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The Impact of Artificial Intelligence Applications on Customers Behaviour: Empirical Research on Listed Banks In Vietnam

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ABSTRACT: In the context of Vietnam's commercial banks striving to meet evolving customer expectations amid rapid digital transformation, AI applications emerge as a pivotal strategy to enhance user engagement. Despite growing research on technology adoption, the application of AI in Vietnam's banking sector remains underexplored. This study investigates the impact of AI application factors on customers' usage behavior, while examining mediating variables in this relationship. It also explores demographic influences, such as gender, income, and education, on usage behavior. Using the Technology Acceptance Model (TAM), a model was tested with Smart-PLS software, analyzing data from 300 customers of Vietnamese commercial banks. The study also included various assessments, such as outer loadings, Average Variance Extracted (AVE), and Heterotrait-Monotrait Ratio (HTMT), as part of the PLS-SEM analysis to ensure robust results. Results reveal that AI factors, including output quality, perceived usefulness, and security, positively influence usage behavior, with mediating factors like intention to use significantly strengthening this relationship. However, demographic variables show no significant impact. The findings underscore the importance of integrating AI strategically to meet customer needs, suggesting that banks prioritize robust AI functionalities to enhance satisfaction, foster sustained usage, and maintain competitiveness in Vietnam's dynamic banking landscape.

KEYWORDS: Artificial intelligence (AI), customer usage behaviour, mobile banking applications, commercial banks, PLS-SEM, Viet Nam

INTRODUCTION

The integration of Artificial Intelligence (AI) into Vietnam's commercial banking sector is reshaping service delivery and customer engagement amid the country's rapid economic growth and digital transformation (Huong, 2024; Luu, 2024). As a key driver of Vietnam's economy, which has sustained robust GDP growth of 6–7% annually, commercial banks play a pivotal role in mobilizing capital and supporting businesses through financial services (Le et al., 2024). The adoption of AI, including predictive analytics and chatbots, enhances operational efficiency, delivers personalized financial products, and promotes financial inclusion, particularly in rural and underserved regions (Kshetri, 2021; Abbas, 2024). These advancements strengthen customer satisfaction and loyalty, positioning banks to meet rising expectations in a competitive financial landscape (Nguyen, 2024).

However, integrating AI into Vietnam's banking sector faces significant challenges. Despite increased smartphone penetration and digital reliance, spurred by the Covid-19 pandemic, customer trust in AI-driven platforms remains fragile due to concerns over security breaches, privacy risks, and complex interfaces (Agarwal et al., 2024; Ha & Nguyen, 2022). Low technological literacy among certain demographics, coupled with high costs of AI implementation, further hinders adoption (Nguyen, 2024). Moreover, the lack of comprehensive regulatory frameworks for AI in banking exacerbates concerns about data protection, limiting customer confidence (Omogbeme et al., 2024). While AI's potential to drive engagement is evident, the factors shaping customers' usage behavior, such as intuitive design, personalization, and perceived security remain underexplored in Vietnam's context.

This study addresses this gap by examining the relationship between AI applications and customers' usage behavior in Vietnam's commercial banks, with a focus on mobile banking platforms. Drawing on the Technology Acceptance Model (TAM), it investigates key drivers of engagement, including output quality, perceived usefulness, ease of use, security, and privacy. By

providing evidence-based insights, this research aims to guide banking managers in optimizing AI-driven services, enhancing customer adoption, and fostering sustainable development in Vietnam's dynamic financial sector.

LITERATURE REVIEW

Artificial Intelligence applications

Artificial Intelligence (AI) applications in banking involve utilizing advanced algorithms and machine learning techniques to automate processes, analyze data, and enhance customer interactions. These technologies enable banks to deliver personalized services, improve operational efficiency, and make data-driven decisions tailored to individual customer needs (Abbas, 2024). Key characteristics of AI applications include automation, which streamlines routine tasks such as transaction processing and customer inquiries; personalization, which customizes financial products based on customer preferences; and predictive analytics, which anticipates customer behavior and needs (Okeke et al., 2024). Additionally, AI systems possess the ability to learn from interactions, continually enhancing their accuracy and effectiveness.

The role of AI applications in shaping customer usage behavior in Vietnamese commercial banks is significant. By providing faster, more efficient, and personalized banking experiences, AI fosters greater customer satisfaction and loyalty. Enhanced service delivery increases users' perceived usefulness of banking applications, thereby boosting their intention to use these services (Nguyen, 2020). Moreover, AI can address common concerns regarding security and privacy by implementing advanced protective measures, thereby building trust among users. As the competitive financial landscape evolves, effectively leveraging AI can lead to higher adoption rates of mobile banking solutions, as customers are more inclined to engage with banks that offer innovative and responsive services (Lazo, 2023).

Factors impact on customer usage behaviour

Output Quality (OQ): Output quality, defined as users' perceptions of a system's effectiveness in task completion and result delivery, is critical in shaping customer usage behavior in Vietnam's commercial banks using AI applications (Gow, 2019). Key factors include speed, efficiency, accuracy, and verifiability of AI-driven mobile banking services. Davis (1993) highlights that output quality influences perceived usefulness, while Marikyan (2023) notes that high output quality drives user preference for AI-powered services. Similarly, Ahmad (2019) finds that superior output quality enhances customer satisfaction and loyalty, strengthening banks' competitiveness in Vietnam's digital financial landscape.

Perceived Usefulness (PU): Perceived usefulness, a core component of the Technology Acceptance Model (TAM), significantly influences customer adoption of AI-driven mobile banking in Vietnam's commercial banks (Kwesi & Opoku, 2020). Defined as the user's belief that technology enhances performance, it drives engagement with banking services (Davis, 1993). Venkatesh and Davis (2000) emphasize its role in improving user outcomes, while Tahard et al. (2020) highlight its impact on innovation adoption. Similarly, Mohd Amir et al. (2020) confirm its positive effect on user intentions, enhancing satisfaction and loyalty in Vietnam's competitive digital banking landscape.

Result Demonstrability (RD): Result Demonstrability is defined as the "tangibility of the results from using an innovation" (Yuan *et al.*, 2021). In the context of mobile banking, successful systems may find it challenging to sustain adoption rates if they fail to clearly showcase the benefits their applications claim, particularly when these benefits do not align with users' specific objectives. Venkatesh and Davis (2000) highlighted that result demonstrability has a direct effect on perceived usefulness; if an app provides productive and relevant results that are not clearly communicated, users may struggle to recognize its true value. Therefore, emphasizing result demonstrability is essential, as it significantly influences how users perceive the usefulness of banking applications.

