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RESEARCH ON THE DEVELOPMENT OF DIGITAL TECHNOLOGY IN BANKING ACTIVITIES IN VIETNAM TOWARDS SUSTAINABILITY

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Abstract: In Vietnam, the digital banking model has undergone rapid development in recent years. This paper evaluates the current state of digital banking development in Vietnam from several aspects: (i) the legal framework for digital banking development; (ii) market participants in the digital banking sector; (iii) methods of digital banking development; and (iv) the quality of digital banking services, thereby identifying the current level of digital banking development in Vietnam. According to the research team's assessment, digital banking in Vietnam is currently in the formative stage, with significant potential for growth. The application of digital technology in banking operations in Vietnam has had a positive impact on operational models, driving a strong transformation in internal business systems and in the provision of advanced products and services to customers. The application of digital technology in banking is considered the next phase after digitalization in the digital transformation process, serving as an important support for the digital banking strategy of the banking industry.

This study aims to discuss digital technologies applied in banking operations, such as Artificial Intelligence (AI), Machine Learning (ML), the Internet of Things (IoT), Big Data, Cloud Computing, Distributed Ledger Technology (DLT), Blockchain, Biometrics, and the products and services created by financial technology companies (Fintech). The application of Big Data in banking is particularly significant for building and managing data resources in the finance and banking sector. Currently, an increasing number of banks are adopting Big Data in their operations to keep pace with the rapid development of modern society, where customers seek simplified, fast, and convenient procedures. Big Data is a powerful tool that can help banks achieve this goal. However, the implementation of Big Data in banks still faces certain challenges.

Keywords: Digital technology, digital transformation, digital banking, Fintech, digital transformation technologies.

INTRODUCTION

The Fourth Industrial Revolution, marked by the advancement of digital technologies, has propelled the economy and business models of enterprises to a new level. This transformation has led to the emergence of e-commerce, cashless payments, automation, and a multitude of new services that either enhance or replace human labor. In addition to Artificial Intelligence (AI), this revolution is significantly characterized by Big Data. Due to the nature of the banking sector which generates massive amounts of data from structured sources such as transaction histories and customer records, to unstructured data such as customer activity on websites, mobile banking apps, and e-banking platforms—the application of Big Data in banking operations has become an inevitable trend that many banks are actively pursuing.

Prominent Big Data applications in the banking sector currently include customer service automation, personalized service experiences, enhanced security, fraud detection and pattern recognition, process optimization, credit risk management, and customer feedback analysis. Therefore, Big Data not only helps

banks shorten the time required to obtain essential information but also provides in-depth insights into customers from previously overlooked unstructured data sources.

The rapid growth of financial technology (Fintech) and shifts in consumer preferences for financial services have compelled the global banking system to transform its business models. Technological innovations have been shaping a new trend in which retail banks are evolving into fully digital banks.

In his book "Digital Bank: Strategies to Launch or Become a Digital Bank", Chris (2014) defines digital banking as a banking model where operations primarily rely on electronic platforms and data, with digital technology forming the core value of banking activities. This study adopts Chris's (2014) approach, defining digital banking as an operational model of institutions providing and conducting banking services, where all activities in management, operations, business, and service delivery are integrated with modern digital technology, applying achievements of the Fourth Industrial Revolution (Industry 4.0) such as Big Data and Artificial Intelligence.

Experts predict that a digital banking ecosystem is likely to form by 2025, driven by changes in customer consumption trends, business models, revenue streams, digital banking platforms, industry data, and the banking value chain (Gasser et al., 2017). Within this trend, Vietnam is considered a country with high potential for digital banking development due to the large market demand. According to UNFPA, Vietnam is currently experiencing a "golden population structure," with people aged 15–24 accounting for 70% of the population[1]—an age group that is most easily reached by digital banking. According to a survey by global consulting and management firm McKinsey[2], individuals aged 21–29 had the highest rate of using banking services via electronic devices in Vietnam in 2014 (60%), followed by those aged 30–39 (48%), 50–64 (39%), and 40–49 (35%). In addition, 52% of Vietnam's population uses the internet, with an annual growth rate of 9%, ranking 15th globally. Most internet access is via mobile devices (93%) and computers (44%)[3]. It is estimated that around 27% of the population uses smartphones, mainly in urban areas. The proportion of customers interacting with banking services via computers, tablets, and mobile phones continues to increase in Vietnam[4].

