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Article

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Policy recommendations for digital banking development contributing to sustainable development in Vietnam

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ABSTRACT

The prolonged period of the COVID-19 epidemic has dramatically impacted the lives of every individual globally, giving rise to social risks and affecting all aspects of operations, including banking activities. Because direct transactions cannot be made, customers must go through the Internet to make their transactions. The Internet creates many channels for consumers to participate in transactions, interact with banks, and conveniently use financial services. This leads to consumers' habits shifting from offline to online and non-cash payments. This shifting trend pushes banks to change to meet customer needs and the widespread deployment of mobile banking, online banking, and digital banking to satisfy requirements and increase customer experience while competing with financial technology companies. Thus, the article's goal is to explore critical factors affecting digital banking development, and from that, the author gave policy recommendations for developing digital banking in Vietnam. Based on the article's goal, the researchers utilized a combination of qualitative and quantitative methodologies with a sample size of 350 managers related to 10 commercial banks in Hanoi and Ho Chi Minh City using SPSS 20.0 and Amos to process the data survey. The study's contributions help policymakers and banking managers apply research results to develop six policy recommendations for digital banking, an inevitable trend of commercial banks today. The research results also analyzed the significant advantages, difficulties, and challenges. The research paper has presented some advantages, pointed out some problems and difficulties that Vietnamese commercial banks face, and proposed policy recommendations for digital banking and sustainable development.

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1. Introduction

Concurrently producing smart financial goods and services, such e-wallets, and establishing an appropriate environment. Several areas make up the e-wallet ecosystem, which aims to increase the number of places that accept the payment, overcome technological limitations, and make the system more secure so that users may use it without worry. By encouraging links with retail websites and enabling commerce-integrated purchasing and e-wallet payments, integrating e-wallet payment gateways on sales websites, especially e-commerce sites with a significant following, may successfully expand the customer base and improve consumer engagement (Albanna et al., 2022; Kitsios et al., 2021). In the present day, the majority of clients, particularly the younger demographic, utilize digital technologies for conducting transactions and making payments. Hence, the primary objective of banks is to cater to the requirements of customers and effectively deliver the products and services they anticipate. Implementing digital transformation in the banking sector is an unavoidable and prevailing trend (Li et al., 2023). In addition, digital transformation enables banking institutions to adapt to technological advancements and market fluctuations more expeditiously. Advanced digital technology has revolutionized the functioning of traditional banking. The advent of shopping portals, social media, and integrated mobile applications has provided banks with several opportunities to engage with their clients. Banking institutions must adopt digital transformation to fully grasp the opportunities presented by the new digital era.

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In addition, new technology helps realize breakthrough creative ideas, meet increasingly complex customer needs, and help businesses/banks manage and operate effectively. As a whole, all societal and conventional activities are moving online as a result of the digital transition. Cloud computing, artificial intelligence, the internet of things, and big data are the four digital technologies that stand for digital transformation (Naeem & Ozuem, 2021). Besides, blockchain is gradually considered an essential and potential component of digital transformation. Digital banking is the process of transforming traditional banking operations and services into a digital format using modern technologies. The distinguishing feature of the bank is that all its goods and services are only offered in digital format, enabling consumers to freely access information and greatly streamline their life. In other words, this banking model is designed to prioritize immediate connection, and the notion of digitalization guarantees rapid advancements in digital technology (Nga & Tam, 2023; Sharma & Sharma, 2019; Yikun et al., 2023).

Understandably, a unified digital banking app streamlines all the services offered by conventional bank locations. Customers may complete all of their banking using this app, eliminating the need to physically visit a branch. Concurrently, many aspects of banking are moving online, including product development, advertising, management sales, capital resources, risk management, and operations (Huang et al., 2021). Banks have been able to rapidly comprehend client wants and psychology due to the prompt and effective use of information technology and innovative management and operational techniques. Simultaneously, it aids banks in reducing expenses, enhancing competitiveness, and advancing compliance and transparency in corporate operations (Alalwan et al., 2017). Digital banking enables clients to simply and securely access banking services, resulting in optimal convenience, cost savings, enhanced financial efficiency, and support for online business growth. The advancement of digital banking necessitates the use of cutting-edge technology, including innovative financial services for clients, as well as strategies for digital apps, mobile banking, and digital banking (Zhu & Jin, 2023).

In addition to its benefits, the development of digital banking in Vietnam is confronted with several obstacles and challenges: (1) The legal infrastructure necessary for establishing and advancing digital banking activities is currently insufficient. Technological advancements have led to rapid development in the digital payment sector. However, the lack of corresponding legislative rules has made commercial banks reluctant to adopt new technologies and services outside the permitted framework. (2) Contemporary fraudulent activity associated with digital financial transactions is progressively getting more intricate and sophisticated. Commercial banks consistently prioritize the prevention of fraud in digital banking transactions, while client peace of mind remains elusive. (3) The competition among banks to adopt digital banking projects also leads to several security threats, including the potential loss of user information security. Vietnam currently has weak capabilities to safeguard financial information in the digital realm. (4) Users lack awareness of the risks associated with online banking transactions, neglecting the security of their personal information and the rental information of students and workers. This creates opportunities for criminals to create fake accounts, making it harder to investigate fraudulent transactions. Furthermore, these criminals are becoming more sophisticated in their methods, making it increasingly difficult to detect their tricks. (5) Vietnamese individuals predominantly utilize physical currency for conducting financial transactions. Non-cash payment is now prevalent only in central provinces and cities with well-developed technology infrastructure. In rural locations, non-cash payment is feasible but still in the planning stages. Moreover, the digital transformation of the banking industry is an inevitable trend. Digital transformation integrates digital technologies into all areas of businesses, agencies, and organizations, fundamentally changing how they operate, provide products and services, and bring value to customers. Digital transformation helps resolve the relationship between the State, market, and society. Digital banking development will promote economic growth, improve labor productivity, competitiveness, production, and business efficiency, and reduce costs for people and businesses. The Fourth Industrial Revolution and the digitalization trend have profoundly changed the face of social life and the global economy, substantially impacting all industries, occupations, and fields. Besides, the Fourth Industrial Revolution also opened up many opportunities and challenges for each country, organization, and individual. Digital banking development has become an inevitable trend and a mandatory requirement to help banks adapt and overcome the challenges of the current context. Therefore, the objective of the study is to examine critical factors affecting digital banking development and contributing to sustainable development in Vietnam. In addition, the study's contributions provide policymakers

and banking managers with the information they need to craft several policy suggestions about digital banking, which is becoming increasingly common among commercial banks. In addition to presenting certain benefits, the study's novelty lies in its analysis of the major problems and challenges, its identification of those faced by Vietnamese commercial banks, and its policy suggestions on digital banking and sustainable development.

2. Literature review and hypotheses development

2.1. Literature review for digital banking and sustainable development

2.1.1. Digital banking

It is an online service provided through mobile applications or websites. Customers can use payment features, transfer money, borrow money, deposit savings, manage personal and business finances, participate in insurance, and invest... via financial applications or websites (Naeem & Ozuem, 2021; Tay et al., 2022). Bank Digital banking brings many benefits to customers, such as saving time and money, diversifying forms of withdrawal and transfer, and keeping information safe thanks to password protection one-time password (OTP) code authentication; diverse forms of withdrawal and transfer help make the transaction process quick and straightforward. Currently, the term digital bank has many different definitions; the article approaches the meaning of the State Bank of Vietnam. Accordingly, digital banking is a banking model that operates based on technological processes to provide all services to customers through digital devices connected to the Internet and mobile telecommunications networks or self-service branches (Islam et al., 2020; Muñoz-Leiva et al., 2017). In recent times, there have been views that equate the nature of digital banking with electronic banking services; however, these are two different concepts. Electronic banking, including Internet banking, SMS banking, and mobile banking services, is a channel that provides services to customers based on the bank's existing business processes. Digital banks operate based on the digitization of banking activities: From digitizing traditional distribution channels and developing modern distribution channels to automating business processes, applying extensive data analysis to serve the decision-making process and create digital products, and applying innovative products. Thus, digital banking is more comprehensive and modern than electronic banking (Almaiah et al., 2022; Alalwan et al., 2017; Nguyen, 2020).

Thus, there are several perspectives about digital banking, which is a banking paradigm that utilizes a digital platform to incorporate all conventional banking activities and services. Furthermore, digital banking is a financial framework in which operations primarily rely on electronic platforms, data, and digital technology, serving as the fundamental basis for banking activities (Chawla & Joshi, 2018). Digital banking is the process of converting all conventional banking operations and services into a digital format. Digital banking encompasses a wider scope than electronic banking, as it is more advanced in its progression and includes electronic banking operations within its framework (Pham, 2023).

2.1.2. Sustainable development

It is a new concept that defines development in all aspects of current society while ensuring continued development in the distant future (Achugamonu et al., 2020). This concept is currently a target for many countries worldwide; each country will rely on its economic, social, political, geographical, and cultural characteristics to plan strategies that best suit its needs. Sustainable development has been defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs (Alalwan, 2018; Kumar et al., 2023). The development is characterized by a harmonious integration of economic, social, and environmental aspects. Sustainable development encompasses the comprehensive advancement of present society, addressing the demands of the current generation while safeguarding the interests of future generations from any adverse impact or detriment. Sustainable development necessitates a synergistic integration of economic growth, resolution of social issues, and safeguarding of the environment (Malaquias & Hwang, 2019; Ozili, 2022; Ringle & Sarstedt, 2016).