Perceived Ease of Use (EU): Perceived ease of use, defined as the user's belief that a system is simple and effortless to operate, significantly influences mobile banking adoption in Vietnam's commercial banks (Davis, 1993). AlKhasawneh (2015) confirms its positive impact on user intentions, though Mohd Amir et al. (2020) note inconsistent correlations with online banking usage. By enhancing ease of use through AI-driven interfaces, banks can boost perceived usefulness and adoption rates, fostering seamless user experiences and sustained engagement in Vietnam's digital banking landscape.

Security (SC): Security is a pivotal factor in the adoption of AI-driven mobile banking applications, profoundly influencing user acceptance. Security risk, defined as the potential for data loss due to unauthorized access, poses a significant threat to user confidence (Tahard et al., 2020). Given the sensitive financial data handled by AI-enabled banking services, robust security measures are critical to maintaining user trust. Prior studies have shown that security concerns can deter online transactions (Arshad et al., 2015). Likewise, in mobile banking, heightened security worries diminish perceived usefulness and ease of use,

discouraging user engagement (Du & Agami, 2017). In Vietnamese commercial banks, addressing security issues is vital for fostering user trust and encouraging the adoption of AI-enabled mobile banking solutions (Phan, 2024).

Privacy (PV): Privacy is about how much control users have over their personal data in mobile banking apps (Terlizzi et al., 2019). When users feel they lack this control, their privacy concerns rise, leading to lower satisfaction and trust, which hurts their willingness to use these services (Unalan & Yaprakli, 2017; Shaikh & Karjaluoto, 2016). For Vietnamese banks, addressing privacy is key to building trust and encouraging adoption of AI-powered mobile banking.

Personal innovativeness (PI): Personal innovativeness, defined as an individual's readiness to adopt new technologies, significantly influences engagement with AI-driven mobile banking in Vietnam's commercial banks (Lim et al., 2020). Innovative users actively explore advanced features like budgeting tools and personalized investment advice (Babina et al., 2024). However, Ho et al. (2020) note that high innovativeness may lead to unmet expectations, reducing satisfaction if AI applications underperform. Thus, personal innovativeness shapes user adoption and trust, impacting the success of mobile banking solutions.

Intention to Use & Usage Behavior (IU & UB): Intention to use and usage behavior are closely intertwined constructs in the context of mobile banking, playing a vital role in understanding the factors that impact adoption rates (Naruetharadhol *et al.*, 2021). Pham and Ho (2015) find that perceived usefulness strongly enhances users' intention to adopt mobile banking apps. Similarly, Doğan (2018) notes that a positive attitude toward these apps reduces adoption barriers, fostering sustained engagement. Thus, cultivating positive perceptions through user-friendly AI applications is critical for boosting intention to use and ongoing usage behavior (Thuy et al., 2023).

RESEARCH METHODOLOGY

Research hypothesis Development

Output quality of AI applications significantly enhances perceived usefulness by fostering user trust, efficiency, and satisfaction in mobile banking (Goli et al., 2023a). High-quality outputs improve decision-making and automate tasks, increasing utility (Broekhuizen et al., 2023; Doğan, 2018). Satisfied users are more likely to recommend AI-driven services, boosting their value (Chaieb et al., 2023). However, Zhai et al. (2024) caution that over-reliance on AI may reduce critical thinking, potentially lowering perceived usefulness. Wilson et al. (2021) suggest user experience may outweigh output quality. In light of this information, the hypothesis below has been proposed

Hypothesis 1. Output quality of AI Applications positively influences the perceived usefulness.

Result demonstrability, the tangible benefits of AI-driven mobile banking, significantly enhances perceived usefulness in Vietnam's commercial banks (Venkatesh & Davis, 2000). Observable outcomes, such as faster transactions and personalized insights, boost user satisfaction and trust (Demirel & Topcu, 2024; Liu, 2024). Almaiah et al. (2022) and Wang and Cheng (2020) confirm that clear results strengthen user engagement and perceived value. However, Kinney et al. (2024) note that inconsistent outcomes may reduce trust and usefulness, while Pang et al. (2024) suggest user familiarity may overshadow demonstrability's impact. Therefore, the overall consensus in the literature supports the hypothesis

Hypothesis 2: Result demonstrability of AI applications positively influences the perceived usefulness.

Personal innovativeness, defined as an individual's propensity to adopt new technologies, significantly enhances the perceived usefulness of AI-driven mobile banking in Vietnam's commercial banks (Lu et al., 2005). Innovative users actively engage with advanced features, such as personalized financial advice and budgeting tools, leading to improved decision-making and higher satisfaction (Molinillo et al., 2023; Singh et al., 2024). Their adaptability fosters exploration of AI functionalities, strengthening perceived value (Goli et al., 2023a). However, Doğan (2018) cautions that unmet expectations may erode trust and engagement. Similarly, Füller et al. (2022) note that limited familiarity or training can hinder recognition of AI benefits, even among innovative users. With the presented data in mind, the hypothesis below has been proposed;

Hypothesis 3. Personal Innovativeness of AI applications positively influences perceived usefulness.

Perceived ease of use, the belief that a system requires minimal effort to operate, significantly enhances perceived usefulness in AI-driven mobile banking in Vietnam's commercial banks (Rizkyla, 2024). Intuitive interfaces enable seamless navigation of features like transaction alerts and budgeting tools, boosting satisfaction and reinforcing the app's value (Doğan, 2018). Suciati et al. (2021) highlight that user-friendly designs foster trust, encouraging exploration of functionalities and creating a positive feedback loop. Efficient task completion, such as quick fund transfers, further strengthens perceived usefulness (Abdullah et al., 2016). However, Rane (2023) cautions that overly simplistic interfaces may limit engagement with advanced features, while Sugandini et al. (2018) note that lack of training can diminish benefits for less tech-savvy users. Therefore, the hypothesis below is proposed in regard to

Hypothesis 4: Perceived Ease of Use has a positive effect on perceived usefulness of AI Applications.