According to McKinsey's survey in Vietnam, 50% of respondents expressed willingness to adopt new financial technologies, particularly digital payments. In the realm of digital payments, Vietnamese consumers are shifting behavior from saving to a "buy now, pay later" model. Per capita income and expenditure were projected to increase by 46% and 44% respectively by 2020, with the consumption-to-income ratio ranging between 70–80%. All these factors demonstrate the market's growing demand for digital banking in Vietnam. This demand also serves as a driving force for banks to accelerate their digital transformation processes to enhance customer experience and convenience, while also motivating regulatory bodies to introduce policies that support the development of digital banking.

Given this context, evaluating the current state of digital banking development in Vietnam is essential. It provides a foundation for commercial banks and regulatory agencies to adjust their strategies and policies in line with the Government's orientation and global trends in banking and financial services. This paper assesses the development of digital banking in Vietnam through several key aspects: (i) the legal framework for digital banking development; (ii) entities participating in the digital banking market; (iii) methods of digital banking development; and (iv) the quality of digital banking services—thereby identifying the current stage of digital banking development in Vietnam.

1. Digital technology in the banking industry and sustainable development

First of all, to understand the concept of digital technology, it is necessary to understand the concepts of digital transformation. According to Matzler et al. (2016), digital transformation is the combined use of technologies such as Cloud Computing, sensors, Big Data, etc. to create new products, services and business models. Digital transformation is the convergence of 04 breakthrough technologies: Cloud Computing, Big Data, IoT and AI (Thomas, 2019). In Vietnam, digital transformation is understood as the process of changing the traditional organizational model to a digital organizational model, based on the application of

new technologies to change the mode of operation, leadership, working processes, and culture of the organization.

Digital technology has supported banks to have wider coverage, reduce operating costs, and improve competitiveness

Thus, digital transformation can be simply understood as the process of using digital technology to change existing business processes, culture, and customer experience. According to the opinions of information technology experts, digital transformation goes through 03 main stages, from converting the manual and traditional processes of the unit to digital and online processes (considered the digitization stage), then moving to the digital transformation stage,digital technology is promoted in this period, followed by the digital reinvention stage, through the connection between technology and digital platforms that have not existed before to improve the efficiency of banking operations with new and innovative products and services (Pham Xuan Hoe,2021).

Digital technologies are considered advanced technologies that are applied to the next stages of digital transformation after going through the digitalization stage. When the system has digitized data, technologies such as AI, Big Data, Cloud Computing... will be used to analyze data, transform and create new value. At this level of digital technology, the application will open up forms of innovation and creativity in a whole industry or field instead of just upgrading or transforming traditional processes and procedures.

Thus, digital technology is a higher development of information technology, allowing faster data processing, transmission with large capacity but lower cost. It is this breakthrough development of technology that has enabled digital transformation in a holistic and comprehensive way, which was previously impossible. Digital technology can be considered in two aspects: building application software with multimedia media, social networks, e-commerce platforms, shopping services, online payments, and hardware development from mobile devices,automation systems, to information data storage and processing, Big Data, Cloud Computing...

The application of digital technology is an inevitable trend, every organization takes advantage of the superiority of advanced technology to improve operational efficiency and compete with competitors. For the banking sector, the application of digital technology brings important benefits such as: Creating new products and services to have the opportunity to reach more customers, eliminating physical boundaries in business activities, and importantly, eliminating intermediate steps, etcoptimize processes, operations, save operating costs and bring benefits and convenience to customers. In addition, management is better thanks to abundant management information, a smooth, timely and effective reporting system, from which managers can make decisions quickly and accurately, labor productivity is improved (Luong Van Hai,2021).

