Digital Financial Literacy and Mobile Banking Behavior: Empirical Evidence from an Emerging Market

Thuy Chung Phan[1], Triet Le Minh[2*], Trang Thao Nguyen [3] , Hien Thu Phan[4]

[1] Department of Financial Management, University of Economics Ho Chi Minh City (UEH), Vietnam

[2] Faculty of Economics and Laws – Vinh Long University of Technology Education, Vinh Long, Vietnam

[3] School of Foreign Languages, University of Economics Ho Chi Minh City (UEH), Vietnam

[4] School of Banking, College of Business, University of Economics Ho Chi Minh City (UEH), Vietnam

[*]Corresponding author: trietlm@vlute.edu.vn

Abstract

Research Purpose: With the rapid development of finance and the increase in the world's population owning smartphones, digital financial literacy has become essential in many countries, including Vietnam. This study investigates the impact of digital financial literacy on the use of Mobile Banking in Vietnam.

Research Motivation: To deepen our understanding of the complex relationship between digital financial literacy and mobile banking behavior, the UTAUT model is adopted, offering a unique contribution to the literature on digital finance.

Method: Our data, consisting of 800 observations of Vietnamese individuals who have used mobile banking, indicates that a significant portion of the Vietnamese population possesses the necessary technical knowledge to utilize technology.

Finding: Our findings show the significant effect of financial, digital, and digital financial literacy on mobile banking behavior. Further, there is a considerable gap in digital financial literacy between genders and urban and rural areas. The study highlights the lower financial literacy digital and financial knowledge levels in Vietnam.

Implication: The contribution of this research will provide an essential foundation for policies aimed at developing digital financial literacy and digital banking to direct the development toward a digital economy in the future.

Keywords: financial literacy, digital literacy, digital financial literacy, mobile banking behavior, emerging market

1. INTRODUCTION

In this day and age, 4.0 technology is gradually transforming all areas of life, and the financial market is one of them. Digital financial tools or applications are increasingly diverse in form, convenient to use, and save time to a minimum. The growing mobile telecommunications services market has also created a solid foundation for developing digital financial products, especially in Asian countries like China, Indonesia, India, and the Philippines (Comninos, 2008). Financial firms that do not require vast capital and many assets can participate in the digital financial market with applications for payment, savings, and investment and provide users with the most convenient experiences. However, some Mobile Banking apps, which represent conventional banks, still have dominant roles in digital banking due to their substantial financial resources and reputation (Jonathan et al., 2020). Current users need to be changed to be more proficient in financial and digital knowledge or, in other words, general digital financial ability to consider, evaluate, and choose the best option for their financial management (Andreou et al., 2021).

Previous studies have shown that financial literacy is vital in managing individual economic well-being. For example, people with good financial literacy are less likely to be taken advantage of and cheated (Campbell et al., 2011; Lusardi & Mitchell, 2011; Deevy et al., 2012; Balloch et al., 2015; Andreou & Philip, 2018) or to be in excessive debt (Lusardi & Tufano, 2015; Andreou & Philip, 2018), to hold more savings (Deuflhard et al., 2019, Morgan & Long, 2020) and to have a better-retired plan (Lusardi & Mitchell, 2007; van Rooij et al., 2012) and have higher levels of financial well-being (Sabri et. al, 2023). However, in today's era, it is not enough to have basic financial knowledge; the technological era requires us also to have a good understanding of digital tools and technologies, including cell phones, smartphones, and tablets, to make an entrance into the new economy effectively (Carlin et al., 2019; Vogels & Anderson, 2019). Besides that, the need for financial literacy among people of all ages has proliferated due to the dramatic advancements in financial services and global economic crises (Hastings et al., 2013; Lusardi & Mitchell, 2011). Therefore, the OECD (2018)

highlights digital financial literacy as an essential component of the global policymaking agenda.