Thus, the digital transformation of the banking system and each bank is closely linked to economics, environment, and social responsibility. Digital transformation is the integration of digital

technologies into all areas of a bank, leveraging technologies to fundamentally change how it operates the business model and provides new values for customers, as well as speed up business activities without harming the environment, contributing to sustainable development (Malaquias & Silva, 2020). For banking service providers and the banking industry in general, digital transformation in the banking sector is also recognized as an effective method to reduce the possibility of bank collapse by ensuring debt ratios bad debt is lower, and the banking industry operates more efficiently. This result is achieved based on AI and big data technologies, making customer assessment more accurate, objective, comprehensive, and effective for supply organizations. Banking services speed up the appraisal process of green projects and credit disbursement, contributing to sustainable development.

In theory and practice, sustainable development is understood as a guarantee for the present but not at the expense of the future. This concept involves three aspects: economics, environment, and social responsibility. In the banking sector, sustainability is recognized by increasing value for owners, environmental protection, and social development through digital transformation. Therefore, in the coming time, Vietnamese banks will develop toward promoting the digital banking model, increasing the convenience of the customer experience, realizing comprehensive financial goals, and contributing to sustainable development. This is based on promoting the application of advanced technology in administration, product, and service supply (Rawashdeh, 2015; Vial, 2019; Zhang et al., 2018).

2.2. Hypotheses development

Digital banking is critical in the country's digital transformation process. In recent years, most commercial banks have seriously invested in expanding digital banking services to serve customer needs better (Nguyen et al., 2020). So, what is the current status of digital banking development. What are the solutions to develop safe and sustainable digital banking, let's learn about the driving factors in developing digital banking below:

LF: Legal framework for digital banking: In the current context of digital solid transformation, having a unified legal framework for e-banking is an urgent need for many credit institutions. The legal framework for digital banking has not kept up with technological development. As we all know, the operations of banks must comply with the provisions of the law, so to develop digital banks, banks must be based on the provisions of the law. It can be seen that in recent times, despite the very drastic and close attention and direction of the Government and the State Bank, with the rapid pace of technological development, the promulgation of legal regulations does not happen overnight but requires a certain amount of time, so it has partly affected the development of digital banking (Lutfi et al., 2021; Oyeleye et al., 2015; Pham, 2023; Zhang et al., 2018). Therefore, the improvement of the legal environment for digital banking development needs to continue to be built to further complete it following relevant legal regulations, as well as the rapid development of science and technology. Based on the above mentioned, the author proposed hypothesis H1:

H1: The legal framework for digital banking positively impacts the development of digital banking.

IS: Customer information security: Undoubtedly, digital banking offers significant convenience to both users and institutions. However, it also confronts the challenge of safeguarding personal information, since customers and banks are consistently targeted by sophisticated cybercriminals. Indeed, there are several instances in which clients fail to adhere to the provided instructions or provide false information, resulting in their deception and exploitation by criminals who unlawfully seize funds from their accounts (Emara & El Said, 2021; Hanafizadeh et al., 2014; Yuan et al., 2019; Yen & Wu, 2016). Due to many technological limitations, banks, customers, and partners participating in digital banking are subject to many risks and are at risk of cyber-attacks. Meanwhile, many banks still do not pay attention to ensuring data safety and security; this is a significant limitation that has not been appropriately cared for and resolved (Pham, 2023). The bank urgently completes and organizes implementing policies on security, safety, and security of information technology systems and risk management. The bank closely reviews registration processes, activates digital banking services to ensure service provision to the right customers, and equips systems to support electronic transaction monitoring and investigation fraud, step by step

synthesizing and analyzing customer data and building a set of rules to detect and prevent fraud early. Therefore, the author proposed hypothesis H2:

H2: Customer information security positively impacts the development of digital banking.

FC: Financial capacity: As mentioned above, digital banking transformation is costly and time-consuming. Banks must invest large budgets in technology and a lot in human resource development, marketing, and reforming the entire system. This is a large budget that not all banks in Vietnam can meet. Therefore, banks need to be proactive with their budgets and ensure appropriate resources for the digital banking transformation process to take place smoothly (Blut et al., 2016; Davinson & Sillence, 2014; Giovanis et al., 2019; Li & Wu, 2023). Financial capacity is one of the most critical factors in ensuring the effectiveness of digital banking business activities and is also a tool to demonstrate current and future economic strength. The future potential power of digital banking. The context of deep integration into the world economy is posing many difficulties and challenges for the banking system, primarily commercial banks (Pham, 2023). Hence, enhancing financial capability would enable commercial banks to effectively execute risk mitigation strategies, protect the security of operating capital, and reduce potential client losses in the realm of digital banking advancement. Thus, the author proposed hypothesis H3:

H3: Financial capacity positively impacts the development of digital banking.

HR: Digital human resources: Banks need high-quality human resources to develop digital banking successfully. In addition to personnel with information technology knowledge and skills to operate the system, banks also need a team of genuinely knowledgeable about digital banking to improve their ability to promote and serve customers (Nguyen, 2020). To meet human resource conditions well, banks must continuously recruit and train quality human resources. In addition, banks also need to improve and innovate their working processes in the digital environment to better meet the needs and increase customer experience on digital banking (Achugamonu et al., 2020; Hanafizadeh et al., 2014). Besides, human resource development determines success or failure in digital banking. Digital transformation is inevitable, bringing economic and social development and giving people a new, more modern life. In that context, banking is one of the leading fields in digital transformation, serving as the foundation for other industries and fields to move forward in innovation. This becomes a challenge for human resource development in digital banks today. Therefore, the author proposed hypothesis H4:

H4: Digital human resources positively impact the development of digital banking.

CS: Customer care services: Customer care services encompass the range of support activities offered by digital banks to assist consumers before, during, and after their purchase or use of bank services, with the aim of ensuring a positive customer experience. Optimal retail experience. This service targets individuals who have previously used, are now using, or have never used the product. Its purpose is to establish a base of loyal consumers and to attract new customers in the future (Alalwan et al., 2017; Chawla & Joshi, 2018; Huang et al., 2021; Liébana-Cabanillas et al., 2014). Customer service is a crucial and enduring investment that plays a pivotal role in establishing the bank's performance and market position. With digital banks, customer experience is interaction and complete integration into services and products from the customer's side. Good customer care will help customers have a positive experience with digital banking (Nguyen, 2020). Positive experiences only appear when the products and services the bank provides meet customer needs, giving customers a feeling of satisfaction and comfort when using the products and services. If customer experience develops positively, they will love the bank and trust digital banking products and services. On the contrary, if the experience becomes terrible, customers will underestimate the quality and organizational structure and will limit or not want to trust anything from digital banking. Building a customer experience strategy is essential for digital banks in the current period. Furthermore, it is necessary to implement good customer care policies, thereby attracting more customers to use digital banking services. Therefore, the author proposed hypothesis H5:

H5: Customer care services positively impact digital banking development.

DM: Digital marketing: Digital marketing is increasingly essential for digital banks, helping them quickly introduce and provide information about their products and services, saving time and human resources (Nguyen, 2020). The emergence of digital marketing has changed the landscape in the field of digital banking with the advantages of speed, simplicity, and efficiency, helping customers use services and products most conveniently. Besides, digital marketing brings more competitive advantages than banks using traditional marketing. Therefore, promoting increased competitiveness in digital marketing for digital banking allows everyone to use digital (Li et al., 2023; Montazemi & Qahri-Saremi, 2015; Naeem & Ozuem, 2021). Most banks believe that it is necessary to increase spending on digital marketing and increase efforts on platforms to increase advertising effectiveness. More competition shows the importance of digital marketing in the banking sector, making it more challenging to stand out. This means banks must take unique approaches, highlight customers and convey success stories, drive value through marketing services, and use promotional campaigns with non-traditional awareness instead of conventional advertising. Furthermore, enhance marketing activities and implement good customer policies. To bring digital banking develop faster for organizations and people, commercial banks need to increase advertising and marketing to introduce to a large number of customers to help customers get updated information, superiority, and help customers have a basic understanding of digital banking services, product benefits, as well as how to use them, thereby helping customers understand and see the benefits, importance, and safety of using digital banking. Therefore, the author proposed hypothesis H6:

H6: Digital marketing positively impacts the development of digital banking.