Perceived usefulness, the belief that an AI-driven mobile banking application enhances financial management, significantly influences users' intention to use it in Vietnam's commercial banks (Ayanwale & Ndlovu, 2024). Features like personalized recommendations and efficient transaction processing increase engagement by demonstrating tangible benefits (Wardana et al., 2022). Similarly, perceived ease of use, characterized by intuitive navigation and minimal effort, fosters exploration of functionalities, reinforcing perceived usefulness and sustaining long-term usage (Doğan, 2018; Venkatesh et al., 2016). Contextual factors, such as low technological familiarity or financial literacy, can also hinder recognition of benefits, limiting adoption (Ismai, 2016). Thus, the author proposes the hypothesis

Hypothesis 5. Perceived Usefulness positively influences intention to use of AI Applications.

Perceived ease of use, the belief that an AI-driven mobile banking application requires minimal effort to operate, significantly influences users' intention to use it in Vietnam's commercial banks (Prastiawan et al., 2021). User-friendly interfaces enable seamless interaction with features like budgeting tools and transaction alerts, enhancing satisfaction and loyalty (Venkatesh, 2000; Rane et al., 2023). However, Wicaksono and Maharani (2020) caution that over-reliance on simplistic interfaces may limit engagement with advanced features. Low technological familiarity can also hinder recognition of benefits, reducing adoption (Çelik & Özköse, 2023). Therefore, hypothesis is proposed below regarding the information mentioned

Hypothesis 6. Perceived Ease of Use positively influences intention to use of AI Applications.

Security profoundly shapes users' intention to adopt AI-driven mobile banking applications in Vietnam's commercial banks, as perceived risks like data breaches and fraud heighten apprehension (Mishra, 2023). Such concerns often eclipse technological benefits, deterring adoption and prompting disengagement (Du & Agami, 2017; Susanto et al., 2016). Conversely, robust security protocols bolster user confidence, encouraging engagement (Lee & Chen, 2022). Prior security breaches amplify wariness, particularly among less tech-literate users, curbing adoption (Saprikis et al., 2022). For security, the hypothesis below has been proposed

Hypothesis 7: Security has a negative effect on intention to use AI Applications.

Concerns about privacy play a significant role in shaping users' willingness to adopt AI-powered mobile banking services in Vietnam's commercial banks, as fear of data misuse erodes trust (Huang, 2022). Worries over how personal information is collected and shared can discourage usage, even when advanced AI features are available (Doğan, 2018; Papagiannidis et al., 2023). In contrast, strong privacy protections can help rebuild trust and support user adoption (Wu et al., 2012). Based on this, the following hypothesis is proposed: **Hypothesis 8. Privacy has a negative effect on intention to use AI Applications.**

The intention to use, influenced by perceived usefulness and ease of use, is a strong predictor of actual usage behavior for AI-powered mobile banking in Vietnam's commercial banks (Muñoz-Leiva et al., 2017). When users have strong intentions, they are more likely to engage with features such as budgeting and investment tools, leading to greater financial control and satisfaction (Ayar, 2024; Nguyen, 2023). However, this relationship can be weakened by technical challenges or low user motivation (Nguyen & Dao, 2024). On the other hand, prior positive experiences and higher tech literacy strengthen the likelihood of continued use (Menon & Shilpa, 2023; Elkhatibi et al., 2024). Therefore, the hypothesis below is proposed in regard;

Hypothesis 9: Intention to Use has a positive effect on Usage Behavior of AI Applications.

Data collection

The research methodology for studying the relationship between artificial intelligence and customer usage behavior in mobile banking within Vietnamese commercial banks is structured using Saunders et al.'s (2007) Research Onion model. Adopting a positivist philosophy, the study employs a deductive approach to test hypotheses derived from existing theories, utilizing a survey strategy to collect primary data from 300 customers via social media platforms (like Facebook, Zalo, Messenger) between September 25 and December 25, 2024. A cross-sectional time horizon is applied, with data gathered through structured questionnaires featuring a 5-point Likert scale (1) Strongly disagree; (2) disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree , which is employed in the construction of a questionnaire to categorize the responses from strongly disagree to agree strongly to assess demographic profiles and AI-related factors like perceived usefulness, security. The measures, informed by prior studies Davis (1993), Nguyen (2023), were developed using a translation–back-translation method to ensure linguistic accuracy.

Structural Equation Modeling (SEM) offers a robust approach to dissecting complex variable relationships in research exploring AI-driven mobile banking (Zeng et al., 2021). This study employs Partial Least Squares SEM (PLS-SEM) through Smart-PLS software, which suitable for tackling intricate, non-linear models and ambiguous constructs. To ensure reliable findings, this study uses key metrics, including outer loadings reflect how effectively measures capture latent concepts. Besides, cronbach's alpha and

composite reliability (both >0.7) confirm consistent variable groupings; and Average Variance Extracted (AVE >0.5) verifies constructs account for most indicator variance. Discriminant validity, assessed by AVE's square root surpassing inter-construct correlations, ensures construct distinctiveness. R^2 indicates the model's explanatory power, while path coefficients reveal variable relationship strength. Collinearity checks prevent unstable estimates. This rigorous PLS-SEM approach enables this study to analyze factors like trust and perceived usefulness, providing actionable insights for enhancing mobile banking adoption in Vietnam's dynamic financial landscape.

Research model

The research model is developed based on the nine hypotheses outlined above, as illustrated in Figure 1 below.