In Vietnam, digital transformation is increasingly becoming the core of economic growth. Seventy percent of the population is under 35, educated, and tech-savvy. A report on e-commerce in Vietnam 2021 by the Department of E-commerce and Digital Economy shows that 75% of Vietnamese have access to the Internet, and 54.6 million people participate in e-commerce, primarily through smartphones. However, digital literacy remains limited. With the increasing diversity and complexity of financial services and particularly the strong link with other digital financial platforms such as savings and investment, all this needs to be done to promote financial inclusion not only locally in Vietnam but globally.

However, there seems to be little evidence of the digital financial literacy and mobile banking relationship in the literature, especially in developing countries like Vietnam. To get an even better understanding of the underlying relationships of digital financial literacy and its relationship to mobile banking behavior, the unified technology acceptance and use of technology (UTAUT) theory is adopted, considered one of the unique contributions to literature. Moreover, this study also contributes to the body of knowledge regarding the role of digitalization and financial literacy in facilitating Mobile Banking in Vietnam.

The rest of the study is organized as follows: next is the literature review and hypothesis development. The third section is the research method, while the fourth section presents the data analysis. The last section discusses the main findings, research implications, and the limitations and future direction of the study.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Digital financial literacy

Digital financial literacy (DFL) refers to the knowledge needed to navigate financial services with the skills to use digital technologies. Digital financial literacy combines financial literacy and digital skills, as highlighted by Tony and Desai (2020), who show that digital financial literacy builds on financial literacy by incorporating various digital features. The abundance of digital financial products and the continued expansion of digital financial services contribute to the need for a higher level of financial literacy for consumers to use financial technology effectively (fintech). Additionally, digital financial literacy is considered an essential step toward solving gender equality when using digital financial services (Women's World Banking, 2021; Center for Financial Inclusion, 2021). Since the emergence of digital financial services, debates on DFL have attracted many parties, such as governments, financial services providers, and the public. Moreover, Mobile banking, in particular, is seen as a convenient and efficient way to access financial services by those with a high level of digital financial literacy since they can easily track their account balances, trade, and access other financial platforms while multitasking (Ahn & Nam, 2022).

2.2 Mobile banking

Mobile banking is an innovative financial service delivered via smartphone and software applications that enables interactive bank services on the go. Previous studies have shown that digital banking is crucial in the banking industry for many reasons. Digital banking bridges conventional banking services to users through a modern and accessible technology platform (McGovern et al., 2019). Digital banking brings even more advantages to users since it is fast, convenient, accessible from anywhere, anytime, and it can be used for multiple purposes, including privacy and security (Malaquias & Hwang, 2016). From the macro perspective, mobile banking also plays a role in increasing the uptake of banking services, thereby promoting financial inclusion, reducing the urban-rural divide (Ammar & Ahmed, 2016; Mtambalika et al., 2016; Van der Wansem, 2013) and inequality and poverty (Mago & Chitokwindo, 2014; Chukwumah, 2017; Pankomera & Van Greunen, 2018).

The first Mobile Banking application was launched in Vietnam in 2010 (Le Thanh Tam et al., 2020). According to the Vietnamese National Statistics Department, with a young population expected to reach 100 million in 2023, Vietnam has a good chance of developing Mobile Banking. In a similar vein, according to statistics from Banking Magazine, by the second quarter of 2022, 68% of adults have accounts at commercial banks in Vietnam; 5.5 million accounts and about 8.9 million bank cards are opened electronically (eKYC); 1.77 million mobile phone accounts were opened (more than 67% of which belongs to those of rural, remote and isolated areas) and by the fourth quarter of 2022, Internet and Mobile Banking transactions reached more than 1.5 billion transactions, with total sales of 13.272.494 billion VND (about 561.2 billion USD), which show the growth of double in values and 1.5 times in transaction value over the same period in 2021 (Do The Dan, 2023). This tendency might be because of the COVID-19 pandemic (Nguyen Thi Hong Nhung et al., 2022). However, to get customers' attention and increase their competitive capacity, digital banks must satisfy new expectations of their customers, such as ease of use, user-friendly design, and distinctive advantages in users' minds (Gurtner et al., 2014). Overall, the tendency to use digital banking in Vietnam is affected by various factors, in which awareness, in general, and user understanding, in particular, play a significant role.