Through analysis of the process of implementing digital banking, it can be seen that in the context of the early stages of the 4.0 Industrial Revolution, commercial banks have gradually made efforts to apply digital technology in service activities. Reality has proven that any credit institution that leaps ahead, recognizes, and implements digital transformation early has reaped many sweet fruits, improving the bank's scale, brand, and services (Nguyen, 2020). It can be seen that the digital transformation of the Vietnamese banking industry in recent times has achieved many positive results, creating a spillover impact and serving the needs of people, businesses, and the economy well. Digital transformation in the banking sector will encourage all other fields and industries to follow suit, and it is a topic of interest to the whole society in which banking plays a vital role in the economy (Hussain et al., 2023; Khémiri et al., 2023; Pradhan et al., 2021). As the industry is considered to be at the forefront of this process, the results of digital transformation in the banking industry will have a pervasive impact on many other sectors in a developed society. This has created remarkable results and is a premise for breakthrough sustainable development in the future. This also demonstrates the correlation between digital banking development and sustainable development. Therefore, the author proposed hypothesis H7:

H7: The development of digital banking positively impacts sustainable development.

Based on previous research, theory and practical conditions for developing digital banking in Vietnam, the author proposes the research model below.

Figure 1 showed that the independent variables include LF: Legal framework for digital banking; IS: Customer information security; FC: Financial capacity; HR: Digital human resources; CS: Customer care services; and DM: Digital marketing. The dependent variable: DBD: The development of digital banking. SD: Sustainable development.

Digital banking development is a form of banking that digitizes all traditional banking activities and services by applying new technology. The characteristic is that the products and services provided by the bank are all implemented in digital form, so information users (customers) have free access and significantly simplify their lives. That is, such a banking model is optimized for real-time interaction, and the concept of 'digitalization' ensures that changes in digital technology occur at high speed.

3. Research methods

The author described the research questionnaire clearly (Appendix Table A1) and in appropriate detail to respondents, explained what data will be collected and how it will be anonymized and stored, and explained how the data collected and the consent was obtained in written form from the respondents

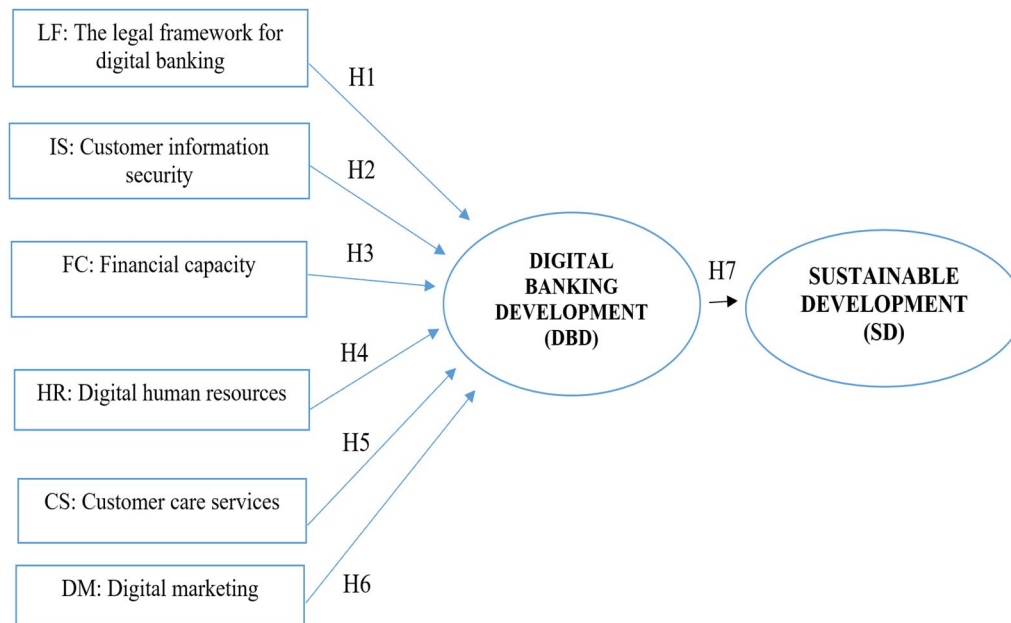


Figure 1. A research model for six factors affecting digital banking development and sustainable development.
 Source: The author proposed the model.

based on questionnaire clearly in Appendix Table A1. The written results will be used to make policy recommendations. All respondents agreed to participate and answer the author's questions based on their knowledge and experiences, allowing the author to use these data for this research goal only. Besides, questionnaires had ethics approval from the Faculty of Finance and Banking at the University of Finance and Marketing (<https://khoataichinhnganhang.ufm.edu.vn/>). Thus, the specific content of the steps is as follows. To achieve the research goal, the author used a combination of two research methods: qualitative research and quantitative research as shown in Figure 2.

3.1. Qualitative research

From an overview of research on digital banking and factors affecting digital banking development. The author identified the research model, preliminary scale, and research hypotheses. Based on this set of scales, a set of observed variables is built. Due to differences between research contexts in different countries, it is possible that the scales of foreign author may not be genuinely suitable for research in Vietnam, so the set of scales needs to be adjusted and supplemented through qualitative research with in-depth interviews with 25 experts including 15 banking leaders and 10 scientists related to digital banking development in two major cities of Vietnam, namely Ho Chi Minh City, and Hanoi. In addition, the study conducts research on the current status of digital banking development to better explain the research model. Through the results of this qualitative research, the scale was adjusted after adjustment, and the scale was used for quantitative analysis.

3.2. Quantitative research methods

Through a survey designed with a nominal scale to describe demographics, observed variables used a 5-level Likert scale to survey 350 employees at the 10 largest commercial banks in Figure 2. These banks have a high conversion to digital banking and provide many digital banking services. The author chose a random sampling method, conveniently selecting 10 large banks in Hanoi and Ho Chi Minh City to represent the banks participating in the investigation. 10 commercial banks have the following names:

1. Vietcombank was established long ago and has undergone more than 50 years of development. It is one of the largest and most prestigious banks in Vietnam. In addition, Vietcombank is also among the top 5 largest state-owned banks today.

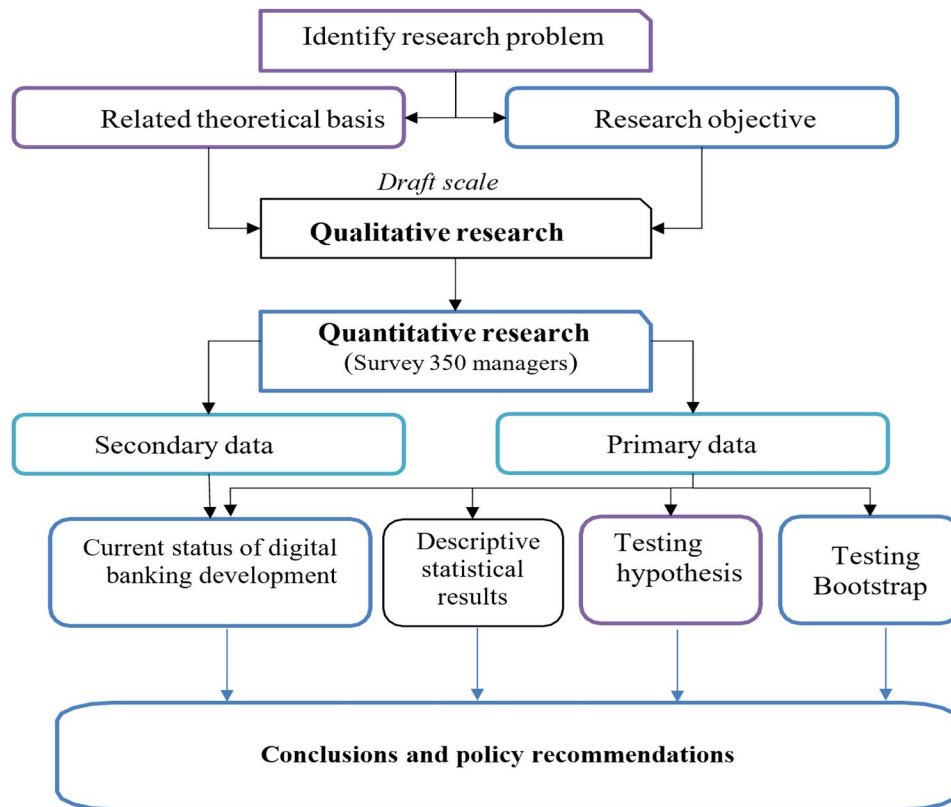


Figure 2. A research process for six factors affecting digital banking development and sustainable development.
 Source: The author proposed the research process.

2. Agribank is a Vietnamese agricultural and rural development bank that operated in 1988. Agribank has achieved significant achievements during its establishment and development, such as being among the top 10 most important enterprises. Currently, always create intelligent products and services, providing essential needs for our customers.
3. BIDV is a joint stock commercial bank for investment and development, established in 1957. Up to now, BIDV has become one of the top 10 largest state-owned banks in Vietnam and one of the top 30 large banks in Southeast Asia. Even better, the banker magazine also ranked BIDV among the 1,000 best banks in the world. The achievements that BIDV has achieved are precious and result from the team's continuous efforts.
4. Vietinbank is a Vietnamese joint stock commercial bank established in 1988. Among Vietnam's leading and largest banks, contributing to the country's strong development.
5. MB bank is a military joint stock commercial bank directly under the Ministry of National Defense. In operation since 1994, although established not too long ago, MB Bank has still made many impressions in customers' hearts.
6. Techcombank is a Vietnam Technological and Commercial Joint Stock Bank established in 1993. The bank provides a full range of products and services for individuals and businesses in Vietnam. In addition to banking services, TechcomBank also has margin trading, securities, and investment research.
7. Sacombank is trusted by many customers because of its professionalism and dedication to supporting all services. And bring good experiences to customers.
8. VPbank was established in 1993, providing various financial products and services. Wide-scale and convenient and convenient services VPBank has received excellent feedback from customers as well as many noble awards.
9. ACB is Asia Commercial Joint Stock Bank and is among the largest banks in Vietnam. With a nationwide network, customers can easily and quickly access products and services.