In terms of the legal basis for the application of digital technology to the banking sector in Vietnam, documents are being applied such as: Decision No. 711/QD-NHNN dated April 15, 2020 of the Governor of the State Bank of Vietnam (SBV) on the promulgation of the Action Plan for the implementation of Directive No. 01/CT-TTg dated January 14, 2020 of the Prime Minister on promoting development Vietnamese digital technology enterprises. The objectives of the Plan are to create a favorable legal environment, complete the policy framework to promote digital transformation in the banking industry, promote research, technology application and develop a variety of digital banking products and services; Decision No. 1238/QD-NHNN dated 08/7/2020 of the Governor of the SBV promulgating the Action Plan of the Banking sector to implement Resolution No. 50/NQ-CP dated 17/4/2020 of the Government. This plan aims to renew thinking, raise awareness of the Fourth Industrial Revolution (Industry 4.0), promote research on technologies and achievements to strengthen management capacity and improve the quality and efficiency of banking operations; develop mechanisms, policies and management to promote the digital transformation of the banking industry, creating favorable conditions for innovation; develop payment infrastructure and improve the quality of human resources in the context of Industry 4.0.

Digital Transformation and Fintech

Digital transformation in banking is the integration of digitalization and digital technology into all banking sectors. This integration allows for the creation – or modification of existing business processes, culture, and

customer experiences to meet changing market requirements and customer desires. Fintech stands for financial technology, which is a broad term used for all companies that use information technology and telecommunications to provide financial services. The birth of fintech refers to the use of modern technology to improve the provision of financial services (payment transactions, credit). Commonly used technology platforms such as: API, EKYC, Blockchain, Blockchain, P2P Lending, AI, biometrics, The application of these platforms helps banks save costs and streamline operational processes, and the integration of these platforms helps bring an easier and more attractive customer experience.

The impact of technology trends on banking operations and governance.

- Impact of Open API: Open Banking is a new term that has emerged in the financial services and banking industry. Accordingly, the bank allows third parties to write applications and provide services from the bank's own data. With the application of programming interfaces (APIs) - technology that allows third parties to access open data or secure access to closed data of an organization with the consent of the data owner and compliance with relevant legal regulations. However, strict regulations on the management and protection of customer information confidentiality make the cooperation process between the two parties difficult. To solve this problem, Fintech companies have researched and applied Open API solutions in the process of cooperating with banks. Thereby, Open API will establish an interactive interface for Fintech companies based on information extracted from the core banking of banks without having to connect directly.

This solution will ensure the harmony of the requirements of the two parties, when the bank still ensures the right to manage the integrity of customer information while Fintech companies still have enough information to process transactions for the bank's customers. When information is shared through Open API, the data can be used for Fintech companies to create more new applications, provide more convenience to customers, support customers to control information as well as make better decisions.

The impact of eKYC (Electronic Know Your Customer): is the process of identifying customer identities on electronic accounts remotely without the need for documents to identify customers when opening accounts and using electronic banking accounts. When implementing eKYC, it helps banks simplify procedures, reduce the cost and time of filling out application forms, transaction documents, digitize customer documents as well as reduce notarization costs, hire lawyers to assess the accuracy of original documents and store them at the bank. In addition, eKYC also helps improve customer experience, improve security, as well as help consultants identify users, reduce the risk of money laundering when customer identification infrastructure is shared by credit institutions.

The use of this eKYC easily helps bank employees choose the form of sales tricks to encourage customers to buy more products with the main product (Cross sales) or tricks to stimulate users to choose a higher-end, more expensive version of the same product (Up sales). In addition, it also meets the needs of customers more and more completely in the direction of One Stop Shopping (customers only visit one place and meet all their financial transaction needs).

Blockchain Impact: Blockchain is a blockchain-block technology that allows data to be transmitted securely based on an extremely complex encryption system, similar to a company's accounting ledger, where money is closely monitored and every transaction on the peer-to-peer network is recorded. In this case, blockchain is an accounting ledger that works in the digital realm. Blockchain possesses a special feature that data transmission does not require an intermediary to confirm information. Blockchain helps banks reduce the time and cost of implementing trade finance; Reduce the need for authentication and manual complex documentation.

In addition, blockchain also centralizes data management in banks, helping to minimize risks due to mistaken manipulations, manipulations, and data hacking. The continuous data update and data sharing between global credit institutions at low cost and uniformity make it easier for banks to identify customers and prevent money laundering. Reduce transaction costs, reduce intermediaries, shorten the process, increase trust between trading parties.