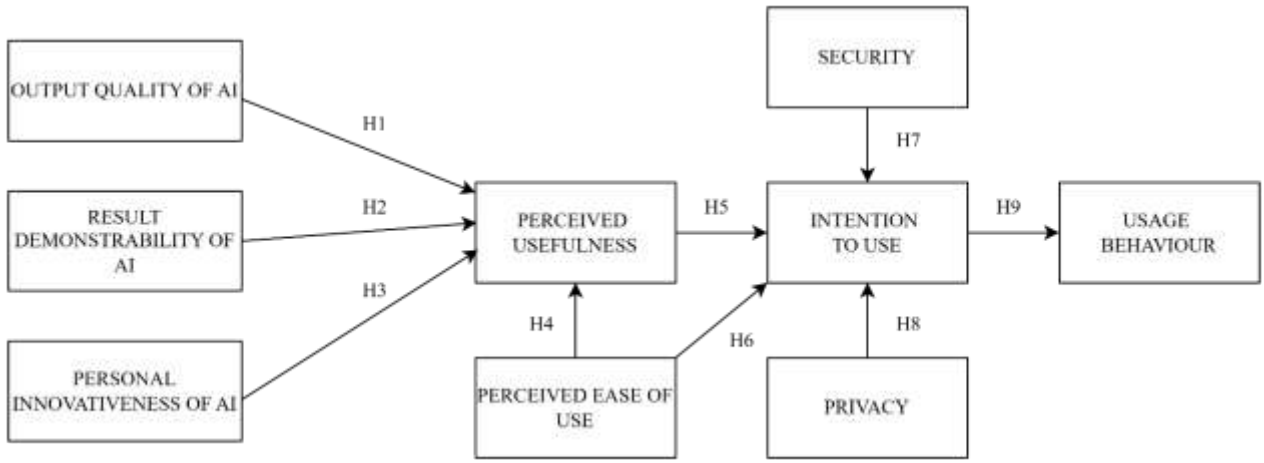

Figure 1. The research model

Source: The authors (2025)

FINDINGS

Results

The research aims to analyze the results obtained from a sample of 300 clients utilizing AI mobile banking apps in Vietnamese commercial banks using descriptive analysis techniques. Using Smart PLS software not only focuses on presenting data in a detailed and clear manner but also ensures high accuracy and efficiency in the process of analyzing and describing data in Figure 2.

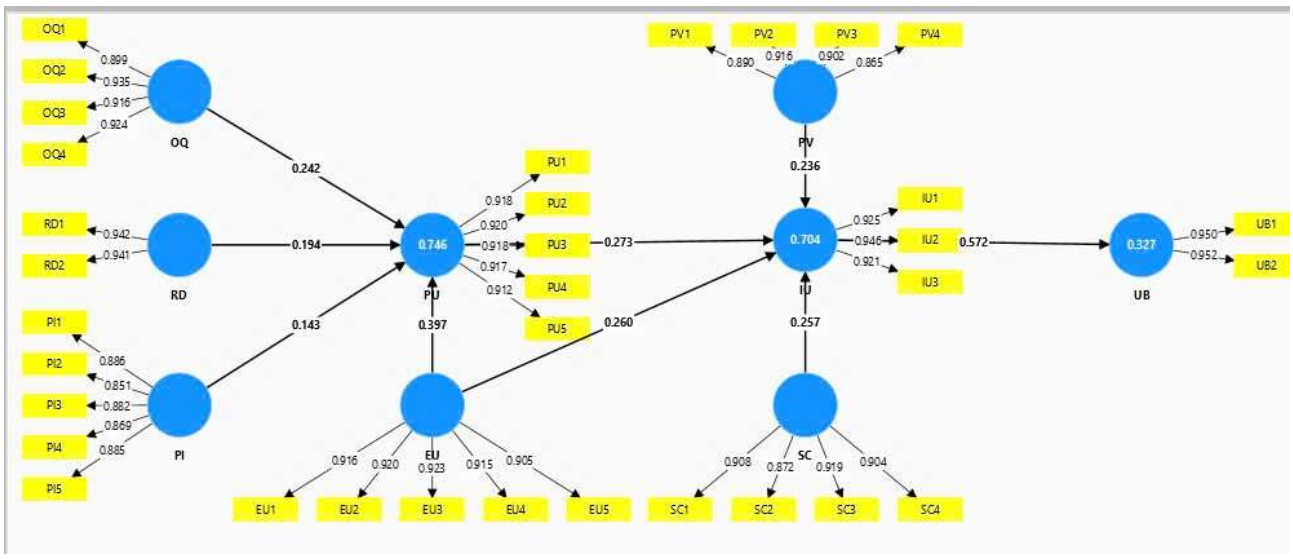

Figure 2. Model showing the relationship between factors impacting customers' usage behavior in commercial banks in Vietnam: The role of AI application

Source: The author (2025)

Outer loadings

Outer loading is a metric used to assess how much individual items contribute to their respective variables. According to Dzin and Lay (2021), items with outer loadings of 0.7 or higher are considered significant contributors to the variables. Conversely,

items with loadings between 0.4 and 0.7 should be evaluated to determine whether they should be retained or removed from the variable. Through the process of researching and consulting many different sources, the author decided to retains all the variables because above items with good outer loadings, many items need to be considered, which are important factors that can affect the research results. Table 1 is the finally external loading table after editing by the author.

Cronbach's alpha serves as a measure of internal consistency to assess the reliability of variables (Collins, 2007). Research indicates that a Cronbach's alpha value of 0.7 or higher signifies acceptable reliability (Taber, 2018). As shown in Table 2, all variables exhibit Cronbach's alpha coefficients exceeding 0.7, indicating strong correlations within the scale and robust internal reliability.

Table 1. Outer loadings

	EU	IU	OQ	PI	PU	PV	RD	SC	UB
EU1	0.916								
EU2	0.920								
EU3	0.923								
EU4	0.915								
EU5	0.905								
IU1		0.925							
IU2		0.946							
IU3		0.921							
OQ1			0.899						
OQ2			0.935						
OQ3			0.916						
OQ4			0.924						
PI1				0.886					
PI2				0.851					
PI3				0.882					
PI4				0.869					
PI5				0.885					
PU1					0.918				
PU2					0.920				
PU3					0.918				
PU4					0.917				
PU5					0.912				
PV1						0.890			
PV2						0.916			
PV3						0.902			
PV4						0.865			
RD1							0.942		
RD2							0.941		
SC1								0.908	
SC2								0.872	
SC3								0.919	
SC4								0.904	
UB1									0.950
UB2									0.952

Source: The authors (2025)

Table 2. Internal Consistency Reliability

	Cronbach's alpha	Composite reliability (rho_a)	Average variance extracted (AVE)
EU	0.952	0.952	0.839
IU	0.923	0.924	0.866
OQ	0.938	0.939	0.844
PI	0.923	0.924	0.765
PU	0.953	0.953	0.841
PV	0.916	0.918	0.798
RD	0.872	0.872	0.887
SC	0.923	0.924	0.812
UB	0.89893	0.894	0.904

Source: The authors (2025)

Composite reliability is "a measure of the internal consistency of indicators within a scale and serves as an alternative to Cronbach's Alpha" (Hair *et al.*, 2017). This research indicates that values ranging from 0.7 to 0.9 are ideal. As shown in Table 2, all the values for this indicator across the variables fall within this range, thus confirming the acceptability of the variables. The average variance extracted (AVE) "measures how well a research variable accounts for the variation among its observed variables" (Dzin and Lay, 2021). (Hair *et al.*, 2017) stated that "AVE values of 0.5 or higher indicate that a latent variable explains more than half of the variance in its observed variables, demonstrating good convergence." In this study, all AVE values for the variables exceed 0.5, confirming their acceptability.

