

Sustaining Mobile Banking Use after Adoption in an Emerging Market: An Extended UTAUT Model of Perceived Cyber Risk, Fintech Innovation, and Age-Contingent Effects

Syarif Agussaid Alkadrie¹, Ramadania², Heriyadi³

¹(Department of Management, Faculty of Economics and Business, Universitas Tanjungpura, Pontianak, Indonesia)

²(Department of Management, Faculty of Economics and Business, Universitas Tanjungpura, Pontianak, Indonesia)

³(Department of Management, Faculty of Economics and Business, Universitas Tanjungpura, Pontianak, Indonesia)

*Corresponding Author: Syarif Agussaid Alkadrie

ABSTRACT : Mobile banking has become a strategic pillar of digital transformation in Indonesia, yet retaining customers after their initial adoption remains a persistent managerial concern. This study examines the determinants of continued intention to use (CIU) mobile banking by extending the Unified Theory of Acceptance and Use of Technology (UTAUT) with perceived cyber risk and fintech innovation, and by testing age and bank-provided mobile banking literacy as moderators. Primary data were gathered from 400 active users of the four largest Indonesian banks, namely BRI, BCA, Mandiri, and BNI, through an online survey. The data were analysed with partial least squares structural equation modelling (PLS-SEM) in SmartPLS 3.0, using a two-stage moderation procedure and 5,000 bootstrap subsamples. The measurement model satisfied the thresholds for convergent validity, discriminant validity, and reliability. The structural model explained 73.0 per cent of the variance in CIU. Facilitating conditions was the strongest predictor, followed by effort expectancy, fintech innovation, social influence, and performance expectancy. Perceived cyber risk exerted only a weak and positive effect on CIU. Age significantly moderated the effects of performance expectancy, social influence, and facilitating conditions, while bank-provided literacy marginally buffered the cyber-risk effect. The results suggest that infrastructure reliability and perceived innovation, rather than risk perception, sustain use among experienced customers, and that these drivers operate differently across age groups. The study contributes a context-sensitive extension of UTAUT and offers practical guidance for banks that aim to retain digital customers in an emerging economy

KEYWORDS- Continued Intention to Use; Mobile Banking; UTAUT; Perceived Cyber Risk; Fintech Innovation

I. INTRODUCTION

The global banking sector is moving through a period of deep structural change that is driven by rapid digitalisation and shifting customer expectations. As customers grow more reliant on mobile devices and demand faster, more accessible financial services, banks have invested heavily in digital channels to stay relevant. Mobile banking has become a strategic pillar that allows incumbent banks to defend their market position against rival banks, fintech firms, and digital-only entrants (Abu-Taieh et al., 2022; Thusi & Maduku, 2020). In Indonesia, the four largest banks classified under Core Capital Bank Group (KBMI IV), namely BRI, BCA, Mandiri, and BNI, have placed mobile applications at the centre of their digital strategy. These applications now serve as the primary point of contact between banks and their customers.

The scale of this shift in Indonesia is substantial. National statistics indicate that the volume of mobile banking transactions rose from 5.53 billion in 2021 to 25.39 billion in 2025, while transaction value climbed from IDR 7.73 quadrillion to IDR 27.75 quadrillion over the same period (Bank Indonesia, 2025). This expansion has been supported by high internet penetration, which reached 80.66 per cent of the population in 2025, and by a young, digitally oriented user base (APJII, 2025). Yet the slowing growth rate observed in 2025 signals that the market is entering a maturation phase. In a maturing market, the question of whether customers will keep using a service becomes more strategic than the question of how to attract new users.

Alongside this growth, two countervailing forces shape customer behaviour. On one side, cyber threats targeting the financial sector have intensified alongside the rapid digitalisation of financial services. According to the Indonesian Financial Services Authority (OJK), citing data from the National Cyber and Crypto Agency (BSSN), Indonesia experienced approximately 361 million cyberattacks in 2023, with the financial sector among the most targeted industries. The growing reliance on digital banking platforms has consequently

heightened concerns regarding cybersecurity, data protection, and transaction safety among banking customers (Financial Services Authority of the Republic of Indonesia, 2022; Otoritas Jasa Keuangan, 2024). On the other side, continuous fintech innovation has enriched mobile banking with biometric authentication, artificial-intelligence-based personalisation, and integrated payment ecosystems (Gomber et al., 2017; Offiong et al., 2024). These forces create a managerial paradox in which the same technology that promises convenience also introduces new perceived risks, so that adoption does not automatically translate into sustained use.

Although the technology acceptance literature is well developed, most studies that apply the Unified Theory of Acceptance and Use of Technology (UTAUT) have focused on initial adoption rather than on continued intention to use (CIU) after adoption (Venkatesh et al., 2003; Geidam & Hassan, 2024). The original UTAUT model also does not fully accommodate the security and innovation issues that now define digital banking. Research that integrates perceived cyber risk and fintech innovation within a single CIU framework remains scarce, and evidence from Indonesia, a large emerging market with notable disparities in digital literacy, is still limited (Fachrudin et al., 2025). This gap matters because risk perception and innovation are precisely the two forces that influence whether customers migrate to, or retreat from, upgraded digital systems.