Impact of Digital Banking: This is a new trend in the banking industry and is considered the perfect solution to help banks increase customer experience. In other words, all that customers could do in normal bank branches, has now been digitized and integrated into a single digital banking application. Through Digital Banking, customers can: Withdraw money, transfer money, deposit savings, manage current accounts and savings accounts, pay bills, borrow from banks, use other utility services.

All of the above activities are packaged on the website or mobile device, customers only need to have a network connection to be able to manage or successfully transact without directly transacting at the bank. Digital Banking helps banks collect more complete information with customers, meet the requirements of money laundering prevention and customer identification, in addition to helping banks reduce the cost of opening transaction points/branches in rural areas, reduce risks, increase access and meet the demand for money transfer services.

Impact of AI (Artificial Intelligence): Banks can use AI to automate transaction processes, from transaction processing to risk analysis. AI can also be used to analyze data from customer transactions, accounts, and activity to provide personalized service to customers. Accordingly, AI can predict risks, increase productivity and efficiency in bank governance. The impact of AI in improving customer experience can be seen most clearly through Chatbots. With this application, customers do not need to go to the bank to find out information about products and services, answer questions and errors encountered while using the current product, but only need to do all this through an online messaging system serving 24/7.

Besides, banks can take advantage of the intelligent intelligence of AI technology to make investment decisions for themselves and their customers. At this time, AI acts as a financial advisor by analyzing customer needs and transaction data to advise investment decisions. And especially AI is ready to serve whenever customers need it. In addition, the ability to analyze huge volumes of data allows AI to detect abnormal transactions and fraudulent behaviors more quickly and accurately, thereby detecting fraud, money laundering or terrorist financing in the financial system.

First, e-KYC.

Usually, banks identify customers by meeting face-to-face and through matching original documents such as identity cards, citizen identity cards or passports, but now when using eKYC electronic identification solutions, some joint-stock commercial banks such as VPbank,BIDV, Sacombank, MBbank,... have carried out electronic customer identification without face-to-face. Thanks to the strong implementation of digital transformation, joint-stock commercial banks in Vietnam have soon cooperated with leading technology companies in the market to research and apply eKYC technology, supporting customers to register for services without being affected by geographical or time barriers.

The eKYC solution makes it easier for customers to register to use Digibank services of banks. Users only need to download the application, enter information and scan their identity documents right on the application, take a photo of their face according to the system requirements to complete the registration and experience the basic utilities on the application.

Second, Blockchain

In the banking sector, Blockchain technology is mainly used by joint-stock commercial banks in Vietnam in trade finance activities, typically MB, VPbank, and Vietcombank,... Blockchain applications make the issuance and notification of credit letters in dong successfully carried out within 27 minutes, much faster than the traditional method which usually takes three to five working days.

In addition, when the parties carry out this transaction, the presentation of documents on Contour instead of having to send paper documents via courier with many manual stages, incurring many costs. The Contour system has made the process of rejecting/accepting documents between parties much more convenient and faster, reducing the time from presenting documents to accepting payment, as well as increasing working capital efficiency. The platform allows for paperless document exchange, saving five to ten days compared to traditional transaction methods, and supports information sharing and instant status updates. This solution

saves time, eliminates inefficient activities, eliminates manual document storage, and provides online storage space.

Thanks to Blockchain technology, the entire process of accumulating points and redeeming gifts is stored and updated automatically on the Digibank application of banks, allowing customers to actively look up the history of point accumulation and redeem gifts.

Third, Digital Bank

In the face of the development of 4.0 technology, in order to increase their competitive advantage, joint-stock commercial banks have determined that Digital Banking will be the leading tool. Typically, Vietcombank, TP bank, MBbank,... has taken a pioneering step in affirming the direction of branchless banking. Today's joint-stock commercial banks have quickly integrated and applied modern technologies into products and services to meet demand, create maximum convenience and lower banking transaction costs for customers.