10. SHB is Saigon – Hanoi commercial joint stock bank (SHB). Belongs to one of the No. 1 largest private banks in Vietnam. The bank's headquarters is in Ho Chi Minh City, Hanoi, and branches and representative offices have nationwide coverage.

The study uses descriptive statistical analysis methods to determine the observed variables' maximum, minimum, average, and standard deviation values. Descriptive statistics of the study sample: This step will provide descriptive statistics for nominal and quantitative variables. Frequent statistics will be used for nominal variables, using the frequency value in the frequency table to calculate percentages. Evaluate which group has the highest or lowest percentage and which group has more than which group. Descriptive statistics for quantitative variables use average statistics and rely mainly on the Mean value. Compare which range this Mean value lies in on the Likert scale. According to mathematical principles, if the average value rounded to the first integer is closest to the value of the Likert scale, it will be evaluated at that value.

Next, correlation analysis is performed to assess the strength of the linear relationship between the dependent and independent variables and identify potential issues of multicollinearity when the independent variables are highly linked. If the Pearson correlation significance values between the independent and dependent variables are below 0.05, then it indicates a linear association between all independent factors and the dependent variable.

After testing the reliability and validity of the research model, the next step is multivariate regression analysis to test the relationship between variables belonging to the factors of digital banking development through the R coefficient squared, sig value, and beta coefficient. In addition, check and ensure that the model does not have multicollinearity with the VIF coefficient of the independent variables $VIF < 3$ (Hair et al., 2018).

The survey questionnaire was designed based on the research results of the research overview and results with expert interviews to make adjustments to clarify the meaning of the questions and suit the Vietnamese context. Through interviews and discussions with 25 experts, including professional scientists and leaders of commercial banks in Vietnam, the author completed the questions for an official survey of 350 people, receiving 295 valid votes. Official rules and questionnaires were presented and processed by SPSS 20.0 software. Creating a questionnaire with the following response coding is an example of a Likert scale: Strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). Results of in-depth interviews with experts and scientists. Most scientists point out factors related to the development of digital banking. The general opinion of scientists confirms that the following 6 aspects are wholly appropriate, and the issues banks are most concerned about today are chosen below (Hair et al., 2018). After that, the sample size for the study was determined by various parameters, including the processing technique for Cronbach's alpha greater than 0.7, as specified by EFA, SEM – structural equation model, etc., and measured the model's fit with $GFI \geq 0.900$, $TLI \geq 0.900$, $CFI \geq 0.900$, and $RMSEA < 0.1$ (Hair et al., 2018). The independent variables include LF: Legal framework for digital banking; IS: Customer information security; FC: Financial capacity; HR: Digital human resources; CS: Customer care services; and DM: Digital marketing. The dependent variable: DBD – The development of digital banking. SD – Sustainable development.

4. Research results and discussions

4.1. Current status of digital banking development in Vietnam

Vietnam is considered a potential market for digital banking development, with a population of nearly 100.0 million and a mature population structure; the proportion of adults accounts for about 70%, of which Internet users are about 69.87 million people, accounting for about 70%. Along with world trends and the increase in online applications such as car booking services, hotel bookings, etc., the development of digital banking in Vietnam has many positive points.

Firstly, as we enter a new era of digital banking and ever-increasingly cutthroat competition, Vietnamese commercial banks have begun to shift their focus from internal politics and management to external factors like customer experience and distribution channel integration. They have also begun to prioritize digitalization and digital banking development. In order to better investigate and execute digital transformation, the majority of Vietnamese banks have established dedicated digital banking divisions.

Second, in order to accommodate the growth of digital banking, commercial banks are beginning to alter their organizational models. Digital banking is now being implemented by the majority of Vietnamese commercial banks at the process and communication channel levels, with just a small number of institutions transitioning to the data platform. Some financial institutions, such as BIDV, Vietcombank, Techcombank, TPBank, etc., have refined their automated transaction systems by incorporating elements of big data into the procedure. Several financial institutions have deployed intelligence in their communication strategies. Machine learning, artificial intelligence (AI), and automated consultation services available around the clock through online chat on the bank's website or social media platforms.

Third, commercial banks use a collaborative framework with technology enterprises in the financial industry or major technology corporations. This collaboration offers clients several thrilling experiences and the opportunity to access a wide range of services with reduced transactions. Simultaneously, banks have augmented their client base and incurred more expenses in technological investment through collaboration. Several cooperative agreements have been established, including VietinBank partnering with opportunity network to offer digital platforms for businesses; Vietcombank and M-Service collaborating on money transfer payments; VPBank and Moca joining forces to provide digital payment services; and VIB teaming up with Fintech company Weezi to develop the MyVIB Keyboard application, enabling customers to transfer money via social networks.

Evaluation of digital banking implementation at Vietnamese commercial banks based on the analysis of the current status of digital banking deployment in Vietnam, it can be seen that in the early stages of the 4.0 Industrial Revolution, Vietnamese commercial banks have gradually applied digital technology in their operations. This has created remarkable results and is a premise for breakthrough development in the future.

First, digital banking allows customers to access rich and diverse services. If Internet and mobile banking focus on features such as money transfer, balance inquiry, and payment, digital banking is a leap forward because customers can thoroughly perform all online transactions. This helps save time and transactions and allows transactions to be made anytime, anywhere with internet access.

Second, digital banking helps commercial banks reduce costs and increase profits and operational efficiency. In fact, when implementing digital banking, Vietnamese commercial banks initially saved costs, such as operating, labor, office, and other expenses, compared to the operating costs of traditional banking operations. In addition, all activities are conducted on an information technology platform, making it easier for commercial banks to manage and plan their administration and operations.

Third, digital banking helps banks increase their competitiveness. Implementing digital banking has enabled commercial banks to create simple and fast transaction processes, minimizing customer waiting time with increasingly improved quality and service costs. Increasingly low. In addition, digital banking development allows commercial banks to access and serve customers anytime, anywhere, thanks to which customers tend to maintain payment deposits for items serving consumption and businesses, allowing banks to maintain a more significant amount of demand deposits. At the same time, through electronically stored databases, banks can analyze and evaluate customers to have more appropriate business strategies.

Besides the achieved results, the implementation of digital banking in Vietnam still has some difficulties and challenges, including:

First, the digital banking development strategy still has some limitations. In fact, many banks still believe that implementing digital banking is simply changing the application interface to interact with customers without paying attention to internal processes and using data analysis science materials and capabilities for employees. This prevents customers from having a seamless experience like with financial technology companies. As an example to illustrate this, when there is a need for a loan, customers can completely fill out the bank's online loan application but still have to go directly to the bank branch or transaction office to complete the loan application procedures, then the bank still has to handle most of the work manually. In addition to applying digital banking, investment costs are an obstacle for Vietnamese commercial banks. The costs of investing in research and development of artificial intelligence (AI) are pretty high. Converting core banking or investing in a new technology system is expensive and has a long payback period.

Second, one of the major problems throughout the process of digital transformation is the requirement for professionals who has expertise in banking finance and technology. Indeed, while Vietnamese

bank workers has expertise in banking and finance, they lack proficiency in technology, and vice versa. Specifically, there is a shortage of skilled professionals in the field of digital banking, and banks must engage in intense competition by offering attractive salary packages in order to recruit smart individuals.

Thirdly, the Government and the State Bank have mandated the development of non-cash payment methods. Hence, the State Bank promotes and endorses the advancement of digital banking. Insufficient and contradictory legislative laws and policies provide a hindrance for commercial banks to confidently implement and utilize digital banking. This is due to the absence of standardized legislation concerning electronic documents and their unique characteristics in transactions. The State Bank of Vietnam currently lacks official regulations pertaining to digital banking products, including electronic deposits, internet banking services, and mobile banking.

Furthermore, the legal framework for safeguarding consumers in electronic transactions remains inadequate. The existing regulations for customer identification at physical bank branches pose obstacles to the adoption of digital banking, as there are no specific provisions for electronic customer identification. In the current scenario, although commercial banks, particularly conventional ones, face several legislative restrictions in ensuring the security of their systems, the legal framework for Fintech businesses remains relatively lenient and has not been rapidly and adequately constructed. This gives rise to significant disparities in unfair competition between traditional commercial banks and Fintech companies.

Fourth, human resources are an essential factor determining economic growth in addition to capital, resources, and technology. Human resources are the knowledge and skills workers acquire through education, training, and experience in the digital era. The scale of human resources of commercial banks has been expanded, and the number of human resources has continuously increased over the years to meet the increase in scale of operations and business network expansion. However, commercial banks' digital human resources are increasingly lacking in quantity and quality: the capacity, professional qualifications, and technological staff level have not been improved, not only in practical and technical capacity. Skills, structure of qualifications, and qualifications have changed, but more importantly, most of the staff have not escaped the subsidized mindset and shaped their business thinking with an essential awareness and understanding of modern banking and digital banking. Applying digital technology in the banking industry is new, requiring in-depth and systematic training to manage, operate, and develop in banking. Therefore, digital human resources need appropriate solutions in pristine conditions.