To address this gap, the present study extends UTAUT with two context-relevant predictors, perceived cyber risk and fintech innovation, and tests two moderators, namely customer age and bank-provided mobile banking literacy. The study pursues three objectives. First, it estimates the direct effects of the six predictors on CIU among experienced mobile banking users. Second, it tests whether bank-provided literacy buffers the effects of cyber risk and innovation. Third, it examines whether age conditions the effects of the four UTAUT core constructs. By doing so, the study offers a more comprehensive and context-sensitive account of what sustains mobile banking use in an emerging economy.

The contribution of this study is fourfold. It shifts the analytical focus from initial acceptance to long-term engagement, which is more relevant for the sustainability of digital transformation. It integrates risk and innovation into the UTAUT framework rather than treating them in isolation. It clarifies how age reshapes the relative weight of acceptance determinants among diverse user segments. Finally, it provides empirical evidence from Indonesia that enriches the largely Western and East Asian literature on digital banking adoption.

II. LITERATURE REVIEW AND HYPOTHESES

2.1 Theoretical foundation

The study is grounded in consumer behaviour theory, which explains how individuals select, use, and evaluate products and services through cognitive, affective, and conative processes ((Schiffman & Kanuk, 2010). Within this broad foundation, the Theory of Reasoned Action and the Theory of Planned Behaviour established that behavioural intention is the most proximal predictor of behaviour. Davis, (1989) operationalised these ideas for technology through the Technology Acceptance Model, and Venkatesh et al., (2003) consolidated eight prior models into UTAUT. UTAUT identifies performance expectancy, effort expectancy, social influence, and facilitating conditions as the four core determinants of usage intention. The model also treats demographic variables, such as age and experience, as moderators that adjust the strength of these relationships.

Continued intention to use refers to a customer's tendency to keep using an application after the initial adoption period ((Bhattacharjee, 2001; Abu-Taieh et al., 2022). Expectation-Confirmation Theory explains that this intention is shaped by satisfaction and by the confirmation of prior expectations. When users find that a service continues to deliver value beyond what they expected, they are more likely to maintain their use. This study therefore positions the extended UTAUT constructs as antecedents of CIU rather than of first-time adoption, which aligns the framework with the maturation phase of the Indonesian market.

2.2 UTAUT core constructs and CIU

Performance expectancy captures the belief that using a system improves task performance, and it is consistently reported as a strong predictor of usage intention (Venkatesh et al., 2003). In mobile banking, (Oliveira et al., 2017) found that performance expectancy was the most influential UTAUT construct, while (Rahi et al., 2019) confirmed its effect on continuance intention in Pakistan. On this basis, the study proposes that performance expectancy positively affects CIU (H1). Effort expectancy reflects the perceived ease of using a system. (Alalwan et al., 2017) showed that ease of use supports continued use of digital banking, which leads to the hypothesis that effort expectancy positively affects CIU (H2).

Social influence describes the degree to which important others encourage a person to use a system. Baptista & Oliveira, (2015) and Merhi et al., (2020) reported that social norms strengthen continuance intention in mobile banking, and Susanto et al. (2016) confirmed this effect among younger users in Indonesia. The study therefore proposes that social influence positively affects CIU (H3). Facilitating conditions refer to the perceived availability of technical infrastructure and support. Although Venkatesh et al., (2003) initially linked facilitating conditions to actual use, later work by Abbas et al., (2018) and Rahi et al., (2019) showed that

adequate infrastructure also sustains continuance intention. Accordingly, facilitating conditions are expected to positively affect CIU (H4).

2.3 Extended predictors: perceived cyber risk and fintech innovation

Perceived cyber risk denotes a user's subjective expectation of potential losses from cyber threats such as fraud, unauthorised access, and data breaches (Featherman & Pavlou, 2003; S. K. Khan et al., 2024). A consistent body of evidence indicates that perceived risk discourages continued use of digital financial services (Kaur & Arora, 2021; Martins et al., 2014). However, some studies in emerging markets report weaker or non-significant effects once trust and ease of use are accounted for (Fachrudin et al., 2025). Because the direction of this effect is contested in the Indonesian context, the study proposes that perceived cyber risk affects CIU (H5) without committing to a fixed sign.

Fintech innovation refers to the perceived novelty and advancement of technology embedded in mobile banking, including seamless payments, personalised services, and improved accessibility (Offiong et al., 2024). Drawing on Diffusion of Innovation Theory, customers who perceive a service as innovative and continuously improving are more likely to keep using it (Rogers, 2003); Sharma et al., 2020). Empirical work by Lee & Shin, (2018) and Jangir et al., (2023) confirmed that fintech innovation raises satisfaction and continuance intention. The study therefore proposes that fintech innovation positively affects CIU (H6).