With Digital Bank, the transaction platforms on Internet Banking and Mobile Banking combine to provide a seamless and unified experience for customers on electronic media such as computers (PCs/laptops) and mobile devices (phones/tablets). Simply enter your username and password, set your transaction limit, receive transaction notifications anytime, anywhere via SMS... The user's financial transactions can be fulfilled within just 60 seconds. The application of technology in the bank's products and services helps customers have the most convenient experience while improving the competitiveness of banks.

Fourth, AI (Artificial Intelligence)

In countries with developed technology, the use of Artificial Intelligence (AI) in activities such as credit assessment, risk management, fraud detection, portfolio management, customer checking, chatbots to serve customers,... are no longer new to banks. The application of AI in banking activities has helped these banks save operating costs, increase operational efficiency, and reduce risks.

In Vietnam, a number of joint-stock commercial banks such as Vietcombank, VPbank, MBbank, TPbank, Techcombank, VIB and ACB are gradually applying AI to a number of functions such as Chatbot, automatic data analysis, security, and asset management. These banks have joined hands with technology companies to build and develop chatbot platforms to support and interact with customers, take care of customers to bring a better experience to customers every day. Currently, AI has become a virtual assistant that is able to respond instantly and almost accurately to frequently asked questions of customers 24/7 in most business areas that customers need support such as: Cards, loans, interest rates; information on incentives, exchange rates, networks... In case the customer has a request for support outside the scope of the Virtual Assistant's consultation, the request will be forwarded to the consultant to continue to support the customer to handle more in-depth operations quickly, reducing the customer's waiting time.

Economic development is a comprehensive and multidimensional process (generally encompassing three aspects: economic, social, and environmental). In contrast, sustainable development (SD) reflects the state or nature of that development — the manner in which development is implemented. Based on the distinction between economic development and sustainable development of the economy, the research team puts forward the following perspectives:

1. While the term "pillar" is appropriate to describe the components of sustainable development, the three pillars of SD should not be equated with the three aspects that reflect the outcomes of economic development: economy, society, and environment — nor should these pillars be considered independently or in isolation. The essence of sustainable development must reflect a reasonable and integrated connection among the three dimensions of economic development goals. Accordingly, the three pillars of SD should also embody this interconnectedness.

2. According to development theory, the economic factor is a necessary condition for social development (a prerequisite to ensuring human social progress), but it is simultaneously constrained by environmental conditions (as it operates within a specific environmental system). Thus, for an economy to develop, it must first achieve economic growth, and that growth must be economically sustainable.

3. The impact of globalization, international integration, and climate change (CC) on sustainable development. Vietnam occupies a geopolitically and culturally strategic and "highly sensitive" position on the global development map. These emerging dynamics present both opportunities and pressures for Vietnam's development process. Therefore, the research team believes that:

– Vietnam's understanding and framework of sustainable development, beyond the integration of the three core pillars, should also incorporate the idea of external constraints on these pillars. These constraints are represented by global factors, which specifically include two critical elements: international economic integration and global climate change.

- Vietnam's sustainable development model must be rationally built on the basis of both internal and global factors, concentrated into 3 important signs: potential – opportunity – pressure. The internal factor posing that Vietnam's development must be built on the basis of making full use of the country's potential strengths. Global factors pose that Vietnam's economic development must be calculated on the basis of overcoming pressure and making full use of opportunities from the outside.

(4) Linking sustainable development with the implementation of the country's industrialization goals. Vietnam is implementing industrialization in the current period in the context that sustainable development is becoming an inevitable global trend, so the path or model of industrialization of Vietnam must definitely be the path of sustainable development. The research team believes that in order to achieve the goal of becoming an industrial country, that is, to successfully implement the process of industrialization in Vietnam by the way of sustainable development, (i) The content and evaluation criteria, indicators reflecting Vietnam's sustainable development must be built based on the goal of becoming an industrial country in terms of content,that is, not only to raise the population income but also to ensure the requirements of social progress for people and a clean environment; (ii) Viet Nam's Sustainable Development Model must be designed as a path to industrialization, which means that it must be in agreement with the process of perfecting the dynamics of industrialization and create conditions for all drivers of the economy to have the opportunity to take effect,agree with the process of arousing resources for the implementation of industrialization (high-quality capital and human resources).

