older adults (aged 70+) particularly benefit from higher familiarity, highlighting the importance of targeted digital literacy interventions and supportive user experiences specifically tailored to this older segment.

To formally verify whether these differences in regression coefficients between the two age groups were statistically significant, we tested interaction terms in the hierarchical regression analyses (reported in Table 5). Significant interaction effects for both technology anxiety and technology familiarity confirm statistically significant differences between younger older adults and older adults, supporting our moderation hypotheses (H3 and H4).

These subgroup analyses demonstrate the importance of developing age-specific strategies to effectively reduce psychological barriers and enhance familiarity, ultimately promoting inclusive and sustained fintech adoption among elderly consumers.

Figure 2 provides visual representations of these moderation effects, clearly illustrating distinct differences between the two age groups in how technology anxiety and technology familiarity affect continuance intentions toward mobile banking.

5. Discussion

This study enhances the understanding of elderly consumers' adoption of mobile financial services by examining the roles of technology anxiety and technology familiarity, as well as the moderating influence of age. Our findings indicate that technology anxiety negatively impacts mobile banking continuance intention, while technology familiarity facilitates sustained fintech engagement. Older seniors (aged 70+) exhibited greater sensitivity to both factors than younger older adults (aged 60–69), emphasizing the need for targeted interventions to bridge the digital divide in fintech adoption. Older adults have the highest psychological barriers but also the most significant potential for benefits from targeted programs that build familiarity.

Specifically, older adults (aged 70+) demonstrated heightened vulnerability to technology anxiety, potentially reflecting differences in prior exposure and adaptation to digital financial technologies. However, since we did not explicitly measure participants' cognitive abilities, the role of cognitive barriers remains speculative and warrants clear examination in future studies. This interpretation aligns with previous research highlighting substantial psychological and cognitive challenges faced by older populations in fintech adoption [29,54]. Security and privacy concerns further reinforce avoidance behaviors, discouraging sustained engagement with mobile financial services [48,56]. Additionally, the lack of a significant association between technology anxiety and continuance intention among older adults suggests that anxiety may have already led to limited or ceased engagement due to prior negative experiences or persistent apprehension. This nuanced finding warrants deeper exploration in future research, particularly focusing on understanding elderly users' coping mechanisms and strategies for overcoming technology anxiety.

Conversely, technology familiarity demonstrated significant positive effects, which were particularly pronounced among older adults. This suggests that once familiarity with fintech applications is developed, elderly users become actively engaged in sustained fintech usage. Previous studies support this interpretation, emphasizing that repeated interactions with digital tools significantly reduce initial resistance, promoting long-term adoption among older consumers [18,70]. Consistent with Self-Efficacy Theory [50], elderly consumers who gain confidence in using fintech applications through repeated interactions demonstrate greater willingness for continuous usage.

The subgroup regression analyses further confirmed substantial differences between younger older adults and older adults in how technology anxiety and technology familiarity influence continuance intention. These age-specific results highlight the necessity for targeted, age-tailored interventions to reduce psychological barriers and enhance technology familiarity, thereby supporting sustained fintech engagement across elderly populations. Formal interaction tests further validated significant statistical differences between these age groups, strongly supporting our moderation hypotheses (H3 and H4).

5.1. Theoretical Contributions

This study contributes to existing research by extending traditional technology adoption frameworks such as the TAM [36] and the UTAUT [37]. While these models primarily emphasize perceived usefulness and ease of use, our findings highlight psychological

and cognitive dimensions—particularly technology anxiety and familiarity—as critical determinants in elderly users' fintech adoption behaviors. Furthermore, by confirming the moderating role of age, we explicitly integrate age-specific psychological mechanisms, clearly distinguishing between younger older adults (aged 60–69) and older adults (aged 70+), thus enhancing existing theoretical frameworks with a nuanced age perspective.

Unexpectedly, traditional socioeconomic variables such as income, education level, and household economic status had relatively limited influence in our models. This surprising result may stem from the sample's relatively homogeneous educational and economic composition, as participants predominantly held higher educational levels and were already experienced users of mobile banking. Future research should explore this finding further by incorporating more heterogeneous samples and explicitly testing economic and educational diversity among elderly populations.

Additionally, while not explicitly tested in this study, Cognitive Load Theory [66] may help explain why older adults exhibit higher anxiety levels due to potentially increased cognitive demands from complex fintech interfaces. Future studies could further integrate Cognitive Load Theory to clarify how cognitive complexity influences anxiety and familiarity among elderly fintech users.

5.2. Practical Implications

These findings offer several actionable insights for fintech providers, financial institutions, and policymakers seeking to enhance elderly consumers' sustained fintech engagement.

First, targeted digital literacy programs should be developed to address technology anxiety and enhance familiarity specifically. Prior research has highlighted experiential and interactive training as being more effective than passive methods, particularly for older adults [72,75]. Interactive tutorials, peer-mentoring programs, and practical workshops explicitly tailored for elderly users could significantly increase their comfort and familiarity with fintech applications.