2.3 Theoretical Framework and Development of Research Hypotheses

Although this is not a new issue, many research papers have been published focusing on factors that affect the use of Mobile Banking in different countries, such as Akturan and Tezcan (2012) in Turkey; Faria (2012) in Portugal;

Hanafizadeh et al. (2014) in Iran; Afshan and Sharif (2016) in Pakistan; Koenig-Lewis et al. (2010) in Germany; Masrek and Razali (2013) in Malaysia. Researchers have used various models while studying the factors affecting the use of Mobile Banking. For example, Sripalawat et al. (2011) used the TAM model, Al-Husein and Sadi (2015) implemented extended TAM, whereas Lee (2009) integrated The Theory of Planned Behavior (TPB) and TAM. Al-Jabri and Sohail (2012) accepted Innovation Dissemination Theory (IDT), Yu (2012) uses UTAUT, whereas Alalwan et al. (2017) adopted UTAUT2 and Tam and Oliveira (2017) with a successful I.S. Model. Ho et al. (2020) use the Diffusion of Innovation (DOI), the Technology Acceptance Model (TAM), and the Decomposed Theory of Planned Behavior (DTPB). However, these studies only measured technology adoption behavior without considering the impact of financial literacy, digital literacy, and mainly digital financial literacy on the behavior of mobile banking users, controlling for demographic characteristics. Therefore, this study aims to address this research gap and provide insights into these factors.

2.3.1 Financial literacy

Financial literacy is seen as the core foundation for development and the process of reaching the top of financial inclusion, according to the World Bank (2013). Financial literacy is a significant factor in having financial capacity, including knowledge, understanding, experience, behavior, and actions when making financial decisions. According to Lusardi and Mitchell (2014), financial literacy is a human capital investment involving many aspects of individual decision-making, such as choice or participation in voting. Similarly, financial literacy is a multidimensional view of an individual's choices in the life cycle, such as wealth, market participation, and business outcomes (Fornero et al., 2021). Murendo and Mutsonziwa (2017) find that individuals with a higher level of financial literacy are better equipped to manage their finances and understand the risks and measures when using Mobile Banking. Based on evidence from previous studies, we hypothesized that:

Hypothesis H1. **Financial literacy positively affects Mobile Banking behavior**.

2.3.2 Digital literacy

In some studies, "digit" refers to the ability to effectively use and interact with digital technologies for transmitting, collecting, sharing, and analyzing information (Prete, 2022). This framework includes the basics of using computers, the Internet, and software and the skills to develop, evaluate, and analyze digital content. Having digital skills is essential for participation in modern information society and achieving success in economic, cultural, and educational contexts. Regarding technology, digital technology plays a vital role in the development of technology products and services, like mobile applications, digital communication, personal computers, electronic technology, software, hardware, online websites and applications, data systems, and new technologies such as AI and blockchain (De Reuver et al., 2018). Digital technologies have brought positive impacts, such as increasing the speed and efficiency of information processing, reducing time and production costs, and enhancing human-to-human interaction through electronic tools (Mubarak et al., 2019). Moreover, people with higher digital literacy tend to be more skilled in mobile banking than others (Mohammadyari and Singh, 2015). Hence, we hypothesized that:

Hypothesis H2. **Digital literacy positively influences Mobile Banking usage behavior.**

2.3.3 Digital Financial Literacy

Tony and Desai (2020) find that digital finance knowledge shares a similar foundation with financial literacy but with the addition of digital features, which can impact how people use Mobile Banking. Besides, to overcome the limitations of previous studies, the authors use the DFL scale of the Organization for Economic Cooperation and Development (OECD/INFE 2022) to measure the relationship between digital financial knowledge and how it affects the survey participants' Mobile Banking behavior. The scale's questions measure users' digital financial capabilities, including their financial literacy, technology skills, financial behavior, and awareness of digital financial security. Recently, Setiawat et al. (2022) found that digital financial literacy is influenced by social-economic standing. DFL also positively affects the current saving and spending behavior. Moreover, the current saving and spending behavior contributes to future saving and spending foresight. We, therefore, proposed that DFL will affect mobile banking behavior based on the above.