2.4 Moderating roles of literacy and age

Bank-provided mobile banking literacy represents the systematic effort of banks to raise customer knowledge and skills so that customers can use digital services effectively and safely (Lusardi & Mitchell, 2014; OECD, 2023). Khan et al., (2024) and Hayat et al., (2026) found that digital and financial literacy weaken the negative effect of perceived risk and strengthen the uptake of innovation. The study therefore proposes that literacy moderates the effect of perceived cyber risk on CIU (H7) and the effect of fintech innovation on CIU (H8). When customers are better educated by their bank, the discouraging effect of cyber risk should diminish and the encouraging effect of innovation should intensify.

Age is a demographic moderator that shapes how users respond to technology (Venkatesh et al., 2012a). Younger users, who are often described as digital natives, tend to evaluate technology pragmatically, whereas older users may rely more on trust, support, and ease of use Hamelmann & Drechsler, (2018). Evidence on the direction of these effects is mixed, which suggests that the influence of age is contingent on context (Candy et al., 2025). The study therefore proposes that age moderates the effects of performance expectancy (H9), effort expectancy (H10), social influence (H11), and facilitating conditions (H12) on CIU. Figure 1 presents the proposed conceptual model that integrates these twelve hypotheses.

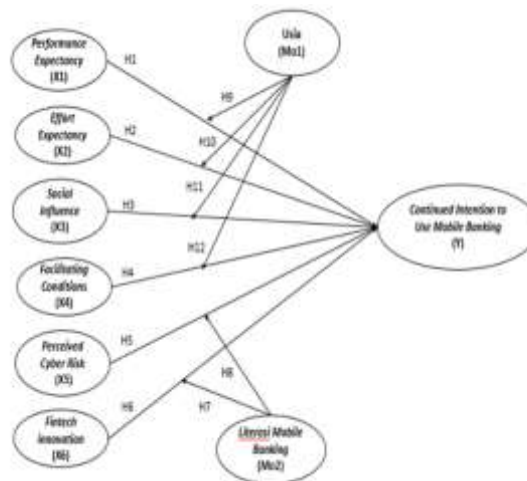


Figure 1. Proposed conceptual model based on extended UTAUT.

III. METHODS

3.1 Research design and sample

The study adopts a quantitative explanatory survey design, which is appropriate for testing relationships among variables through numerical data (Creswell, 2012). The target population comprised active mobile banking users of the four KBMI IV banks in Indonesia, namely BRI (BRImo), BCA (myBCA), Mandiri (Livin by Mandiri), and BNI (wondr by BNI). A purposive sampling technique was used, and respondents had to be domiciled in Indonesia, hold an account with one of the four banks, and have actively used the corresponding application for at least six months. The minimum sample size followed the rule of ten

observations per indicator, which yielded a target of around 410 respondents. A total of 400 valid responses were obtained through an online questionnaire, which is adequate for the model tested.

3.2 Measures

All constructs were measured with multi-item reflective scales adapted from validated instruments and rated on a five-point Likert scale ranging from strongly disagree to strongly agree. Perceived cyber risk was measured with five items adapted from Khan et al., (2024), and fintech innovation with three items from Offiong et al., (2024). The four UTAUT core constructs, performance expectancy, effort expectancy, social influence, and facilitating conditions, were each measured with four items from Venkatesh et al., (2003). Bank-provided mobile banking literacy used four items adapted from Lusardi & Mitchell, (2011), continued intention to use was measured with four items from Bhattacharjee, (2001), and age was recorded as a continuous variable in years. Table 1 summarises the constructs, the number of items, and their sources.

Table 1. Constructs, indicators, and sources

Construct	Items	Definition (brief)	Source
Perceived Cyber Risk (PCR)	5	Subjective expectation of loss from cyber threats	Khan et al. (2024)
Fintech Innovation (FI)	3	Perceived novelty and advancement of the service	Offiong et al. (2024)
Performance Expectancy (PE)	4	Belief that use improves task performance	Venkatesh et al. (2003)
Effort Expectancy (EE)	4	Perceived ease of using the system	Venkatesh et al. (2003)
Social Influence (SI)	4	Perceived social pressure to use the system	Venkatesh et al. (2003)
Facilitating Conditions (FC)	4	Perceived availability of support and infrastructure	Venkatesh et al. (2003)
Mobile Banking Literacy (Mo1)	4	Bank-driven education raising customer competence	Lusardi & Mitchell (2011)
Continued Intention to Use (CIU)	4	Intention to keep using after adoption	Bhattacharjee (2001)
Age (Mo2)	1	Respondent age in years (continuous)	(Schiffman & Kanuk, 2010)

Source: compiled by the authors (2026).