Second, fintech platforms should adopt age-friendly user experience (UX) design principles, focusing on reducing cognitive barriers and enhancing usability. Simplified interfaces, biometric authentication, intuitive navigation, larger fonts, and voice-assisted confirmations could substantially enhance elderly users' fintech experiences [63,71]. Communicated security and privacy protection features are crucial for mitigating technology anxiety and fostering elderly consumers' trust in mobile financial services [48].

Third, fintech providers should establish dedicated customer support channels explicitly catering to elderly consumers. Personalized customer support, intergenerational learning opportunities, and friendly assistance for older adults (e.g., real-time fraud monitoring, specialized support services) could further bridge the digital divide and promote elderly consumers' sustained fintech adoption [63,76].

5.3. Limitations and Future Research Directions

Despite significant contributions, this study has several limitations that warrant further investigation.

First, our study focused exclusively on elderly individuals who had prior experience with mobile financial services. This could partly explain the relatively low mean score for technology anxiety (M = 1.77), as our sample already includes users familiar with mobile banking technologies. Alternatively, technology anxiety might have been reduced due to the widespread everyday integration of mobile banking services in recent years. Thus, future studies should explicitly investigate non-users or first-time users to provide a more comprehensive understanding of anxiety and resistance within elderly populations.

Second, the sample predominantly included individuals with higher education levels and relatively stable economic backgrounds, limiting generalizability. Therefore, future research should recruit more diverse elderly populations, including those with lower educational and economic statuses, to capture broader insights into fintech adoption barriers.

Third, although age moderation was explicitly tested, other potentially relevant factors, such as broader digital literacy indicators, social influence, individual innovativeness, and prior fintech exposure, should be explored in future research. Digital literacy, in particular, should be operationalized using comprehensive and validated indicators to delineate its influence on elderly consumers' fintech adoption.

Fourth, the cross-sectional design limits our ability to assess long-term changes in technology anxiety and familiarity. Future research employing longitudinal methods could provide deeper insights into how elderly consumers' fintech adoption behaviors evolve over extended periods of use.

Additionally, this study explicitly focused on psychological dimensions and did not directly assess cognitive abilities. Therefore, interpretations regarding cognitive barriers or cognitive factors are speculative and should be validated in future research incorporating explicit cognitive assessments.

Finally, incorporating Cognitive Load Theory explicitly in future studies could offer valuable insights into how the cognitive demands of fintech interfaces influence elderly users' anxiety levels and adoption behaviors. Such research could significantly inform user interface design strategies aimed at reducing cognitive complexity and facilitating elderly consumers' continued fintech adoption.

Addressing these limitations through future research would substantially advance our understanding of elderly consumers' fintech adoption, contributing to the development of more inclusive, effective digital financial services.

6. Conclusions

This study advances our understanding of fintech adoption among elderly consumers by highlighting the crucial roles of technology anxiety, technology familiarity, and age-related differences. The findings underscore the need to address psychological and cognitive factors—particularly anxiety reduction and familiarity enhancement—to promote sustained mobile banking engagement among elderly populations. By explicitly integrating these psychological dimensions, our study expands traditional technology adoption models, such as the TAM and UTAUT, which typically emphasize perceived usefulness and ease of use alone. This expanded perspective provides nuanced insights critical for enhancing digital financial inclusion for older adults.

As fintech ecosystems increasingly integrate mobile banking solutions, developing accessible and age-friendly user experiences becomes imperative. Our findings indicate that enhancing elderly consumers' digital literacy, simplifying interface designs, and communicating security features can significantly improve sustained fintech adoption among older adults. Fintech providers, financial institutions, and policymakers should adopt targeted interventions that specifically address the diverse psychological and cognitive needs of elderly consumer groups.

To further strengthen fintech adoption strategies for elderly populations, we offer several clear recommendations for future research:

- Longitudinal studies to track long-term changes in elderly consumers' technology anxiety, technology familiarity, and fintech adoption behaviors.
- Comprehensive digital literacy assessments, incorporating operationalized indicators of elderly consumers' digital skills, confidence, and proficiency.

- Examination of interface complexity and cognitive load, leveraging Cognitive Load Theory to clarify how cognitive demands influence elderly consumers' fintech anxiety and sustained adoption.
- Inclusion of more diverse samples, particularly elderly non-users or first-time users, as well as elderly individuals with lower educational attainment and socioeconomic status, to enhance the generalizability of findings.
- Investigation into personalized support interventions specifically designed to meet elderly consumers' cognitive and emotional needs, enhancing continuous fintech engagement.

In conclusion, this study demonstrates that reducing technology anxiety and enhancing familiarity are essential for fostering inclusive fintech adoption among elderly consumers. By addressing age-specific psychological barriers and systematically enhancing technology familiarity, fintech providers and policymakers can effectively bridge the digital divide, ensuring meaningful digital financial inclusion for aging populations.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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

Abbreviations

The following abbreviations are used in this manuscript:

TAM	Technology Acceptance Model
UTAUT	Unified Theory of Acceptance and User of Technology
PAD	Pleasure–Arousal–Dominance

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