Hypothesis H3. **Digital Financial Literacy positively affects Mobile Banking behavior**.

2.3.4 Demographic factors and mobile banking usages as mediators

Previous studies have shown that demographic effects have mixed results depending on each particular point. For example, males and young people tend to have higher financial and technological Knowledge (Sinha, 2018), and those living in urban areas (Beck and Brown, 2011; Ravichandran and Madana, 2016; Obradovich and Guenther, 2016) with higher educational level (Prasad et al., 2018; Sulaiman et al., 2007) and income (Yao et al., 2022; Neuenschwander et al., 2012) tend to have a higher level of digital financial knowledge and Mobile Banking usage as compared to their counterparts. Moreover, factors related to banking user behavior, including frequently participating in financial transactions or using many applications and the type of transactions involved, positively impact the use of Mobile Banking (Shem et al., 2012; Ky et al., 2018; Morgan and Trinh, 2019). Interface design (Islam et al., 2021) and the cost of using Mobile Banking (Cudjoe et al., 2015; Hanafizadeh et al., 2014) were also found to be one of the most influential factors

that drive the goals and motivations of users to use banking services. Recently, some studies have found that individuals with higher knowledge of using online and face-to-face services at the bank will have more confidence and skills to use financial services, leading to a better understanding of finance and digitalization over time. We proposed that demographics and customer usage will moderate the relationship between F.L., DL, and DFL and mobile banking behavior.
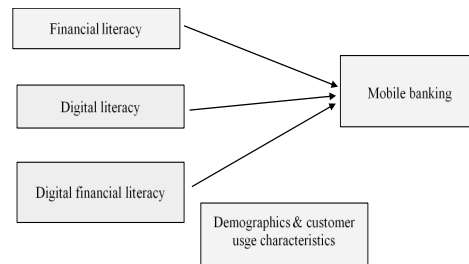

Fig. 1. Research model

3. METHODOLOGY

3.1 Data Collection and Sample Characteristics

An online questionnaire was designed and distributed to Vietnamese respondents with bank accounts and at least some experience with mobile banking services and products. The survey took place between November and February 2023 using snowball sampling. Respondents were required to complete sub-questionnaires within the survey, with three main sections on demographics: F.L., DL, DFL, and mobile banking usage. Of the one thousand people who responded to the survey, only 800 completed all sections. Specifically, 41.5% were males, and 58.5% were females. More than half of them were aged between 18 and 22 years, followed by the age cohort, making up 73.6% of the total sample. The majority of survey participants were university degree holders (86%). Most respondents (70%) were employed with a monthly income of below 10 million VND (approximately 500 USD). Since the survey area is mainly in Ho Chi Minh City, 80% of the respondents are civil citizens, while only 20% of the entire sample comes from rural areas (for more details, see Table 1).

Table 1. Demographic characteristics of survey subjects

Variables	n	%
1. Gender		
Male	332	41.5
Female	468	58.5
2. Age		
Older than 41 years old	27	3.38
26 - 41 years old	184	23.00
Younger than 26 years old	589	73.63
3. Place of residence		
City	160	20.00
Countryside	640	80.00
4. Education		
Secondary high school	5	0.63
High school	66	8.25
College	40	5.00
University	651	81.38
Bachelor	2	0.25
Master	32	4.00
Doctor	4	0.50
5. Income		
Under 10m VND	560	70.00
From 10m under 20m VND	164	20.50
From 20m under 30m	47	5.88
From 30m under 40m	16	2.00
From 40m under 50m	11	1.38
Over 50m VND	12	1.50
Total	*800*	*100*

3.2 Measures

The core aim of our analyses is to investigate the effect of DL, DL, and DFL on attitudes and behavior toward mobile banking services. Therefore, a measure of mobile banking behavior was examined in different ways. For example,

participants were asked to indicate the tendency and frequency of using mobile banking: "Have you used any service on Mobile Banking applications in the past month?" (i.e., withdrawals and deposits, loan payments and utility payments) and "How often do you conduct financial transactions (money transferring, bills paying) via their mobile applications?". Moreover, they were also asked to indicate their interaction with mobile banking applications, particularly their evaluation of the benefits, cost, and quality. This approach is ideal for this study as the mobile banking questionnaires developed by the IFC capture all dimensions of mobile banking usage, whether mobile banking services are offered by banks in developed or developing countries. The social and economic characteristics of the respondents are proposed to be measured by five indicators: age, education, income, and living areas.