3.3 Data analysis

The data were analysed with partial least squares structural equation modelling (PLS-SEM) in SmartPLS 3.0. PLS-SEM was chosen because it handles complex models with interaction terms and does not require strict multivariate normality (Hair Jr. Joseph F. et al., 2017). The analysis followed the two-step procedure recommended by Hair Jr. Joseph F. et al., (2017). The measurement model was first evaluated through convergent validity, using outer loadings and average variance extracted (AVE), discriminant validity, using the Fornell-Larcker criterion and the heterotrait-monotrait ratio (HTMT), and internal consistency reliability, using Cronbach alpha and composite reliability. The structural model was then assessed through the coefficient of determination (R squared), effect size (f squared), and predictive relevance. Moderation effects were estimated with the two-stage approach, and significance was determined through bootstrapping with 5,000 subsamples.

IV. RESULTS

4.1 Respondent profile

The 400 respondents were distributed across the four banks, with Livin by Mandiri users forming the largest group at 33.2 per cent, followed by BRImo at 25.0 per cent, myBCA at 22.0 per cent, and wondr by BNI at 19.8 per cent. The sample was diverse in age, with a mean of 37.47 years and a range from 19 to 71 years, which provided sufficient variation to detect age-based moderation. A clear majority, namely 58.2 per cent, had used mobile banking for more than three years, which confirms that respondents were experienced users in the continued-use stage rather than newcomers. The gender split was nearly balanced, and half of the respondents held a postgraduate degree. Table 2 reports the demographic profile.

Table 2. Demographic profile of respondents (N = 400)

Characteristic	Category	Frequency (n)	Percentage (%)
Bank / application	BRI (BRImo)	100	25.0
	BCA (myBCA)	88	22.0
	Mandiri (Livin)	133	33.2
	BNI (wondr)	79	19.8
Age	≤ 25 years	102	25.5
	26–35 years	77	19.2
	36–45 years	112	28.0
	> 45 years	109	27.3
Length of use	6 months – 1 year	61	15.2
	> 1 – 3 years	106	26.5
	> 3 years	233	58.2
Gender	Male	208	52.0
	Female	192	48.0
Education	High school	93	23.2
	Diploma	16	4.0
	Bachelor	90	22.5
	Postgraduate	201	50.2

Source: primary data processed (2026). Mean age = 37.47 years; SD = 12.68.

4.2 Descriptive statistics

The descriptive analysis showed that customers held generally favourable perceptions of mobile banking. Performance expectancy and effort expectancy recorded the highest means, at about 4.38 and 4.30 on a five-point scale, which indicates that customers strongly valued the speed, productivity, and ease of the service. Facilitating conditions, fintech innovation, and continued intention to use also fell in the high to very high range. Social influence and bank-provided literacy were somewhat lower yet still positive, while perceived cyber risk recorded the lowest mean at about 3.31, which reflects a moderate level of concern. Table 3 reports the construct means and their interpretation.

Table 3. Construct descriptive statistics

Construct	Mean	SD (approx.)	Category
Performance Expectancy (PE)	4.38	1.00	Very high
Effort Expectancy (EE)	4.30	0.91	Very high
Facilitating Conditions (FC)	4.21	0.90	Very high
Fintech Innovation (FI)	4.13	0.87	High
Continued Intention to Use (CIU)	4.16	0.92	High
Mobile Banking Literacy (Mo1)	3.92	0.95	High
Social Influence (SI)	3.74	1.10	High
Perceived Cyber Risk (PCR)	3.31	1.23	Moderate

Source: primary data processed (2026), SmartPLS 3.0. Interpretation: 4.21–5.00 very high; 3.41–4.20 high; 2.61–3.40 moderate.

4.3 Measurement model

The measurement model met all required thresholds. Every indicator loaded above 0.70 on its intended construct, with loadings ranging from 0.816 to 0.967, and each AVE exceeded 0.50, ranging from 0.757 to 0.894, which confirmed convergent validity. Internal consistency was strong, since Cronbach alpha ranged from 0.903 to 0.960 and composite reliability ranged from 0.932 to 0.971. Discriminant validity was supported by all three criteria: the cross-loadings, the Fornell-Larcker criterion, and the HTMT ratio. The square root of each AVE exceeded its inter-construct correlations, and the highest HTMT value was 0.871, which remained below the 0.90 cut-off. Table 4 summarises validity and reliability, and Table 5 reports the Fornell-Larcker results.