Discriminant Validity

Discriminant validity "refers to the extent to which factors are separate and uncorrelated. The idea is that variables should have stronger relationships with their own factor than with others." (Renno and Wood, 2013). Specifically, if these values are below 0.9, the variables can be included in the model. According to the results in Table 3, the values range from 0.517 to 0.839, indicating that the variables can continue to be used.

Table 3. Discriminate validity

	EU	**IU**	**OQ**	**PI**	**PU**	**PV**	**RD**	**SC**	**UB**
EU	1								
IU	0.797	1							
OQ	0.757	0.782	1						
PI	0.631	0.665	0.751	1					
PU	0.839	0.756	0.816	0.707	1				
PV	0.619	0.720	0.587	0.510	0.521	1			

RD	0.814	0.841	0.833	0.668	0.830	0.567	1		
SC	0.552	0.687	0.527	0.365	0.434	0.610	0.517	1	
UB	0.517	0.629	0.463	0.237	0.379	0.581	0.434	0.819	1

Source: The authors (2025)

4.5. Coefficient of determination (R-square)

R-squared is defined as "a statistical measure that indicates how well the research model fits the factors (or variables)" (Mohd Dzin and Lay, 2021). While there is no specific standard for what constitutes an acceptable R-squared value for a new model, a value closer to 1 signifies a stronger model, whereas a value nearer to 0 indicates a weaker model. In this study, the R-squared values for IU, PU, and UB are 70.4%, 74.6%, and 32.7%, respectively.

Table 4. R Square

	R-square	**R-square adjusted**
IU	0.704	0.700
PU	0.746	0.743
UB	0.327	0.324

Source: The authors (2025)

Path Coefficient

Path coefficients are defined as the regression coefficients in the path model that represent the relationships between latent variables (Liu *et al.*, 2015). In figure 23, all relationships with a p-value of less than 0.05 indicate significance. Additionally, the β values can be either positive or negative; in this analysis, all β values are greater than 0, indicating that the relationships are positive.

Table 5. Path coefficient

	Original sample	**Sample mean**	**Standard deviation**	**T statistics**	**P values**
EU -> IU	0.260	0.261	0.072	3.618	0.000
EU -> PU	0.397	0.394	0.089	4.445	0.000
IU -> UB	0.572	0.573	0.053	10.867	0.000
OQ -> PU	0.242	0.243	0.083	2.908	0.004
PI -> PU	0.143	0.143	0.068	2.091	0.037
PU -> IU	0.273	0.272	0.067	4.055	0.000
PV -> IU	0.236	0.233	0.059	4.015	0.000
RD -> PU	0.194	0.196	0.078	2.483	0.013
SC -> IU	0.257	0.258	0.055	4.644	0.000

Source: The authors (2025)

Collinearity

Collinearity is a phenomenon caused by a strong correlation between independent variables in a linear regression model (Dzin and Lay, 2021). In practice, many studies have indicated that VIF values less than 2 are considered to indicate no collinearity. All VIF values in the model are below the threshold of 5, suggesting that there are no serious issues with multicollinearity in this model. This allows the independent variables to be examined independently without being affected by correlations with other variables.

Table 6: Collinearity

	EU1	EU2	EU3	EU4	EU5	IU1	IU2	IU3	OQ1	OQ2	OQ3	OQ4
VIF	4.098	4.236	4.328	3.991	3.702	3.386	4.151	3.167	3.128	4.440	3.656	4.068
	PI1	**PI2**	**PI3**	**PI4**	**PI5**	**PU1**	**PU2**	**PU3**	**PU4**	**PU5**	**UB1**	**UB2**
VIF	2.983	2.476	2.985	2.732	2.972	4.125	4.332	4.211	4.189	4.045	2.874	2.874
	PV1	**PV2**	**PV3**	**PV4**	**RD1**	**RD2**	**SC1**	**SC2**	**SC3**	**SC4**		
VIF	2.823	3.841	3.100	2.541	2.486	2.486	3.294	2.602	2.637	3.469		

Source: The authors (2025)

DISCUSSION

Table 7. Hypotheses Result

Hypotheses	Relationships	Path coefficient	P values	Result
H1	Output quality of AI Applications -> perceived usefulness	0.242	0.004	Supported
H2	Result demonstrability of AI applications -> perceived usefulness.	0.194	0.013	Supported
H3	Personal Innovativeness of AI applications -> perceived usefulness.	0.143	0.037	Supported
H4	Perceived Ease of Use -> perceived usefulness of AI Applications.	0.397	0.000	Supported
H5	Perceived Usefulness -> Intention to use AI Applications.	0.273	0.000	Supported
H6	Perceived Ease of Use positively -> intention to use of AI Applications	0.260	0.000	Supported
H7	Security -> intention to use AI Applications.	0.257	0.000	Supported
H8	Privacy -> intention to use AI Applications	0.236	0.000	Supported
H9	Intention to Use -> Usage Behavior of AI Applications.	0.572	0.000	Supported

5.1. The relationship between output quality of AI applications and perceived usefulness

Hypothesis 1. Output quality of AI Applications positively influences the perceived usefulness.

With the prediction of hypothesis 1, output quality of AI Applications positively influences the perceived usefulness. Besides, after analyzing the obtained data, it can be found that there is a significant relationship between these two variables when $\beta = 0.242$ and $p = 0.004 < 0.05$. Thus, this result is similar to the original author's hypothesis and previous studies.

Past studies support the hypothesis that the output quality of AI applications significantly enhances their perceived usefulness, influencing user trust, efficiency, and satisfaction. High-quality outputs provide accurate, reliable data, improving decision-making and automating routine tasks, which saves time and boosts utility (Goli et al., 2023; Broekhuizen et al., 2023). Trustworthy outputs increase user reliance, integrating AI into workflows (Doğan, 2018). Satisfied users, experiencing outputs that meet expectations, are more likely to continue usage and recommend the application, amplifying its perceived value (Chaieb et al., 2023).