Regarding the measures for F.L. and DFL, we used those of the OECD (2022) survey. Specifically, seven questions refer to simple and compound interest calculation, inflation, risk diversification, and a trade-off between risk and return for measuring the level of F.L. Thus, corrected responses to seven questions from the survey are summed up to compile a financial knowledge score that takes a range in values of 0 to 7. Moreover, DFL was also measured with the OECD (2022)'s DFL scale, which proposed three dimensions of DFL, including knowledge of digital financial products and services (2 questions), attitudes (3 statements), and behavior toward digital financial products (4 statements). For example, participants were asked to indicate their understanding of the validity of digital contracts and the use of personal data. They were also asked to report their degree of accordance with each of the seven items on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree) relating awareness, experiences, and solutions to manage cybersecurity risk. A sample item, for example, included "it is essential to pay attention to the security of a website before making a transaction online (e.g., HTTP sites, safety logo, or certificate)." The overall score for DFL is obtained as the sum of the three previous components, including knowledge, behavior, and attitudes; hence, it takes any value between 0 and 9. Lastly, digital literacy has 11 yes/no questions adapted from Lyons & Kass-Hanna (2021). Details of the variables and the related calculation are given in Table 2.

3.3 Empirical approach

This study analyzes the descriptive statistics of F.L., DL, and DFL scores as the first results. We then use probit regression to explore the determinants of financial literacy (F.L.), Digital literacy (DL), and Digital financial literacy (DFL). Further, we examine the relationship between F.L., DL, DFL, and the tendency to use Mobile Banking (FREQUENCY), controlling for various individual characteristics and bank usages as presented in the following equations.

F.L., DL, DFL determinants:

$$Literacy_{ji} = \alpha_0 + \alpha_1\ Sociodemographics_i + \alpha_2\ Bank\ usages_i + \varepsilon_i (1)$$

where $Literacy_{ji}$ is the overall score of FL_i, DL_i, DFL_i; $Sociodemographics_i$ is a vector of control variables for gender, age, education, monthly income, and rural versus urban residence; $Bank\ usages_i$ is a vector of control variables for banking usage, $\alpha_0\ and\ \varepsilon_i$ Is constant and error terms, respectively.

Mobile banking behavior:

$$Frequency_i = \beta_0 + \beta_1\ FL_i + \beta_2\ DL_i + \beta_3\ DFL_i + \beta_4\ Sociodemographics_i + \beta_5\ Bank\ usages_i + \eta_i\ (2)$$

where $Frequency_i$ Is a dummy variable, taking the value of one if the individual has held a bank account and mainly conducted at least a few times per week in their mobile banking apps over the last month and 0 otherwise; $Sociodemographics_i$ is a vector of control variables for gender, age, education, monthly income, and rural versus urban residence; $Bank\ usages_i$ is a vector of control variables for bank usage, $\alpha_0\ and\ \eta_i$ Is constant and error terms, respectively.

4. RESULTS AND DISCUSSION

4.1 Descriptive statistics and correlation analysis

Table 2 presents the average values of F.L., DL, and DFL scores in the sample. The average F.L. score of the respondents is 5.75 on a scale of 7 points, which may be taken as favorable compared to those of their G20 counterparts (OECD, 2016). A similar observation can be found in the average DFL score. Surprisingly, the average DL score is 11 on a scale of 12 points, which shows the tech-savvy behavior among our respondents. The frequency of mobile banking usage is 0.72, indicating that the respondents actively interact with mobile apps.