(5) Institutional factors in sustainable development

In recent years, many suggestions need to add a pillar of sustainable development in terms of institutions. The reason for this proposal comes from the importance of this factor for the implementation of socio-economic and environmental goals. Many countries in recent years due to unsustainable institutional factors have led to serious impacts on the country's economic development process. In Vietnam, the unpositive developments of the macroeconomy, the impact of the rapid economic growth model in recent years have had a negative impact on social progress aspects for people and especially caused natural resources to be quickly depleted and environmental pollution became very serious. There are many views that this situation stems partly from the fact that we have not yet had an institutional system of positive economic development, including legal documents and under the law; development policies still have many irrational points, many policies are barriers to opening up as well as exploiting private economic capacity,... With these analyses, many opinions say that it is necessary to add an institutional element as a pillar of sustainable development. The research team's viewpoint:

(1) Sustainable development reflects the development status of a country, so the picture of sustainable development must be consistent with the picture of economic development. Development theory and practice, when developing the current development assessment criteria of international organizations, have uniformly affirmed that the achievements of economic development are expressed in 3 aspects: economy - society - environment. Setting the development goals of the economy, we usually also imply a development formula consisting of the 3 contents mentioned above.

(2) Although the institution of development is important to the development process, it does not contain the same implications as the 3 aspects of economy, society and environment. We cannot set institutional SDGs as the destination of a development process, but it only means a condition, a way to achieve the SDGs.

2. Legal framework for digital banking development in Vietnam

The review of the legal framework related to the development of digital banking in Vietnam shows a large gap between current legal regulations and the level of development of digital banking. Concrete:

(i) Current regulations are not in line with the characteristics of new financial technology services and advanced technology applications: Current financial technology solutions place new requirements for lawmakers to update and develop new policy frameworks for management, oversee new elements of the financial services sector, such as cryptocurrencies[*5], cryptocurrencies[*6], financial technology (fintech). The current legal regulations only focus on the payment aspect of digital banking, while this is only a segment of digital banking services. Other fields of digital banking services do not have regulations such as the application of artificial intelligence in service consulting, crowdfunding, online lending, peer-to-peer lending, and personal financial data management. Even in the field of electronic payment, there are new forms that are not yet available within the scope of regulations, such as contactless payment (of SamsungPay), application of QR Code and biometrics (fingerprint, iris). Or as for the regulations on electronic documents, the current legal regulations on accounting documents and electronic documents are not suitable for the specific nature of electronic documents, arising in digital transactions. The review of current legal documents of the State Bank of Vietnam (SBV) shows that many regulations on electronic documents, such as regulations on electronic documents, making electronic documents, signing electronic documents, archiving electronic documents, in the Accounting Law 2015, Decree No. 174/2016/ND-CP dated December 30, 2016 of the Government detailing a number of articles of the Law on Accounting 2015, Decision No. 376/2003/QD-NHNN dated 22/4/2003 of the Governor of the SBV promulgating regulations on preservation and archiving of electronic documents, used for accounting and payment of capital of payment service providers, Decision No. 1789/2005/QD-NHNN dated 12/12/2005 of the Governor of the SBV on the promulgation of the regime of bank accounting vouchers, Circular No. 38/2013/TT-NHNN dated 31/12/2013 regulating the translation of accounting vouchers written in foreign languages when used to record accounting books, how to write digits on accounting vouchers and archive electronic documents, at the SBV. However, the regulations on electronic documents, which are based on the thinking of paper documents, are designed in the digital environment and are understood as accounting documents on software applications. Therefore, the regulations on the content, method and process of circulation, storage, control and signing of documents are similar to paper documents but in electronic form. Meanwhile, digital transactions, such as digital payment transactions, are not only provided by banks, but also cooperation between many units such as banks, fintech companies, and mobile phone companies. Digital transactions also do not require to be associated with a bank account, but can be done through e-wallets, QR codes, etc. and confirmed by mobile phone number, identification code, anytime, anywhere. Digital transactions such as mobile payments are now fully automated transactions, from initiation, payment to the final accounting bookkeeping. The control and reconciliation points are carried out automatically by control programs, management software, without direct human implementation and supervision. Therefore, the regulation of the content of electronic documents, the process of control, preservation and storage needs to be studied and considered with the new requirements of financial products and services in the market.