The findings indicate that the output quality of AI applications positively influences the perceived usefulness of mobile banking services in commercial banks in Vietnam. High-quality outputs foster user trust, as accurate transaction processing and reliable customer service interactions enhance the perception of security and reliability in mobile banking. This trust is essential, as customers are more likely to view the service as dependable when they receive precise and trustworthy information. Moreover, quality outputs significantly enhance the overall user experience by providing personalized financial advice, real-time transaction

alerts, and efficient customer support. These features contribute to a smoother user journey, resulting in increased satisfaction and a stronger perception of the mobile banking application's usefulness. Additionally, AI applications that offer high-quality data analysis facilitate informed financial decision-making, empowering users to manage their finances effectively. Besides, there is a strong correlation between output quality and user satisfaction; when services meet or exceed expectations, users are more likely to remain loyal and recommend these services to others.

5.2. The relationship between Result demonstrability of AI applications and perceived usefulness

Hypothesis 2: Result demonstrability of AI applications positively influences the perceived usefulness.

From the analysis results of the study, it can be seen that the values of result demonstrability are β = 0.194 and P = 0.0013 < 0.05. With a value of P = 0.0013 < 0.05, it indicates that the result demonstrability variable has a strong statistical impact on the perceived usefulness variable. This result is similar to the original hypothesis.

Research highlights that observable outcomes from AI-driven mobile banking applications, such as faster transactions, enhanced security, and personalized financial insights, significantly increase user satisfaction and trust (Demirel & Topcu, 2024). Liu (2024) demonstrates that result demonstrability correlates with heightened perceived usefulness, as users experiencing tangible benefits, like real-time transaction alerts or tailored savings recommendations feel more confident in their financial decisions. This satisfaction strengthens user commitment and prompts advocacy within social networks, amplifying the application's value. Almaiah et al. (2022) emphasize that demonstrable results foster trust, crucial in banking, where verifiable outcomes, such as secure transactions and data protection, encourage reliance on AI tools. Wang and Cheng (2020) further show that clear evidence of AI effectiveness enhances engagement and perceived value, aligning with Hypothesis 2, which posits that result demonstrability positively influences perceived usefulness. When users recognize immediate benefits, such as improved financial management, their perception of the application's utility rises, reinforcing adoption. These results underscore the pivotal role of result demonstrability in shaping positive user experiences in Vietnam's mobile banking sector, supporting strategic efforts to enhance AI-driven engagement.

The strong outer loading indices for result demonstrability, with RD1 at 0.941 and RD2 at 0.942, highlight the clarity of outputs and users' perceptions of mobile banking applications. To enhance the perceived usefulness of these services, commercial banks in Vietnam can implement several solutions. First, investing in an intuitive user interface (UI) and user experience (UX) design can help users easily identify and understand key features and benefits, facilitating better comprehension of functionalities such as transaction alerts and personalized recommendations. Additionally, implementing real-time feedback mechanisms will notify users of transaction statuses, security alerts, and personalized insights, reinforcing their trust in the application. Providing educational resources such as videos and tutorials can further empower users to utilize the app effectively, enhancing their engagement and appreciation of its features. Moreover, utilizing AI analytics to offer tailored financial insights and alerts will cater to individual user needs, significantly increasing perceived usefulness.

5.3. The relationship between Personal Innovativeness of AI applications and perceived usefulness

Hypothesis 3. Personal Innovativeness of AI applications positively influences perceived usefulness.

From the analysis results of the study, it can be seen that the values of result demonstrability are β = 0.143 and P = 0.037 < 0.05. With a value of P = 0.037 < 0.05, it indicates that the personal innovativeness of AI applications has a strong statistical impact on the perceived usefulness variable. This result is similar to the original hypothesis.

Research shows that users with higher personal innovativeness are more likely to engage with advanced AI application features, enhancing perceived usefulness. Innovative users leverage tools like personalized financial advice, improving decision-making and satisfaction (Molinillo et al., 2023). Their adaptability enables effective navigation of AI banking apps, while their feedback aids application refinement (Singh et al., 2024; Goli et al., 2023). These findings support Hypothesis 3, confirming that personal innovativeness positively influences perceived usefulness, underscoring the value of fostering innovation to boost engagement and application improvement.

The strong outer loading indices for Personal Innovativeness of AI applications PI1 at 0.886, PI5 at 0.885, and PI2 at 0.882 highlight the importance of fostering personal innovativeness among users in the context of AI applications. To leverage this potential, commercial banks in Vietnam can implement several solutions. First, they should promote a culture of innovation by organizing workshops and seminars that showcase the benefits of adopting new technologies. Providing comprehensive training programs, including online tutorials and webinars, can empower users to effectively utilize advanced features of AI applications, enhancing their confidence and engagement. Additionally, banks can incentivize early adopters with rewards such as discounts or loyalty points to stimulate interest in innovative features. Establishing feedback mechanisms will allow users to share their experiences, helping banks refine their offerings while fostering a sense of community. Highlighting success stories and

testimonials from users who have benefited from innovative features can inspire others to explore these tools.

5.4. The relationship between Perceived Ease of Use and perceived usefulness of AI Applications.

Hypothesis 4: Perceived Ease of Use has a positive effect on perceived usefulness of AI Applications.

The study's findings support Hypothesis 4, confirming that perceived ease of use positively influences the perceived usefulness of AI-driven mobile banking applications. Research shows that intuitive navigation enhances users' recognition of an app's utility for banking tasks (Rizkyla, 2024). For instance, seamless access to features like transaction alerts and budgeting tools increases appreciation of the app's value, encouraging sustained use (Doğan, 2018). Suciati et al. (2021) highlight that user-friendly interfaces foster trust and satisfaction, promoting exploration of additional functionalities. This reduces cognitive load, enabling efficient task completion, such as quick fund transfers and goal setting, further solidifying perceived usefulness (Abdullah et al., 2016). These results underscore the importance of intuitive design in enhancing user engagement and perceived value in Vietnam's mobile banking sector.