Fifth, Vietnam is a potential market for digital marketing development in the banking sector. However, there are still many challenges when applying digital marketing in banking business activities. The investment cost is considerable. Modern machinery and technology cost a lot of money, so many banks are still hesitant about capitalization. The limitations in information technology human resources. Vietnamese banks are now grappling with a dearth of personnel in constructing and advancing digital marketing strategies. Training institutions and banks in Vietnam are facing a challenge due to their failure to keep pace with technological advancements. In addition to the numerous advantages it offers users, the progress of digital banking encounters the challenge of safeguarding personal information, given that the banking sector is consistently the primary focus of cybercriminals.

Finally, the security is worth discussing, primarily when digital banking is implemented in Vietnam. According to the Department of Information Security, Ministry of Information and Communications, customers still face the risk of fraud by account theft; practice in Vietnam shows that personal information security is still not given enough attention by internet users. Hence, the banking system needs to pay more attention to security issues and have many ways to ensure security cyber security and enhanced guidance to raise customer awareness. In fact, there are many cases where customers misuse services and are tricked into fake banking sites, causing crooks to take advantage of and appropriate money from customer accounts. This requires banks and customers to equip themselves with knowledge about digital technology to avoid risks.

4.2. Descriptive statistical results for digital banking and sustainable development

Digital transformation and sustainable development are becoming the main development paths for digital banks in the modern economy. We live in a decade where science and technology have brought

Table 1. Descriptive statistical results for digital banking and sustainable development.

Factors affecting digital banking and sustainable development	N	Min	Max	Mean	Std. deviation
LF: Legal framework for digital banking	295	1.00	5.00	3.4339	0.85408
IS: Customer information security	295	1.00	5.00	3.0746	0.91168
FC: Financial capacity	295	1.00	5.00	3.5729	0.82516
HR: Digital human resources	295	1.00	5.00	3.1220	0.92141
CS: Customer care services	295	1.00	5.00	3.5695	0.86960
DM: Digital marketing	295	1.00	5.00	2.5932	0.67306
DBD: Digital banking development	295	1.00	4.00	2.4915	0.60533
SD: Sustainable development	295	1.00	5.00	2.5831	0.73243

Source: Author' calculations with SPSS 20.0 and Excel.

Notes: Average values for determinants of digital banking and sustainable development; n=350 (295 samples and 295 values, 55 lack of information). The Std. Deviation is given in parentheses.

remarkable changes to every corner of life. This is also the decade in which climate change has been happening at an unprecedented rate. This context poses an essential challenge for banks in shaping and orienting the transition to a sustainable, comprehensive, and flexible business model in the future. Consumers have more and more choices, and optimistic investors are urging banks to step up to solve business–social–internal governance issues in a specific and transparent way to contribute to sustainable development. Therefore, the study was conducted with 350 questionnaires, receiving 295 valid votes. Questionnaires were presented and processed by SPSS 20.0 with descriptive statistical results below.

Table 1 presents the mean values of all components, around 3.0. Moreover, the standard deviation has an approaching value of 1.0. The provided data exhibits significant potential for digital banking and sustainable development in Vietnam. The research results show that leaders have raised awareness and determination to implement and develop digital banking, which has many outstanding advantages based on the digital operating model. Digital banking will provide many products. Emerging financial offerings encompass mobile payments, unsecured consumer loans utilizing cutting-edge data analysis technologies, digital insurance products, digital investing, and more. Digital banks offer significant benefits to commercial banks by reducing operational costs, increasing profits, improving processing speed, and ensuring operational efficiency. Additionally, they aid clients in reducing expenditures and providing greater convenience. In recent years, commercial banks have been actively and resolutely working towards the advancement of digital banking in order to align with current trends, fulfill competitive demands, and achieve worldwide integration.

In addition, digital banking is a form of digitizing banking activities and services similar to those provided at traditional transaction counters. When using digital banking, customers can efficiently perform money transfers, payments, balance control, and transaction tracking... At the same time, the bank can also complete transactions with customers, capital management, risk management, marketing, and product development on the same digitized platform. In Vietnam, the digital transformation process has long become mandatory and no longer a choice for the banking industry. In particular, in recent times, the increased demand for using digital banking for transactions has accelerated the digital transformation process of banks in Vietnam by 3–5 years. Also, users gradually changed their awareness and habits of using digital banking services during this period. This creates a golden opportunity for development and poses many challenges for banks in digital transformation.

Figure 3 shows that research results show over 45 percent from level 3 to level 5. Besides, the digital banking model, with diverse financial service product characteristics, simple procedures, fast processing time, and transactions without barriers by geographical location through devices connected to the Internet, is very suitable for modernized and industrialized society. The most advanced form of digital banking, known as 'Digital banking' incorporates cutting-edge innovations in mobile, digital, intelligence-based strategies, AI, payments, big data, blockchain, and other technologies to better serve both individual and business clients.

In the financial and payment services industry, commercial banks in Vietnam compete with tech start-ups. Entities' incentive to join the market might be diminished or market instability and hazards can be increased due to the numerous deficiencies and disparities in regulations governing entities engaging in the digital banking industry. Safeguards for fintech businesses in Vietnam are still lacking, in contrast to the numerous legislative restraints imposed on conventional banks and financial services.

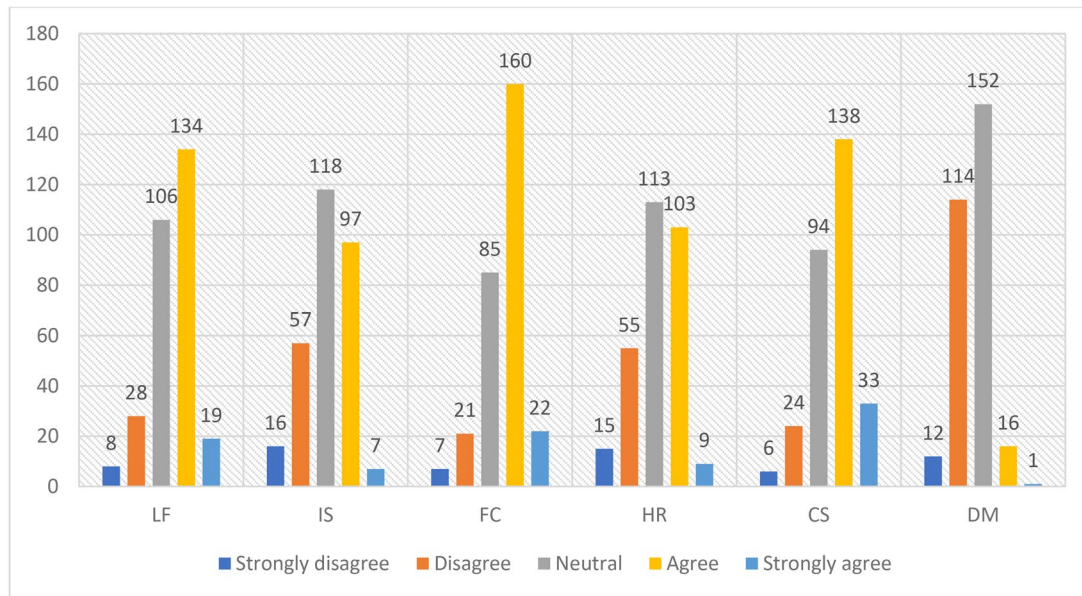


Figure 3. Frequency of statistical results for digital banking and sustainable development.

Source: Author's calculations with SPSS 20.0 and Excel.

An uneven playing field between fintech firms and financial service providers, particularly commercial banks, might result from the promulgation of regulatory laws for fintech companies without proper and timely consideration. Due to the cross-border nature of fintech, there has to be more communication and collaboration across nations to keep up with the latest developments in financial services. Indeed, a great number of nations are investigating, contemplating, and debating the possibility of harmonizing their growth patterns with international legal standards and laws. It is a problem for regulatory bodies in countries to build a legislative framework for new financial market activity while simultaneously preserving the stability of the financial system. Therefore, traditional banking has a low penetration level in Vietnam, while the country's digital infrastructure has grown substantially. Vietnam stands a better chance than other medium-term nations of promoting the growth of digital banking transactions as the penetration level of general banking services is enhanced.

4.3. Testing results for factors affecting digital banking and sustainable development

Figure 4 displays the testing outcomes for six factors that impact digital banking and sustainable development, with a statistically significant result at a significance level of 0.01. Six components need to be considered, namely: LF: Legal framework for digital banking; IS: Customer information security; FC: Financial capacity; HR: Digital human resources; CS: Customer care services; DM: Digital marketing. However, digital banking services still have limitations. Accessing digital banking services requires a lot of paperwork, procedures, and complex usage processes and is not entirely digitized. Information security vulnerabilities and high cybersecurity risks exist in providing digital banking services in Vietnam.