Table 2. Descriptive statistics of variables

Variables	Obs	Mean	Std	Min	Max
DFL	800	6.12	1.75	2	9
FL	800	5.75	1.29	0	7

DL	800	11.07	1.78	1	12
FREQUENCY	800	0.72	0.45	0	1

Table 3. Correlation Matrix

Variables	FREQUENCY	FL	DL	DFL
FREQU -ENCY	1.000			
FL	0.278 0.000	1.000		
DL	0.555 0.000	0.258 0.000	1.000	
DFL	0.151 0.000	0.278 0.000	0.149 0.000	1.000

The correlation matrix presented in Table 3 shows relatively low correlations between the observed variables.

4.2 Regression results

We present our empirical findings in this section. First, we show our F.L., DL, and DFL determinants results. Then, we analyze the relationship between F.L., DL, DFL, and mobile banking behavior.

4.2.1 Determinants of financial, digital, and digital financial literacy

Table 4 presents results on DL, FL, and DFL determinants, showing the strong effects of age and education. Indeed, age negatively affects both F.L. and DL with a significance level of 1%, consistent with the findings of Luo et al. (2018) or Corsi et al. (2020), who find that younger people are more likely to have higher levels of financial and digital literacy than their older counterparts. Moreover, education is also significantly correlated with financial literacy, showing that those with a university degree or higher will have more opportunities to improve their financial literacy than those with lower educational backgrounds (Setiawan et al., 2022). However, the gender effect seems marginal in this study, which shows that men have better financial literacy than women. Still, they seem to be worse than women regarding digital financial literacy. This result is partly confirmed by Hasler and Lusardi (2017) globally. We also fail to find evidence regarding the effect of residence on either F.L., DL, or DFL, consistent with Lewis Liew Teo Piaw et al. (2020), who find that living in cities and rural areas might lead to a gap in financial literacy.

Table 4. Determinants of FL, DL & DFL

Variables	FL (1)	DL (2)	DFL (3)
AGE	-0.043*** (0.008)	-0.028*** (0.011)	-0.014* (0.08)
GENDER	0.229* (0.120)	-0.208 (0.184)	-0.188* (0.100)
AREA	-0.132 (0.152)	0.263 (0.177)	0.168 (0.122)
EDU	0.784*** (0.154)	0.103 (0.195)	0.163 (0.149)
INCOME	-0.082 (0.065)	0.073 (0.136)	-0.056 (0.055)
USE MULTIPLE SERVICES	0.123 (0.084)	0.376** (0.185)	-0.051 (0.07)
DEMAND FOR TRANSACTIONS	0.258** (0.131)	0.136 (0.237)	0.691*** (0.11)

INTERACTION WITH APPLICATION USERS	0.282* (0.163)	0.387 (0.251)	0.429*** (0.143)
MEDIA	0.038 (0.06)	0.094 (0.115)	-0.262*** (0.05)
OFFICE BANKING KNOWLEDGE	-0.617*** (0.141)	0.375 (0.261)	-0.023 (0.118)
ONLINE BANKING KNOWLEDGE	-0.151 (0.145)	0.761*** (275)	0.093 (0.126)
Obs.	800	800	800
Pseudo Rsq.	0.170	0.389	0.0974
Chi-sq	0.0000	0.0000	0.0000
Log pseudolikelihood	-302.874	-120.776	-466.391

*Notes: *, **, *** indicates the 10%, 5%, and 1% significance level respectively.*

Regarding banking usage, we found that most factors affect financial, digital, and primarily digital financial literacy. In particular, using multiple services (USE MULTIPLE SERVICES) positively affects digital literacy (coefficent=0.376, p-values=5%), indicating that numerous financial services can help bank customers gain digital knowledge. People with a high demand for transactions (DEMAND FOR TRANSACTIONS) and intense interaction with mobile applications while facilitating their bank transactions (INTERACT WITH APPLICATION USERS) tend to have higher levels of digital financial literacy. These observations are consistent with Luo et al. (2018) in the Chinese banking context. Moreover, the results also show the service distribution effect. While understanding the branch-based banking system (OFFICE BANKING KNOWLEDGE) harms financial literacy, online banking (ONLINE BANKING KNOWLEDGE) strongly affects digital literacy. This tendency is consistent with Elhajjar et al. (2020), who show that French bank customers aged 18-40 firmly show a more robust demand for digital banking transactions, of which 65% use at least two electronic devices.