(ii) The use of digital banking services is limited by the current regulations on identification and verification of customer information. According to Decree No. 116/2013/ND-CP and relevant regulations, for the business of opening bank accounts, e-wallets, non-physical identification cards (new technology transactions), or establishing first-time relationships with financial institutions or new technology financial service providers, these organizations must meet directly with customers to verify the information. Conducting face-to-face meetings to carry out customer identification (KYC) procedures will limit the spillover of financial services. Currently, there are no sanctions to allow the application of electronic customer identification (eKYC). In order to prevent the risk of money laundering, banks in Vietnam are having to comply with many strict regulations on customer identification. As a rule[*7], customers who wish to open a payment account and bank card must provide the required personal information accurately, as well as an ID card, passport, or entry

visa. Payment service providers are obliged to keep the account holder's signature form, update the account holder's information and comply with the law on prevention of money laundering and terrorist financing. Financial institutions must apply measures to identify customers when they open an account or set up a transaction with them[*8]. For transactions related to new technologies, banks must still meet customers face-to-face when establishing a relationship for the first time. Banks are obliged to establish a process for assessing the risk of money laundering when providing services using new technology. Thus, although the above regulations help managers in the prevention and control of financial crime risks, they reveal limitations, which are not in line with the characteristics of digital banking services in the digital era. Regulations on face-to-face meetings of customers for tellers at branches and transaction offices of banks are only in line with the operation model of traditional banks. The introduction of digital banking services, customer contact has largely been carried out on digital platforms such as websites, phone applications, and social networks, so requiring customer identification through face-to-face meetings is an obstacle to the development of this model. going against the development trend of digital banking. The regulation on the implementation of direct identification at the transaction counter increases the time to open new accounts for customers at banks, increases the inconvenience of using banking services, and increases the barriers for customers when starting to use banking services. When switching to a bank providing services, customers must also carry out this identification procedure again while the information has been stored and verified by another bank.

(iii) Regulations for entities participating in the digital banking market still have many inadequacies and differences, which may reduce the motivation to enter the market or cause instability and risks to the market. While traditional financial institutions and financial services are subject to many legal constraints to ensure system safety, safety and legal regulations for fintech companies in Vietnam are incomplete. The promulgation of legal regulations for fintech companies, if not considered in a timely and appropriate manner, can create an unfair playing field between fintech companies and traditional financial service providers, which are mainly commercial banks. The global and borderless nature of fintech requires enhanced international cooperation and the exchange of information on financial service innovations in the world market between countries. In fact, the unification of development trends and international laws/norms (rules) is being studied, considered and discussed by many countries. For national regulators, building a legal framework for new financial market activities is also a challenge when it comes to ensuring the stability of the financial system, ensuring competition and encouraging innovation to provide more convenient services. superior at a lower cost for users.

(iv) The legal corridor for the protection of consumer rights in the financial sector and the protection of user data privacy is still not guaranteed. The legal framework for consumer protection in the financial sector in our country is still very limited. While the 1999 Ordinance on Protection of Consumer Rights only sets out the most general principles on consumer protection and does not mention the financial sector in particular, the decrees guiding the implementation of this Ordinance, specifically Decree No. 69/2001/ND-CP dated October 2, 2001, then replaced by Decree No. 55/2008/ND-CP dated April 24, 2008, which also left this field vacant. Specialized legal documents such as the Law on Credit Institutions in 1997 (amended and supplemented in 2004), the Law on the State Bank of Vietnam in 1997 (amended and supplemented in 2003), the Law on Securities in 2006, etc. also do not mention, or do not focus on the field of consumer protection, only giving some general principles on the interests of depositors and borrowers. Thus, the limited legal foundation has affected consumer rights.