Table 4. Convergent validity and reliability

Construct	Loadings	Cronbach α	CR	AVE
Perceived Cyber Risk (PCR)	0.822-0.915	0.924	0.940	0.757
Fintech Innovation (FI)	0.923-0.935	0.921	0.950	0.864
Mobile Banking Literacy (Mo1)	0.877-0.906	0.916	0.941	0.799
Performance Expectancy (PE)	0.930-0.967	0.960	0.971	0.894
Effort Expectancy (EE)	0.919-0.944	0.950	0.964	0.869
Social Influence (SI)	0.816-0.904	0.903	0.932	0.774

Facilitating Conditions (FC)	0.831-0.933	0.903	0.933	0.776
Continued Intention to Use (CIU)	0.850-0.911	0.916	0.941	0.800

Source: primary data processed (2026), SmartPLS 3.0. CR = composite reliability; AVE = average variance extracted.

Table 5. Discriminant validity (Fornell-Larcker criterion)

	CIU	EE	FC	FI	MBL	PCR	PE	SI
CIU	0.894							
EE	0.765	0.932						
FC	0.779	0.807	0.881					
FI	0.737	0.702	0.722	0.930				
MBL	0.641	0.638	0.654	0.672	0.894			
PCR	0.190	0.150	0.092	0.232	0.156	0.870		
PE	0.673	0.807	0.697	0.610	0.487	0.187	0.946	
SI	0.613	0.573	0.600	0.580	0.635	0.160	0.466	0.880

Source: primary data processed (2026). Diagonal values (bold positions) are the square roots of AVE; off-diagonal values are inter-construct correlations.

4.4 Structural model and hypothesis testing

The structural model explained 73.0 per cent of the variance in CIU, with an adjusted R squared of 0.720, which represents a moderate to substantial level of predictive power for behavioural research (Hair Jr. Joseph F. et al., 2017). The small gap between the two values indicates that the model is parsimonious and that the predictors contribute substantively rather than inflating the explained variance. Among the direct effects, facilitating conditions was the strongest predictor of CIU, with a path coefficient of 0.302, followed by effort expectancy at 0.189, fintech innovation at 0.185, social influence at 0.121, and performance expectancy at 0.103. Perceived cyber risk had a small positive coefficient of 0.047 that was significant only at the more lenient one-tailed level of $\alpha = 0.10$ ($T = 1.300$; $p = 0.097$). Figure 2 visualises the path estimates and Table 6 reports the full hypothesis test.

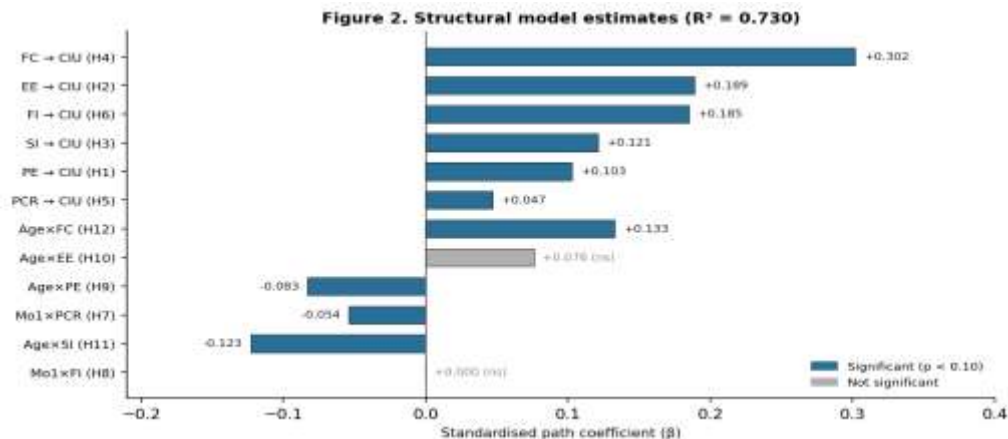


Figure 2. Structural model estimates from bootstrapping (5,000 subsamples).

Table 6. Hypothesis testing results

No	Path	β	T-stat	p-value	Decision
H1	PE → CIU	+0.103	2.102	0.018	Supported ($p < 0.05$)
H2	EE → CIU	+0.189	2.857	0.002	Supported ($p < 0.01$)
H3	SI → CIU	+0.121	2.914	0.002	Supported ($p < 0.01$)
H4	FC → CIU	+0.302	4.331	0.000	Supported ($p < 0.01$)
H5	PCR → CIU	+0.047	1.300	0.097	Supported ($p < 0.10$)
H6	FI → CIU	+0.185	2.135	0.017	Supported ($p < 0.05$)
H7	Mo1 × PCR → CIU	-0.054	1.362	0.087	Marginal ($p < 0.10$)
H8	Mo1 × FI → CIU	+0.000	0.018	0.493	Not supported
H9	Age × PE → CIU	-0.083	1.685	0.046	Supported ($p < 0.05$)
H10	Age × EE → CIU	+0.076	1.078	0.141	Not supported
H11	Age × SI → CIU	-0.123	3.151	0.001	Supported ($p < 0.01$)
H12	Age × FC → CIU	+0.133	2.028	0.022	Supported ($p < 0.05$)

Source: primary data processed (2026), SmartPLS 3.0, 5,000 bootstrap subsamples. One-tailed tests.