Currently, debit and credit cards in Vietnam pose many risks because most of these cards are magnetic cards. Magnetic cards are a technology from the 1970s, and today's criminals can use advanced technology to come up with many ways to copy data on the card and steal user information. Some risks that can come from this type of card are Card counterfeiting, card fraud, and using electronic chips or direct reading devices to steal card information to make payments, withdraw money, and transfer money.

Card counterfeiting is done by stealing personal and card information by skimming, using a card swiping machine with a card swipe box with an encryption function to steal card information, which is information theft information on card receipts, skimming on automated teller machine (ATM), using spyware to steal information, illegally accessing database websites to steal information, using tricks to distribute spam, fake emails to get personal information, create websites selling fake products, set up fake companies to scam payment information.

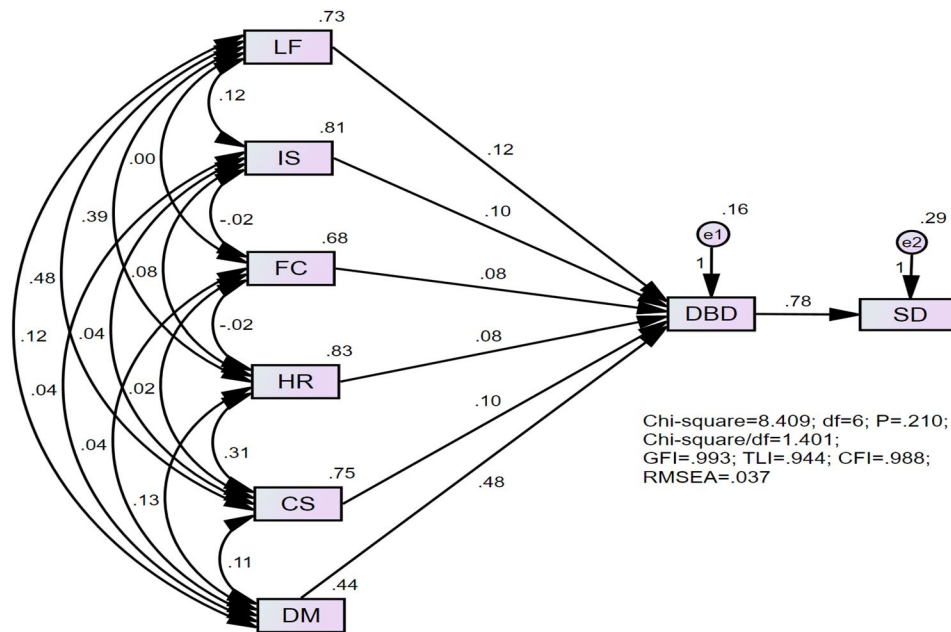


Figure 4. Testing results for factors affecting digital banking and sustainable development.
Source: Author's calculations with SPSS 20.0 and Amos.

Table 2 shows testing results for six key factors affecting digital banking and sustainable development with sig. 0.01. Besides, digital banking services are penetrating deeper into the market, and the proportion of customers of the commercial bank system in Vietnam using digital banking services accounts for about 55%, according to statistics from the Banking Strategy Institute and the Department of Public Works. Information Technology, State Bank of Vietnam in 2022. Report on banking services – user usage behavior and trends in Vietnam said that in 2022, up to 91% of surveyed users used banking services. Banking solutions compared to the rate of 71% in the 2020 survey.

Statistics on data from commercial banks on the system, such as VPBank and Vietnam International Commercial Joint Stock Bank (VIB), also show that most bank transactions take place via electronic channels, in actual form online, through the bank's software applications. As for VPBank, in 2022, the bank has increased mobilization by more than 9% of the total mobilization of the entire bank, and over-the-counter transactions have decreased by 17–18%. According to VIB, 80% of the bank's non-cash transactions are currently taking place on MyVIB and internet banking applications, with only 20% of transactions being performed at the counter. The number of customers regularly using MyVIB in 2022 increased by 91% compared to 2021.

Table 3 shows testing results for Bootstrap with 5000 samples for factors affecting digital banking and sustainable development with sig. 0.01 and column C.R. < 1.96. Compare this CR value to 1.96 (1.96 is the value of the normal distribution at two-sided would be 5%). If the p value < 5%, then the conclusion is that the non-zero Bias hypothesis is statistically significant. Due to the hypothesis: H_0 : Bias = 0; H_1 : Bias \neq 0. If the value of C.R. is more critical than 1.96, then infer a p value of < 5%, accepting H_1 , concluding a deviation other than 0 is statistically significant at 95% confidence. If the absolute value of C.R. is less than 1.96, infer the p value > 5%, rejecting H_1 , and accept H_0 , the conclusion of a deviation other than zero is not statistically significant at 0% confidence, and thus the conclusion can be reliably obtained by the original estimating model. Usually, this is the expected result when analyzing SEM.

Besides, Bootstrap testing is a resampling method with replacement in which the original sample acts as the crowd. This method is used to retest the model and evaluate the reliability of the estimates with a correspondingly large sample number of 5000. In the SEM model, Bootstrap testing is conducted to retest the model. This helps evaluate the reliability of estimates with a large sample number. The test results show that the data is consistent with research practice and ensures enough reliability for further analysis and policy implications.

Table 2. Testing six key factors affecting digital banking and sustainable development.

Relationships			Unstandardized estimate	Standardized estimate	S.E	C.R	P	Note
DBD	<—	LF	0.125	0.176	0.039	3.233	0.001	Accepted
DBD	<—	IS	0.096	0.143	0.026	3.668	***	Accepted
DBD	<—	FC	0.079	0.107	0.028	2.797	0.005	Accepted
DBD	<—	HR	0.082	0.124	0.030	2.740	0.006	Accepted
DBD	<—	CS	0.097	0.140	0.035	2.763	0.006	Accepted
DBD	<—	DM	0.480	0.530	0.036	13.284	***	Accepted
SD	<—	DBD	0.784	0.659	0.054	14.586	***	Accepted

Notes: *** 1%; Source: Author' calculations with SPSS 20.0 and Amos.

Table 3. Testing bootstrap with 5000 samples for factors affecting digital banking and sustainable development.

Relationships			SE	SE-SE	Mean	Bias	SE-Bias	C.R	Note
DBD	<—	LF	0.047	0.001	0.123	−0.002	0.002	−1.00	Accepted
DBD	<—	IS	0.027	0.001	0.094	−0.002	0.002	−1.00	Accepted
DBD	<—	FC	0.028	0.001	0.078	0.000	0.001	0.00	Accepted
DBD	<—	HR	0.030	0.001	0.083	0.001	0.001	1.00	Accepted
DBD	<—	CS	0.036	0.001	0.097	−0.001	0.002	−0.50	Accepted
SD	<—	DBD	0.059	0.002	0.485	0.005	0.003	1.67	Accepted

Source: Author' calculations with SPSS 20.0 and Amos.

4.4. Research discussions

In theory, sustainability is understood as a guarantee for the present, but not at the expense of the future. This concept involves three aspects: economics, environment, and social responsibility. In the banking sector, sustainability is recognized by increased value for owners, environmental protection, and social development. Therefore, evaluating the business performance of a business should not only focus on economic value but also consider the impact of business activities on society and the environment. Based on the testing for SEM, six key factors affecting digital banking and sustainable development with sig. 0.01. Six components need to be considered: LF: Legal framework for digital banking; IS: Customer information security; FC: Financial capacity; HR: Digital human resources; CS: Customer care services; DM: Digital marketing, the following discussions synchronously implemented:

First, LF: Legal framework for digital banking: This factor affects digital banking development with a significance level of 0.01, the findings of this investigation are entirely congruent with prior research (Lutfi et al., 2021; Pham, 2023; Zhang et al., 2018). Many legal regulations are unclear and not synchronized, causing difficulties and inadequacies in the digital transformation. In recent years, despite receiving more attention from the Government, the State Bank has issued regulations regulating the digital transformation process in banking operations and has achieved specific successes; however, there are still some regulations that are not clear and consistent, causing difficulties and inadequacies in the digital transformation process at banks today. Some rules on transaction procedures are still conducted directly on paper, causing problems, disruptions, and difficulties in implementation. Furthermore, authenticating customers' identities through digital platforms is not yet specific, and there is no guaranteed basis for identity authentication. The banks are currently not allowed to have a secure source of information through the population information database to authenticate user identities, which causes many risks to their operations. Therefore, complete the legal corridor to pave the way for digital transformation. Accordingly, the law needs a mechanism to achieve regulations on digital signatures, authenticate the signer's identity, and recognize the validity of several unregulated contracts and electronic transactions. At the same time, consider amending and supplementing some regulations in banking, criminal proceedings, intellectual property, electronic transactions to promptly follow the rapid growth process of transformation numbers, building a specific legal corridor. From there, create an effective mechanism to monitor and manage digital banking activities to protect organizations and individuals conducting transactions and payments via digital banking platforms. However, to achieve the above goal, deploying in many fields to create seamlessness between regulations is necessary. In intellectual property, it is essential to clearly explain the concept and the protection mechanism for customer information in banking activities, helping banks protect customer information in a confidential business.