4.2.2 FL, DL, DFL, and the frequency of using Mobile Banking

Table 5 presents the probit regressions of F.L., DL, and DFL on attitudes and behavior to mobile banking services. Collum (1) shows the impact of F.L. without F.L. and DFL effects while controlling for demographic characteristics and banking features, demonstrating that F.L. is highly significant. Similarly, we find substantial DL and DFL effects. As discussed in section 2 above, according to Abdinoor & Mbamba (2017) and Yasir et al. (2019), the higher level of F.L. and DL predicts that bank customers will be more digitally financially competent. So they more often use mobile banking. Thus, our hypotheses H1, H2, and H3 are confirmed with the expected signs even though the DFL effect is not statistically significant at a 10% level when considering both F.L. and DL effects. The tendency of financial service providers can explain these observations, either financial technology firms or banks, to share the same concerns regarding personal data privacy and cyber risk attacks these days.

Regarding control variables, we find the firm age, gender, and living area effects across models, showing that male and younger customers tend to have higher mobile banking usage than their counterparts. The results are consistent with existing literature on the relationship between gender (Pijpers et al., 2001; Wan et al., 2005; Demirgüç-Kunt et al., 2018). This tendency is also found in those living in the city areas due to its higher level of financial development and more ready access to financial services (Baptista et al., 2015). Moreover, we also find that using multiple banks (BANKS) affects the frequency of use in all four models, with a significance level of 5%, which is consistent with François-Seck Fall et al. (2020) and Mbiti and Weil (2015) who find that mobile banking is a complementary service to traditional banking services. Similarly, we find that using services for transferring and receiving money (INTERACT WITH APPLICATION USERS) is statistically significant at 1%, which is in line with Akhter Shareef's (2018) study while considering the interaction between users in the application and customer experience. Similar to the study of Sharma and Sharma (2019), we find that Knowledge of services at bank branches (OFFICE BANKING KNOWLEDGE) and mobile banking applications (ONLINE BANKING KNOWLEDGE) and Easy to check account balance (EASY TO CHECK ACCOUNT BALANCE) positively affect the use of Mobile Banking. These observations are similar to the study of Shankar and Rishi (2020), who find that convenience of access and transactions increases the use of mobile banking. Finally, we see the positive effect of cost (ONLINE BANKING COST) on FREQUENCY, indicating that bank customers tend to use Mobile Banking when they feel the fees of mobile banking services are reasonable and comparable with other financial services (Bosire, 2012).

Table 5. Determinants of F.L., DL & DFL

Variables	FREQUENCY			
	(1)	**(2)**	**(3)**	**(4)**
FL	0.286*** (0.052)	-	-	0.227*** (0.06)
DL	-	0.484*** (0.06)	-	0.447*** (0.059)
DFL	-	-	0.138*** (0.037)	0.045 (0.04)
AGE	-0.048*** (0.012)	-0.040*** (0.014)	-0.059*** (0.012)	-0.037** (0.014)
GENDER	0.393*** (0.127)	0.483*** (0.137)	0.432*** (0.127)	0.463*** (0.14)
AREA	0.633*** (0.15)	0.628*** (0.162)	0.675*** (0.151)	0.6*** (0.166)
EDU	-0.234 (0.196)	0.018 (0.202)	0.042 (0.188)	-0.24 (0.219)
INCOME	0.117 (0.088)	0.130 (0.095)	0.153* (0.085)	0.123 (0.099)
BANKS	0.168** (0.069)	0.126** (0.071)	0.108 (0.067)	0.149** (0.073)
USE MULTIPLE SERVICES	0.139 (0.092)	0.091 (0.096)	0.088 (0.09)	0.067 (0.098)
DEMAND FOR TRANSACTIONS	0.078 (0.137)	0.150 (0.142)	0.042 (0.135)	-0.008 (0.152)
INTERACT WITH APPLICATION USERS	0.413** (0.167)	0.587*** (0.18)	0.145 (0.177)	0.503*** (0.184)
MEDIA	-0.039 (0.063)	-0.101 (0.066)	-0.010 (0.063)	-0.098 (0.07)
OFFICE BANKING KNOWLEDGE	0.841*** (0.156)	0.761*** (0.163)	0.371** (0.168)	0.83*** (0.168)
ONLINE BANKING	0.751*** (0.191)	0.603*** (0.201)	0.464** (0.193)	0.628*** (0.208)