Turning to the moderation effects, age was the more active moderator of the two. Age significantly moderated the effects of performance expectancy, social influence, and facilitating conditions on CIU, but not the effect of effort expectancy. The interaction of age with social influence was the strongest moderation effect in the model, with a negative coefficient of 0.123 and a t-statistic of 3.151. The negative interactions for performance expectancy and social influence indicate that these effects were stronger among younger customers, whereas the positive interaction for facilitating conditions indicates that older customers relied more on infrastructure and support. Bank-provided literacy showed a marginal negative interaction with perceived cyber risk and no interaction with fintech innovation. The effect sizes were uniformly small, which is common in multivariate behavioural models with correlated predictors, and facilitating conditions again recorded the largest effect size.

V. DISCUSSION

The findings paint a coherent picture of what sustains mobile banking use after adoption in Indonesia. The four UTAUT core constructs all influenced CIU, which confirms that the model remains relevant for explaining long-term engagement and not only initial acceptance (Venkatesh et al., 2003; Oliveira et al., 2016). The most striking result is the dominance of facilitating conditions, which carried the largest path coefficient and the largest effect size. This pattern suggests that, once customers have adopted a service, the reliability of the infrastructure, the stability of the system, and the availability of technical support become the decisive factors in their decision to continue. The result is consistent with the Indonesian context, where high internet penetration coexists with uneven connection quality across regions.

Effort expectancy and fintech innovation were the next strongest drivers, which underscores that ease of use and perceived novelty work together to retain customers. When an application is simple to operate and is seen to evolve through useful new features, customers experience confirmation of their expectations and remain loyal (Bhattacharjee, 2001; S. K. Sharma et al., 2023). The significant effect of fintech innovation supports its inclusion as an extension of UTAUT and echoes the findings of Offiong et al., (2024). Social influence and performance expectancy contributed smaller but meaningful effects, which indicates that both social norms and functional benefits still matter even in a mature user base.

The most theoretically interesting result concerns perceived cyber risk, whose effect on CIU was weak, positive, and significant only at the lenient one-tailed level of $\alpha = 0.10$. This pattern departs sharply from studies that report a clear negative effect of risk perception (Kaur & Arora, 2021), yet it aligns with evidence from Indonesia and with the idea of risk recalibration (Fachrudin et al., 2025; Apaua & Lallie, (2022)). Experienced users who have already adopted mobile banking appear to have priced in the risk and adopted protective habits, so that perceived risk no longer deters their continued use and may even coexist with sustained engagement among risk-aware customers. The marginal buffering role of bank-provided literacy reinforces this interpretation, since education from the bank appears to soften, rather than amplify, the influence of risk.

The moderation results add important nuance to the UTAUT literature. The stronger effects of performance expectancy and social influence among younger customers suggest that digital natives evaluate technology pragmatically and are more responsive to peer and community signals, often amplified through social media. In contrast, the stronger effect of facilitating conditions among older customers indicates that this segment depends more heavily on dependable infrastructure and responsive support before committing to continued use. These patterns partly contradict the conventional assumption that age uniformly strengthens acceptance effects, and they highlight the value of segment-specific strategies (Venkatesh et al., 2012; Apaua & Lallie, 2022). The absence of a significant age effect on effort expectancy may reflect the high usability standard now common across leading Indonesian banking applications.

From a managerial perspective, the results carry clear implications. Banks should prioritise infrastructure reliability and technical support as the foundation of customer retention, because facilitating conditions outweigh all other drivers. They should continue to invest in visible, useful innovation and in intuitive interface design to maintain ease of use. Marketing should be segmented by age, with social proof and feature messaging directed at younger customers and assurance of stability and support directed at older customers. Finally, structured literacy programmes can help neutralise the lingering influence of cyber-risk concerns, particularly for less experienced or older users.

VI. CONCLUSION

This study set out to explain what sustains continued intention to use mobile banking in Indonesia by extending UTAUT with perceived cyber risk and fintech innovation, and by testing age and bank-provided literacy as moderators. Using PLS-SEM on data from 400 experienced users of the four largest Indonesian banks, the model explained 73.0 per cent of the variance in continued intention. Facilitating conditions emerged as the dominant driver, followed by effort expectancy, fintech innovation, social influence, and performance expectancy, while perceived cyber risk exerted only a weak and marginally significant positive effect. Age

conditioned the effects of performance expectancy, social influence, and facilitating conditions, and bank-provided literacy marginally buffered the influence of cyber risk.

Theoretically, the study advances the technology acceptance literature by reframing UTAUT as an adaptive framework for the continued-use stage and by integrating risk and innovation within a single model. Practically, it offers banks a clear priority order for retention strategy and a rationale for segmenting that strategy by customer age. The evidence from a large emerging market enriches a literature that has been dominated by Western and East Asian contexts. Overall, the study shows that in a maturing digital banking market, dependable infrastructure and perceived innovation, rather than risk perception, hold customers over the long term.