Secondly, IS: Customer information security: This factor affects digital banking development with a significance level of 0.01, the findings of this investigation are entirely congruent with prior research (Emara & El Said, 2021; Pham, 2023). Banks must promote investment in technology, upgrade security infrastructure systems to ensure the highest level of safety, and prevent cases where the bank's server system is attacked to a minimum influence on users. Banks need to be proactive in applying technology in banking operations and boldly invest in innovating equipment and facilities. Accordingly, to solve the situation where Fintech companies are increasingly encroaching on banking activities, which were previously only the playground of banks, it is necessary to be autonomous in applying digital technologies for quick payments and loans while ensuring security and information security issues. To do so, banks need to boldly invest more in training in-depth research on Fintech and try to build and create applications to provide financial services for the banking industry alone, not having to depend on cooperation with Fintech companies. Therefore, it is also necessary to boldly innovate equipment and facilities to build a synchronous, quality digital infrastructure, connect technical standards, unify primary and shared data, and ensure security and confidentiality for customers. Only then can we enhance and promote the digital transformation process and the development of the banking industry. In addition, investing in scientific and technical development requires the banking industry to have considerable investment capital and cannot be completed immediately. Therefore, there is a great need for support from the state in terms of capital sources and effective and practical policies to support the banking industry promptly and quickly in the current digital transformation process.

Third, FC: Financial capacity: This factor affects digital banking development with a significance level of 0.01, the findings of this investigation are entirely congruent with prior research (Giovanis et al., 2019; Li & Wu, 2023; Pham, 2023). The investment required for digital technology is substantial due to the rapid pace of technological advancement. Technologies that are quickly developed are swiftly superseded by newer and more advanced ones. Hence, in order to keep up with the advancements in technology, the banking system must consistently enhance, refine, sustain, and reinvent its technological infrastructure to remain competitive, hence generating significant financial strain. Banks, particularly small and medium-sized ones, will face significant financial strain. This is also an issue faced by commercial banks. Therefore, At the same time as they implement digital banking, commercial banks should strengthen their financial capabilities. It is possible to increase financial capacity, operational efficiency, and the ability to update, develop, maintain, and replace technology in order to stay competitive and integrate foreign imports by proactively expanding charter capital. Concurrently, in order to fulfill development and competitiveness demands in a worldwide setting, it is essential to choose technical requirements, technologies, and contractors with enough capacity and reputation to choose optimal technologies at reasonable rates. To take digital banking to the next level, commercial banks must aggressively collaborate with e-commerce companies and logistical infrastructure.

Fourth, HR: Digital human resources: This factor affects digital banking development with a significance level 0.01, the findings of this investigation are entirely congruent with prior research (Achugamonu et al., 2020; Giovanis et al., 2019; Pham, 2023). Need to improve the quality of human resources in the banking industry. In the context of the 4.0 Industrial Revolution, the banking industry needs strategies and goals to improve the quality of human resources and attract and retain talents. Accordingly, existing staff must organize in-depth training courses on information technology, foster professional skills, and update knowledge on digital technology operating skills in banking activities and transactions. At the same time, it is also necessary to organize exchange, learning, and training sessions on soft skills, creative and breakthrough thinking, and skills to quickly and effectively solve unexpected situations that may arise. Besides, it is also necessary to build good welfare regimes for employees. From there, creating a team of professional, highly specialized, dynamic, and creative staff, contributing to promoting the digital transformation process in the banking industry. In addition, personnel recruitment needs to be more rigorous, fair, and transparent. Only then will we be able to attract quality, highly qualified human resources compliant with operating procedures for providing banking products and services and have good professional ethics for developing the banking industry.

Fifth, CS: Customer care services: This factor affects digital banking development with a significance level 0.01, the findings of this investigation are entirely congruent with prior research (Alalwan et al., 2017; Huang et al., 2021; Pham, 2023). For commercial banks, customer experience is interaction and

complete integration into services and products from customers. Customer experience often exists in two forms: positive experience and negative experience. Positive experiences only appear when the products and services the bank provides meet customer needs, giving customers a feeling of satisfaction and comfort when using the products and services. If customer experience develops positively, they will love the bank and trust in using products and services. If the experience turns out to be wrong, customers will underestimate both the quality and the organizational structure and will limit or not want to trust anything from that bank. Building a customer experience strategy is considered very important for digital banking. Therefore, improving the bank's customer experience when converting to digital banking is extremely important, helping customers form a bond and feel safe when interacting with their selected bank. A customer experience strategy that helps promote brand incentive programs reduce interest rates in credit activities, and support customers during the banking digital transformation process is about creating new customer experiences in banks, thereby promoting the bank's brand. A good experience strategy will create loyal customers who stay with the bank for a long time, increasing competitiveness compared to competitors.

Finally, DM: Digital marketing: This factor affects digital banking development with a significance level 0.01, the findings of this investigation are entirely congruent with prior research (Li et al., 2023; Naeem & Ozuem, 2021; Pham, 2023). One of the essential channels in today's marketing strategy is advertising on mobile devices of businesses in general and commercial banks in particular because most Vietnamese people use electricity smartphones. Currently, network operators require user information to be registered to own a phone number – this is considered a source of information data and a channel to help group customers carry out correct advertising campaigns more effectively. The critical thing to do is to ensure that the advertisement reaches the right target audience and must go hand in hand with the consumer's purchasing process. Therefore, enhance marketing initiatives and develop effective consumer policies. Enhance advertising and marketing efforts to reach a wide customer base, providing them with up-to-date information and a fundamental comprehension of the advantages of digital banking services. This will enable customers to grasp the benefits, significance, and security of utilizing digital banking, ultimately attracting a substantial number of customers to adopt these services.

5. Conclusions and policy recommendations

5.1. Conclusions

Digital transformation of the banking industry under the impact of the 4th Industrial Revolution has brought many positive changes. Along with that, thanks to the advantage of a young population and the effect of the COVID-19 pandemic, it further promotes the digital transformation process in the banking sector. Besides favorable conditions, digital banking activities of commercial banks in Vietnam also face significant difficulties and challenges. The study analyzed the current situation of digital banking in Vietnam, exploring the development drivers, challenges, and problems facing the digital transformation process in this field. In addition, the study also surveyed 295 respondents related to the research topic at 10 commercial banks in two major cities in Vietnam. Research results show six factors affecting digital banking development and sustainable development. This study used descriptive statistical tools to measure mean value, standard deviation, and structural equation models. Finally, the study's contributions help policymakers and banking managers apply research results to develop digital banking policies and sustainable development policies. In addition, management agencies need to closely monitor to identify limitations and determine solutions, including requiring credit institutions to persistently implement sustainable development goals and increase growth. Strengthen the protection of customer information, take responsibility for information technology risks that arise during our operations as well as those of our partners, improve digital capacity for the workforce in the banking sector, and synchronously develop digital infrastructure, creating conditions to support people and businesses in fully exploiting digital banking services. That means that in the current context, to survive and reach out to the big sea, banks need to seriously consider and research the application of digital banking development to contribute to sustainable development.

5.2. Policy recommendations

The COVID-19 epidemic has fundamentally changed customer behavior and consumption habits, notably financial transactions. This has promoted the digital transformation process of banks in Vietnam more strongly. In fact, thanks to the advances of Industrial Revolution 4.0 and the push from COVID-19, banks have also applied digital quite thoroughly in their operations and become an industry group that welcomes new technology trends. In the future, banks must continue to affirm their leadership position in the digital environment to add value to customers in the new era. To promote the development of digital banking in Vietnam, the following implications to theory and implications to practice need to be implemented synchronously:

First, improve LF: Legal framework for digital banking. This factor has an average value of 3.4339; the standardized estimate is 0.176 with sig. 0.01. To stay up with the rapid advancements in science and technology, Vietnam must speed up the process of finalizing the legislative framework for the growth of digital banking. Alternatively, relevant branches and ministries providing feedback on draft documents in specific fields, such as mobile money electronic documents... also need to gradually remove difficulties and obstacles about public relations points, awareness, and approaches to digital banking in Vietnam. For the State Bank to quickly complete the legal framework, the State Bank needs to accelerate the research process on financial technology (Fintech), creating a legal corridor for the application of modern technology in the field of finance and banking. At the same time, establish a research team on digital banking and evaluate the potential and trends of developing/transforming the digital banking model in Vietnam to have policies to support commercial banks in this transition process. The organize international seminars/forums on digital banking, helping commercial banks learn, share, and serve as a bridge for commercial banks to cooperate with researched banks/financial institutions' digital applications and successfully build/transform digital banks. Completing the legal framework for digital banking development needs to be focused and accelerated. Accordingly, in the immediate future, it is necessary to prioritize regulations related to testing in the financial sector, remove obstacles in current legal regulations, and complete draft guiding circulars when the Decree on non-commercial payment procedures is approved. The Government issues and evaluates revisions to enhance electronic identification and authentication in the banking sector, examining guidance papers pertaining to the storage, protection, and exchange of data, as well as instructions on accessing the national population database for customer service purposes. In particular, in the context that the Law on Credit Institutions is being considered for amendment, it is necessary to focus on reviewing regulations that are no longer appropriate in the context of new industry operations, such as adding regulations on digital banking and payments digital, new products and services on digital platforms, and the Sandbox mechanism on Fintech in various financial service fields not only in the banking sector, online lending, and using cloud services.