KNOWLEDGE				
NAVIG-ATION BAR	0.035 (0.236)	-0.311 (0.259)	0.019 (0.227)	-0.414 (0.267)
MENU	-0.178 (0.267)	0.068 (0.28)	-0.225 (0.259)	0.034 (0.299)
EASY TO PAY	0.384 (0.277)	0.225 (0.297)	0.333 (0.27)	0.198 (0.304)
EASY TO TRAN-SFER	-0.132 (0.3)	-0.299 (0.327)	-0.294 (0.3)	-0.131 (0.334)
EASY TO CHECK ACC-OUNT BALANCE	0.379 (0.279)	0.611** (0.293)	0.209 (0.278)	0.63** (0.298)
ONLINE BANK-ING COST	0.773*** (0.141)	0.608*** (0.142)	0.633*** (0.133)	0.685*** (0.149)
COST SAVING	-0.214 (0.164)	0.042 (0.17)	-0.306* (0.169)	0.013 (0.179)
Obs	800	800	800	800
Pseudo Rsq.	0.379	0.452	0.354	0.472
Chi-sq	0.0000	0.0000	0.0000	0.0000
Log pseudolikelihood	-297.011	-261.816	-308.948	-252.646

Notes: F.L. referred to 1 when participants answered correctly from 4 out of 7 questions in the financial literacy part, whereas 0. DL refers to 1 if the survey answers "Yes" to 7 of the 12 questions measuring digital literacy. DFL refers to 1 when respondents score at least six at their overall DFL scores; *, **, and *** indicate the 10%, 5%, and 1% significance levels.

5. CONCLUSION

Using a dataset of 800 observations recently collected for Vietnamese bank customers, this study examines the roles played by F.L., DL, and DFL to determine bank customers' mobile banking behavior. To begin, we construct F.L., DL, and DFL scores. Both FL and DL focus on the dimension of knowledge, whereas DFL follows a comprehensive approach, including knowledge, attitudes, and behavior. We then examine how F.L., DL, and DFL affect mobile banking.

Our analysis yields several significant findings. First, FL, DL, and DFL have statistically significant effects on mobile banking frequently in the Vietnamese banking industry. Second, both F.L. and DL seem to have a much more substantial influence on mobile banking frequency than DFL, even when we control for demographic variables and other related banking usages, which our study indicates is insufficient to characterize attitudes and behavior towards mobile banking services. These results corroborate previous studies such as Abdinoor & Mbamba (2017) and Yasir et al. (2019). Third, male, young, and more educated people tend to have higher levels of DL, FL, and DFL than their female and older counterparts and those with low education. Furthermore, the more often respondents interact with their bank accounts, the higher the likelihood they have higher financial and digital literacy. This tendency may be because of their learning-by-doing tendency regarding financial transactions.

Some policy implications may be suggested based on the results of this study. First, our findings indicate that DFL is essential for improving mobile banking, but either F.L. or DL are more influential factors for achieving particular goals.

These results are crucial for designing and promoting education and training programs toward digitalization, cybersecurity awareness, and financial knowledge. Second, our findings suggest that certain demographic groups, such as older, less educated people and those living in rural areas, should be targeted for the interventions.

Despite significant contributions, we acknowledge the limitations of this study, which can point the way to future research. First, the data were mainly collected in Ho Chi Minh City and its neighboring areas and didn't guarantee Vietnamese customers' representativeness. Second, we cannot identify the causal relationship between each F.L., DL, and particularly DFL and mobile banking behavior due to data limitations. The absence of inclusion of instrument variables represents a limitation of our research and should be included in future models. Third, this study did not examine the heterogeneous effects of F.L. and DFL by investigating the characteristics of respondents that might be of interest. In particular, several studies have shown that the F.L. effect may differ between risk-averse customers and those with herding behavior.

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