REFERENCES

- [1] Abbas, S. K., Hassan, H. A., Asif, J., Ahmed, B., Hassan, F., & Haider, S. S. (2018). Integration of TTF, UTAUT, and ITM for mobile Banking Adoption. *International Journal of Advanced Engineering, Management and Science*, 4(5), 375–379. <https://doi.org/10.22161/ijaems.4.5.6>
- [2] Abu-Taieh, E. M., AlHadid, I., Abu-Tayeh, S., Masa'deh, R., Alkhaldeh, R. S., Khwaldeh, S., & Alrowwad, A. (2022). Continued Intention to Use of M-Banking in Jordan by Integrating UTAUT, TPB, TAM and Service Quality with ML. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(3). <https://doi.org/10.3390/joitmc8030120>
- [3] Alalwan, A. A., Dwivedi, Y. K., & Rana, N. P. (2017). Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust. *International Journal of Information Management*, 37(3), 99–110. <https://doi.org/10.1016/j.ijinfomgt.2017.01.002>
- [4] Apaua, R., & Lallie, H. S. (2022). *Measuring User Perceived Security of Mobile Banking Applications*. 1–36. <http://arxiv.org/abs/2201.03052>
- [5] Baptista, G., & Oliveira, T. (2015). Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators. *Computers in Human Behavior*, 50, 418–430. <https://doi.org/10.1016/j.chb.2015.04.024>
- [6] Bhattacherjee, A. (2001a). An empirical analysis of the antecedents of electronic commerce service continuance. *Decision Support Systems*, 32(2), 201–214. [https://doi.org/10.1016/S0167-9236\(01\)00111-7](https://doi.org/10.1016/S0167-9236(01)00111-7)
- [7] Bhattacherjee, A. (2001b). An empirical analysis of the antecedents of electronic commerce service continuance. *Decision Support Systems*, 32(2), 201–214. [https://doi.org/https://doi.org/10.1016/S0167-9236\(01\)00111-7](https://doi.org/https://doi.org/10.1016/S0167-9236(01)00111-7)
- [8] Candy, C., Budiman, J., Wijaya, C., Ernestine, E., & Mayviana, V. (2025). Customer Continuance Intention Toward the Use of Electronic Money. *Jurnal Ilmu Manajemen Advantage*, 9(1), 72–83. <https://doi.org/10.30741/adv.v9i1.1527>
- [9] Creswell, J. W. (2012). *Research Design Qualitative, Quantitative, and Mixed Methods Approaches (3rd ed.)*. Sage Publication Inc.
- [10] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- [11] Fachrudin, F., Utama, S., & Lubis, M. (2025). Factors influencing mobile banking continuance intention: A UTAUT-based study in Indonesia. *International Journal of Science, Technology & Management*, 6(1), 230–247.
- [12] Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: A perceived risk facets perspective. *International Journal of Human-Computer Studies*, 59(4), 451–474. [https://doi.org/10.1016/S1071-5819\(03\)00111-3](https://doi.org/10.1016/S1071-5819(03)00111-3)
- [13] Financial Services Authority of the Republic of Indonesia. (2022). POJK 29 2022 Resilience and Cybersecurity for Commercial Banks. *Financial Services Authority Regulation*, 111. <https://ojk.go.id/id/regulasi/Pages/Ketahanan-dan-Keamanan-Siber-Bagi-Bank-Umum.aspx>
- [14] Geidam, M. M., & Hassan, R. (2024). Factors Influencing FinTech Continuous Use: Systematic Literature Review and Expert Validation. *Contemporary Management Research*, 20(2), 137–175. <https://doi.org/10.7903/cmr.23599>
- [15] Gomber, P., Kauffman, R. J., Parker, C., & Weber, B. W. (2017). On the fintech revolution: Interpreting the forces of innovation, disruption, and transformation in financial services. *Journal of Management Information Systems*, 35(1), 220–265. <https://doi.org/10.1080/07421222.2017.1296746>
- [16] Hair Jr. Joseph F., S., M., V. G., O., R., M. C., & GUdorgan, S. P. (2017). *Advanced Issues In Partial Least Squares Structural Equation Modeling*.
- [17] Hamelmann, T., & Drechsler, A. (2018). Impacts of digital natives on technology acceptance: A conceptual analysis. *ACIS 2018 - 29th Australasian Conference on Information Systems*, 1–12. <https://doi.org/10.5130/acis2018.bd>