The strong outer loading indices for Perceived Ease of Use PU1 at 0.918, PU2 at 0.920, and PI2 at 0.882 underscore the importance of a user-friendly interface in enhancing the perceived ease of use of AI applications, which is crucial for banking services. To capitalize on this insight, commercial banks in Vietnam can implement several solutions. First, they should invest in optimizing the user interface (UI) to ensure it is intuitive and visually appealing, simplifying navigation and minimizing the steps required to complete tasks. Regular user testing and feedback sessions can help identify pain points, allowing targeted improvements that meet user needs effectively. Additionally, creating interactive tutorials or onboarding processes will guide new users through the application's features, reducing the learning curve and enhancing engagement. Quick access to frequently used features, such as fund transfers and account balances, should be prioritized to improve efficiency and reduce frustration. Finally, establishing a routine for regular updates based on user feedback and technological advancements will keep the application relevant and user-friendly.

5.5. The relationship between Perceived Usefulness and intention to use of AI Applications.

Hypothesis 5. Perceived Usefulness positively influences intention to use of AI Applications.

The findings from this research strongly support Hypothesis 5, which asserts that perceived usefulness positively influences the intention to use AI applications. With a β value of 0.273 and a p-value of 0.000, the results indicate a statistically significant relationship between these two constructs. This significance underlines the importance of perceived usefulness in shaping user intentions, suggesting that as users recognize the benefits of AI applications.

The findings of this study align with prior research, notably Ayanwale and Ndlovu (2024), who emphasized the strong link between perceived usefulness and users' intention to adopt applications. This supports the view that when users perceive clear benefits such as personalized services or efficient transactions, they are more likely to engage with the technology. Similarly, Wardana et al. (2022) found that valuable AI features encouraged frequent use, reinforcing the importance of usefulness. While some studies, like Doğan (2018), prioritize ease of use as the primary determinant of intention, this research suggests that perceived usefulness plays an equally significant role. These variations may result from contextual differences, but overall, the study confirms that perceived usefulness and ease of use are interrelated and jointly essential in shaping user intention.

In the study, the items with the strongest outer loadings PU1 at 0.918 and PU2 at 0.920, which can serve as a foundation for developing strategic solutions for commercial banks. These items emphasize the necessity of a user-friendly AI interface that enhances banking functionalities. Banks should prioritize enhancing the user experience by investing in the optimization of the UI design and overall functionality of their AI applications. Ensuring that these applications are intuitive and visually appealing will help users recognize their value more readily. Additionally, marketing efforts should focus on promoting key features, such as personalized financial insights and efficient transaction processing, to clearly convey their benefits to potential users. Finally, providing comprehensive training resources and customer support will empower users to fully utilize the features of the application, reinforcing the perceived usefulness of the technology.

5.6. The relationship between Perceived Ease of Use and intention to use of AI Applications.

Hypothesis 6. Perceived Ease of Use positively influences intention to use of AI Applications.

The findings from this research provide strong support for Hypothesis 6, which posits that perceived ease of use positively influences the intention to use AI applications. The results indicate a β value of 0.260 and a p-value of 0.000, demonstrating a statistically significant relationship between perceived ease of use and users' intention to adopt AI mobile banking applications. of use and user intention.

This study's findings align with Venkatesh (2000) and He et al. (2018), confirming that perceived ease of use drives

intention to use AI-driven mobile banking apps through intuitive interfaces enabling features like budgeting tools and transaction alerts. User-friendly designs enhance engagement and adoption. Unlike Rane et al. (2023), who prioritize perceived usefulness for satisfaction, this research underscores ease of use as equally critical. Variations in scope and focus on AI banking contexts highlight that both ease of use and usefulness shape user intention in Vietnam's mobile banking sector.

The items with the strongest outer loadings are EU3 at 0.923 and EU2 at 0.920 can serve as a foundation for developing targeted solutions for commercial banks. These items emphasize the importance of creating an intuitive user experience within AI-powered banking applications. To leverage these insights, banks should prioritize optimizing the user interface and ensuring that the application is easy to navigate. This could involve simplifying the layout, enhancing visual elements, and minimizing the number of steps needed to complete tasks. Additionally, banks should provide interactive tutorials or help sections within the app to guide users, particularly new ones, through its features.

5.7. The relationship between security and intention to use AI Applications.

Hypothesis 7: Security has a negative effect on intention to use AI Applications.

The findings from this research reveal a significant relationship that contradicts Hypothesis 7, which proposed that security has a negative effect on the intention to use AI applications. The results indicate a β value of 0.257 and a p-value of 0.000, demonstrating a statistically significant effect.

This study's findings, showing a positive relationship between security perceptions and intention to use AI-driven mobile banking applications (β = 0.257, p = 0.000), diverge from prior research highlighting security concerns as adoption barriers (Du & Agami, 2017; Mishra, 2023). While earlier studies noted data breach fears deter engagement, robust security frameworks can enhance trust, encouraging adoption (Lee & Chen, 2022). Evolving user recognition of AI benefits, like personalized services, alongside advanced security measures and greater data protection awareness, likely shifts perceptions, outweighing concerns and supporting Hypothesis 7. This underscores the role of reliable security in fostering confidence in Vietnam's mobile banking sector.

Moreover, the strong outer loading values associated with trust in the AI system (SC1 at 0.919 and EU3 at 0.908) suggest that users still perceive these applications as secure and beneficial. This shift in user sentiment indicates that while security remains a concern, it does not always overshadow the perceived advantages of adopting AI technologies in banking. Thus, the findings of this research provide valuable insights into the changing landscape of user attitudes towards security and technology adoption.

5.8. The relationship between privacy and intention to use AI Applications.

Hypothesis 8. Privacy has a negative effect on intention to use AI Applications.

The results of this research provide significant insights into Hypothesis 8, which posits that privacy has a negative effect on the intention to use AI applications. The findings reveal a β value of 0.236 and a p-value of 0.000, indicating a statistically significant relationship.

This study's findings, showing a positive relationship between privacy perceptions and intention to use AI-driven mobile banking applications (β = 0.236, p = 0.000), contrast with earlier research highlighting privacy concerns as a barrier to adoption (Huang, 2022; Doğan, 2018). While prior studies noted that fears over data security reduced user engagement, Wu et al. (2012) suggested robust privacy protections can enhance trust, mitigating concerns. Evolving user awareness of AI benefits, like personalized services, combined with advanced security measures and transparent data practices, likely fosters greater trust, outweighing privacy worries and supporting Hypothesis 8. This shift underscores the role of improved transparency in reshaping user confidence in Vietnam's mobile banking sector.