Second, improve IS: Customer information security. This factor has an average value of 3.0746; the standardized estimate is 0.143 with sig. 0.01. In the digital age, banks are taking advantage of the power of technology to increase marketing efficiency on digital platforms, replacing traditional methods. As the utility ecosystem expands, the number of channels to reach customers becomes larger. Banks target bank-owned channels such as branches, websites... and other media such as partners, client. The most crucial point is when the customer buys a product or service. They care about fast, simple, convenient, and secure experiences; banks need to focus on ensuring seamlessness and speed of processing in all customer operations, as well as service quality when handling incidents. To ensure security, banks must introduce (i) invested technological measures such as formatting and decentralizing access, blocking phishing fraudulent methods of impersonating banks. Banks or financial companies to trick users into sharing financial information, malware, monitoring abnormalities in connection signals; (ii) regularly organize training, propaganda, and warnings to raise awareness, vigilance and experience in dealing with situations for employees and customers; (iii) establish policies and ensure compliance with procedures. In addition, during the product development process, the network security team participates from the design stage to analyze and find security loopholes that can be exploited at every step of operation and every touch point of the customer. However, the most important thing is balancing security issues while ensuring an easy, convenient, and fast experience for bank customers.

Third, improve FC: Financial capacity. This factor has an average value of 3.5729 and a standardized estimate of 0.107 with sig. 0.01. Increasing capital is the top goal of commercial banks because it will help meet Basel 2 standards and upcoming Basel 3 and improve financial capacity, competitiveness, and business opportunities. Allocating resources for the development of new technologies involves commercial banks considering the investment to expense ratio in their yearly budget plan, and reducing unnecessary costs. It is important to additionally take into account the conservation of resources for the purpose of investing in technology. It is crucial to ascertain transparent and valuable investment expenses and anticipate prospective future income projections. Systematically integrate contemporary technology into banking operations, establishing a foundation for transitioning into a digital financial institution. Exploring these technologies takes a substantial amount of time and a well-defined plan. Therefore, one potential approach to examine is to engage in partnerships with technology businesses and/or invest in technology startups. To overcome the above limitations and shortcomings, the banking system, especially commercial banks, in addition to improving financial capacity, needs to focus on some of the following key issues: Increasing equity capital – a decisive factor in financial capacity to expand business: For domestic commercial banks to remain competitive and save costs, it is critical to keep increasing their equity capital. Reduce potential negative outcomes, greatly assist commercial banks in attracting additional funding, train and educate employees, purchase cutting-edge equipment, build stronger infrastructure, broaden their customer base, and gain operational and managerial expertise in accordance with all applicable laws, regulations, and industry standards. Proactively implementing capital increases is a need for commercial banks in the near future. This includes: increasing equity capital to mitigate risk, meeting capital requirements in accordance with the Camel safety framework, and becoming more competitive with other banks in Vietnam, whether they are joint ventures or foreign banks; strictly inspecting investment projects to ensure they adhere to the principle of making a profit before investing; and ensuring compliance with credit principles and the timely recovery of loan capital.

Fourth, improve HR: Digital human resources. This factor has an average value of 3.1220 and a standardized estimate of 0.124 with sig. 0.01. In the current period of rapid technological development, many green technologies have been applied that have brought practical effects to life and the environment. Developing green production technology not only helps Vietnam achieve sustainable development goals but also solves the problem of environmental pollution in our country today. In that context, businesses have been implementing sustainable development strategies within their own enterprises and improving the capacity of suppliers and related partners in their value chain to create a sustainable green development ecosystem. Finally, the Government should support the public-private partnership investment approach to maximize the resources of relevant parties, invest in improving the capacity and role of business representative organizations to enhance the ability to gather, dialogue, and contribute suggestions to strengthen institutions and economic policies, disseminate legal policies, and raise propaganda. Raise awareness of the business community about digital banking support businesses in international integration with high standards. In addition to financial readiness, it is essential to have a team of empathetic personnel. Enhance the training programs for bank staff, focusing on knowledge, skills, and fostering a risk management culture. Additionally, ensure effective communication and guidance to clients regarding product usage and risk prevention. When it comes to risk management tools, it is important to invest in stress testing capabilities, establish sufficient lines of defense, prioritize quality, and ensure data reporting satisfies current requirements while also being adaptable for future roles in the realm of digital banking.

Fifth, improve CS: Customer care services. This factor has an average value of 3.5695; the standardized estimate is 0.140 with sig. 0.01. Consumers are increasingly moving towards more intelligent, safer, and faster technology, experiencing a series of new technologies. For example, customers can access and manage their accounts through mobile applications and online platforms without going to traditional banks. In addition, artificial intelligence and chatbots provide 24/7 interaction, helping customers answer questions and receive support quickly. Meanwhile, blockchain technology allows transactions to be performed promptly, securely, and transparently. Artificial intelligence and automation technology help reduce manual work and increase productivity. Therefore, simultaneously creating a suitable ecosystem while developing advanced financial goods and services, such as e-wallets, that incorporate intelligent features. The e-wallet ecosystem encompasses several domains, expanding the range of payment

acceptance locations, surmounting technological constraints, and enhancing security measures to ensure consumers may utilize it confidently. Integrating e-wallet payment gateways on sales websites, particularly e-commerce sites with a large following, may effectively extend the customer base and enhance customer engagement by promoting linkages with retail websites and enabling commerce-integrated shopping and e-wallet payments. To promote the development of new banking products, experts believe it is necessary to amend, supplement, or replace documents on electronic transactions to suit the practical application of digital technology recognizing prices, legal value of electronic data, electronic signatures; recognition of forms of authentication in the case of applying blockchain technology; specific regulations on security and confidentiality in electronic transactions; regulations Specific regulations on signing electronic agreements/contracts; rules on identification and authentication in electronic transactions.

Finally, improve DM: Digital marketing. This factor has an average value of 2.5932; the standardized estimate is 0.530 with sig. 0.01. Banks reach the right customers through social networks and social media; building a digital marketing strategy must be methodically planned, get the right customers, and provide customers with products and services as advertised; not only can it increase brand awareness and create public sympathy for banks, but it can also create a brand identity that a website can never do. One of the critical channels in today's marketing strategy is advertising on mobile devices of businesses in general and commercial banks in particular because most Vietnamese people use electricity smartphones. Currently, network operators require user information to be registered to own a phone number – this is considered a source of information data and a channel to help group customers carry out correct advertising campaigns more effectively. The critical thing to do is to ensure that the advertisement reaches the right target audience and must go hand in hand with the consumer's purchasing process. To be able to apply and deploy digital marketing effectively, banks need to pay attention to the following points: The human resources team must be strong, with employees knowledgeable about marketing, technology, and digital; Modern infrastructure and equipment, consistent with current trends; Consult, learn, and gain experience from potential partners as well as competitors in the market; Research and survey customers, find out what products and services customers use to determine their strengths and weaknesses.

5.3. The limitations and further research

Although the author has made many efforts, due to limitations in data accessibility, survey subjects, and research experience, the article still has some restrictions that need to be overcome in subsequent studies. As follows: (1) Regarding the scope of the research, the author only surveyed some commercial banks in Hanoi and Ho Chi Minh City that represent Vietnam but still do not wholly represent Vietnamese banks. The following research direction needs to expand the survey subjects to many regions for greater representativeness. (2) In terms of sample size, the study surveyed and collected 295 questionnaires corresponding to 295 working employees of 10 banks. Although the number of survey questionnaires is consistent with the research methodology and the number of research variables, it is still small compared to the overall number of banks in Vietnam. Future research directions could increase the number of research samples. (3) The data analysis results show that there are only 6 variables that impact digital banking development. However, there are still other factors affecting the development of digital banking. Future research directions can expand to other factors affecting digital banking and sustainable development in other countries.

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Ethical statement

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Data availability statement

The derived data supported the findings of this study and was available from the corresponding author upon reasonable request.

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Appendix

Table A1. Research questionnaires.

Factors affecting the digital banking development contributing to sustainable development in Vietnam		5-point Likert scale				
LF: Legal framework for digital banking	(1)	(2)	(3)	(4)	(5)	
IS: Customer information security	(1)	(2)	(3)	(4)	(5)	
FC: Financial capacity	(1)	(2)	(3)	(4)	(5)	
HR: Digital human resources	(1)	(2)	(3)	(4)	(5)	
CS: Customer care services	(1)	(2)	(3)	(4)	(5)	
DM: Digital marketing	(1)	(2)	(3)	(4)	(5)	
DBD: Digital banking development	(1)	(2)	(3)	(4)	(5)	
SD: Sustainable development	(1)	(2)	(3)	(4)	(5)	

Notes: A 5-point Likert scale states the level of agreement in five points. The 5-point Likert scale consists of the below points – (1) Strongly Disagree; (2) Disagree; (3) Neither Agree nor Disagree; (4) Agree; (5) Strongly Agree.