- [18] Hayat, U., Akhtar, A., & Nawaz, A. (2026). *The Critical Review of Social Sciences Studies Digital Financial Literacy , FinTech Adoption , and ESG Investment Decisions in*. 4(1), 3640–3660.
- [19] Jangir, K., Sharma, V., Taneja, S., & Rupeika-Apoga, R. (2023). The Moderating Effect of Perceived Risk on Users' Continuance Intention for FinTech Services. *Journal of Risk and Financial Management*, 16(1). <https://doi.org/10.3390/jrfm16010021>
- [20] Kaur, H., & Arora, S. (2021). Role of perceived risk in online banking and its impact on behavioral intention: Trust as a moderator. *IIM Kozhikode Society & Management Review*, 10(1), 82–96. <https://doi.org/10.1177/2277975220960015>
- [21] Khan, S. K., Shiwakoti, N., Stasinopoulos, P., Chen, Y., & Warren, M. (2024). The impact of perceived cyber-risks on automated vehicle acceptance: Insights from a survey of participants from the United States, the United Kingdom, New Zealand, and Australia. *Transport Policy*, 152, 87–101. <https://doi.org/https://doi.org/10.1016/j.tranpol.2024.05.002>
- [22] Lee, I., & Shin, Y. J. (2018). Fintech: Ecosystem, business models, investment decisions, and challenges. *Business Horizons*, 61(1), 35–46. <https://doi.org/https://doi.org/10.1016/j.bushor.2017.09.003>
- [23] Lusardi, A., & Mitchell, O. (2011). *Financial Literacy and Planning: Implications for Retirement Wellbeing*. <https://econpapers.repec.org/RePEc:nbr:nberwo:17078>
- [24] Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1), 5–44. <https://doi.org/10.1257/jel.52.1.5>
- [25] Martins, C., Oliveira, T., & Popovič, A. (2014). Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal of Information Management*, 34(1), 1–13. <https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2013.06.002>
- [26] Merhi, M., Hone, K., Tarhini, A., & Ameen, N. (2020). An empirical examination of the moderating role of age and gender in consumer mobile banking use: a cross-national, quantitative study. *Journal of Enterprise Information Management*, 34(4), 1144–1168. <https://doi.org/10.1108/JEIM-03-2020-0092>
- [27] OECD. (2023). OECD/INFE 2023 International Survey of Adult Financial Literacy. In *OECD Business and Finance Policy Papers, No. 39*.
- [28] Offiong, U. P., Szopik-Depezyńska, K., Cheba, K., & Ioppolo, G. (2024). FinTech as a digital innovation in microfinance companies – systematic literature review. *European Journal of Innovation Management*, 27(9), 562–581. <https://doi.org/10.1108/EJIM-04-2024-0462>
- [29] Oliveira, T., Faria, M., & Thomas, M. A. (2017). Mobile banking user adoption and its determinant factors: A literature review. *Computers in Human Behavior*, 70, 408–417. <https://doi.org/10.1016/j.chb.2016.12.073>
- [30] Oliveira, T., Faria, M., Thomas, M. A., & Popovič, A. (2016). Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM. *International Journal of Information Management*, 34(5), 689–703. <https://doi.org/10.1016/j.ijinfomgt.2016.04.010>
- [31] Otoritas Jasa Keuangan. (2024). *Cybersecurity Guidelines For Financial Sector Technology Innovation (FSTI) Providers*. <https://ojk.go.id/en/berita-dan-kegiatan/info-terkini/Documents/Pages/Cybersecurity-Guidelines-for-Financial-Sector-Technology-Innovation-FSTI-Providers/2024.07.26> Cybersecurity Guidelines for Financial Sector Technology Innovation Providers.pdf#search=CY
- [32] Rahi, S., Othman Mansour, M. M., Alghizzawi, M., & Alnaser, F. M. (2019). Integration of UTAUT model in internet banking adoption context: The mediating role of performance expectancy and effort expectancy. *Journal of Research in Interactive Marketing*, 13(3), 411–435.
- [33] Rogers, E. M. (2003). *Diffusion of innovations (5th ed.)*. Free Press.
- [34] Schiffman, L. G., & Kanuk, L. L. (2010). *Consumer behavior (10th ed.)*. Pearson Prentice Hall.
- [35] Sharma, R., Singh, G., & Sharma, S. (2020). Modelling internet banking adoption in Fiji: A developing country perspective. *International Journal of Information Management*, 53, 102116. <https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2020.102116>
- [36] Sharma, S. K., Al-Badi, A. H., Govindaluri, S. M., & Al-Kharusi, M. H. (2023). Predicting continuance intention to use mobile banking: The role of innovation. *Information Systems Frontiers*, 25(2), 621–635. <https://doi.org/10.1007/s10796-021-10179-7>
- [37] Thusi, P., & Maduku, D. K. (2020). South African millennials' acceptance and use of retail mobile banking apps: An integrated perspective. *Computers in Human Behavior*, 111, 106405. <https://doi.org/https://doi.org/10.1016/j.chb.2020.106405>
- [38] Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>
- [39] Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012a). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1),

- 157–178. <https://doi.org/10.2307/41410412>
- [40] Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012b). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1), 157–178. <https://doi.org/10.2307/41410412>