Additionally, the strong outer loading values for the privacy-related items (PV2 at 0.916 and PV3 at 0.908) indicate that, while privacy remains an important issue, users may feel that banks are implementing sufficient measures to safeguard their data. This changing perspective suggests that users can reconcile their privacy concerns with the perceived advantages of adopting AI technologies in banking. Consequently, the findings of this research offer valuable insights into the evolving attitudes toward privacy and technology adoption, indicating that users might be more open to embracing AI applications than previously assumed.

5.9. The relationship between Intention to Use and Usage Behavior of AI Applications.

Hypothesis 9: Intention to Use has a positive effect on Usage Behavior of AI Applications.

The findings of this research provide strong support for Hypothesis 9, which posits that intention to use has a positive effect on the usage behavior of AI applications. The results indicate a β value of 0.527 and a p-value of 0.000, demonstrating a statistically significant relationship between users' intention to use and their actual usage behavior.

This study's findings confirm a positive correlation between intention to use and actual usage behavior of AI-driven

mobile banking applications, aligning with prior research (Muñoz-Leiva et al., 2017). Perceived usefulness and ease of use drive intention, predicting feature exploration (Ayar, 2024; Nguyen, 2023). However, Nguyen and Dao (2024) note that technical difficulties or low motivation can disrupt this relationship, highlighting contextual influences. These results reinforce intention as a key predictor of engagement while emphasizing the need to address external barriers in Vietnam's mobile banking sector.

The items with the strongest outer loadings IU2 at 0.946, IU1 at 0.925, and IU3 at 0.921 provide a solid foundation for developing strategic solutions to enhance user engagement with AI applications. These items emphasize the importance of fostering a strong intention to use, which subsequently drives actual usage behavior. To capitalize on these insights, banks should focus on creating a compelling user experience that highlights the benefits of using AI applications, such as personalized financial management tools and efficient transaction processes. Additionally, implementing features that encourage regular interaction, like reminders for budgeting or investment opportunities, can help sustain users' engagement. Moreover, addressing potential barriers by providing robust customer support and technical assistance can help users overcome obstacles that might hinder their ability to translate intention into actual usage. By concentrating on these strategies, banks can enhance user satisfaction and loyalty, ultimately driving greater long-term usage of AI applications.

CONCLUSION

This research has successfully fulfilled its objectives by empirically investigating the relationship between artificial intelligence (AI) and customer usage behavior in mobile banking within the context of Vietnam's commercial banking sector. The study confirms that AI applications significantly shape user engagement and adoption through several key determinants. Among these, perceived ease of use, output quality, and result demonstrability emerged as critical enablers of perceived usefulness. Users are more likely to adopt AI-powered mobile banking when they perceive the technology to be intuitive, effective, and capable of delivering tangible, visible outcomes. The findings also emphasize the importance of individual-level factors such as personal innovativeness, which fosters openness to exploring new technologies and enhances perceptions of usefulness. Notably, concerns surrounding security and privacy, while initially perceived as barriers, were shown to have a positive influence when adequately addressed. This suggests that proactive efforts in building digital trust can turn potential apprehensions into drivers of adoption. Besides, the study reinforces the central role of intention to use as a strong predictor of actual usage behavior. Once users develop a favorable attitude toward AI applications, driven by usefulness, ease of use, and trust they are more likely to translate these intentions into sustained engagement. These results align well with established theoretical models such as the Technology Acceptance Model and its extensions, offering empirical validation within the Vietnamese banking context.

Despite its contributions, this study has limitations that pave the way for future research. Firstly, the sample was restricted to 300 customers in Vietnam, primarily in Ho Chi Minh City, limiting generalizability. Expanding the sample size and including diverse regions or other developing countries could enhance applicability, as cultural and economic contexts influence technology adoption (Ha & Nguyen, 2022). Secondly, the study relied on cross-sectional data, capturing user perceptions at a single point. Longitudinal studies tracking actual usage over time would provide deeper insights into behavioral shifts. Thirdly, the scarcity of literature on AI mobile banking in Vietnam constrained the literature review. Future research could explore specific AI features (e.g., chatbots, fraud detection) and their integration with emerging devices like smartwatches. By addressing these limitations, scholars can enrich the understanding of AI's role in mobile banking and its impact on customer behavior across diverse contexts.

RECOMMENDATION

Based on the findings from previous research and analysis, it is clear that all factors associated with AI applications have a significant influence on customers' usage behavior in commercial banks in Vietnam. To assist banking managers in effectively integrating AI practices into their organizational strategic planning and to enhance customer intention to use mobile banking apps, several recommendations are proposed, arranged in order of their impact.

First, banks should prioritize enhancing the perceived usefulness of their AI applications. This can be achieved by clearly demonstrating the tangible benefits these technologies offer, such as personalized financial advice, streamlined transaction processes, and improved customer service. By effectively communicating these advantages, banks can significantly increase users' perceived value of the applications, thereby driving higher levels of engagement.

In conjunction with this, it is crucial to improve the ease of use of mobile banking apps. Developing intuitive and user-friendly interfaces will minimize friction and simplify navigation, making it easier for customers to adopt and regularly utilize AI-powered banking solutions. A seamless user experience is essential to encourage ongoing interaction with the app. Besides, prioritizing output quality is vital. Investments in AI technologies that deliver accurate, reliable, and timely information will foster

trust among users. High-quality outputs not only reinforce the perceived value of the applications but also encourage customers to engage more frequently and confidently. Addressing security and privacy concerns is another critical factor. Implementing robust security measures and transparent data handling practices is essential to alleviate user apprehensions. By clearly communicating these safeguards, banks can enhance trust and increase the likelihood of customers embracing mobile banking applications.

Additionally, fostering personal innovativeness within the banking culture can motivate customers to explore AI applications. Providing educational resources, workshops, and support can enhance users' willingness to engage with new technologies, making them feel more empowered to utilize AI tools effectively. Enhancing result demonstrability is also important; banks should illustrate the effectiveness of their AI applications through personalized insights and real-time feedback. This approach helps users recognize the immediate benefits of using these tools, further reinforcing their intention to adopt and continue using the apps. Finally, banking managers should focus on strengthening user intention through targeted marketing strategies.

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