3. Entities participating in the digital banking market in Vietnam

The participants in the digital banking service provision market in Vietnam are currently relatively rich, but commercial banks are still key units in the development of digital banking. By the end of 2017, there were 27 non-bank units licensed by the SBV for payment intermediary services, about 40 units participating in the field of fintech providing online payment tools, providing POS/mPOS digital payment solutions, money transfers, crowdfunding, etc Online Loan Service[*9]. Active participants in participating in the development of digital banking in countries such as Singapore, Indonesia, Malaysia, etc. usually fintech companies.

However, in Vietnam, the number of fintech companies operating is still thin in both quality and quantity. According to the report "ASEAN Fintech Landscape Survey 2018" conducted by auditing firm Ernst and Young, there are 78 fintech companies operating in Vietnam, much lower than other countries in the region (Singapore has about 490 fintech companies, Indonesia is 262, Malaysia is 196).

The problem of cooperation between traditional banks and fintech companies in providing financial technology solutions in Vietnam has existed but is still quite monotonous. All payment intermediary companies licensed by the SBV coordinate with commercial banks to provide electronic payment products and services to consumers. For example, Vietnam Prosperity Joint Stock Commercial Bank (VP Bank) is currently cooperating with fintech company Timo in providing digital banking services, cooperating with Moca company in providing digital payment services; Military Commercial Joint Stock Bank (MB) cooperates with a fintech company to create technology that allows users to make transactions right in Facebook's Messenger application; the small-value money transfer service model of the Joint Stock Commercial Bank for Foreign Trade of Vietnam (Vietcombank) on the basis of cooperation in using the network of telecommunications agents of Mobile Online Joint Stock Company (M_Service) in rural areas; MB's money transfer service model on the basis of cooperation in using the network of the Military Telecommunications Corporation (Viettel) in rural, mountainous and island areas...

The cooperation is considered monotonous because fintech companies have only focused on developing in the field of electronic payment, few businesses are licensed by the SBV to provide payment intermediary services. The development stage of fintech and digital banking in Vietnam is still in the early stages of development, so the demand for cooperation between the two sides is not high. In addition, the lack of openness to cooperation from financial institutions and traditional banks in the field of fintech stems from the psychology of apprehension, not seeing the need to cooperate to expand the market. Meanwhile, cooperation with fintech companies can make banks face potential risks because fintech activities in Vietnam contain many risks such as: Legal risks because currently the legal system does not have specific regulations on cooperation between fintech companies and banks; risks of customer information security.

4. Digital transformation trends in the world, opportunities for Vietnam's banking industry

The trend of digital transformation in the world is becoming more and more obvious, businesses around the world have had a marked change in perception. Especially during and after the COVID-19 pandemic, digital transformation is gradually becoming a familiar concept and an inevitable trend to be able to develop and survive. According to Microsoft's research in the Asia-Pacific region, digital transformation contributed to GDP in 2019 was 25% and by 2021 it will be 30%. McKinsey's research results also show that, by 2025, digital transformation will contribute to US GDP to about 25%, with Brazil at 35%, and in European countries at about 36%. According to McKinsey's survey of 2,260 businesses in Southeast Asia and India (2022), in the next 3 years, about 70% of businesses will convert to digital sales platforms. With that shift, it is expected that by 2025, revenue from digital platforms will account for about 69%, while revenue from traditional channels will decrease to 31%.

For the banking sector, the digital transformation process has taken place extremely strongly, from the original traditional banking model, the world has gone through steps towards digital banking (digitizing customer processes and journeys); open banking and further (banking as a service); decentralized finance (application of Blockchain technology). Currently, the world is starting to participate in the formation of Metaverse banking - Metaverse Banking, also known as "digital space banking", is the next generation of the internet, combining the physical world and the digital world.

In the face of the continuous trend of digitalization in the world, it can be seen that the potential for digital transformation with the banking industry in Vietnam is not small.

Firstly, the large population, young structure and high internet/smartphone penetration. According to the latest data from the United Nations, as of December 8, 2022, Vietnam has 99.3 million people, ranking 15th in the world in the population ranking of countries and territories with a young population structure, with an average age of 33.3 years. Therefore, access to high technology, the percentage of the population using

smartphones is increasing rapidly. According to estimates by the Vietnam Internet Association (VIA), as of September 2022, Vietnam has about 70 million Internet users, accounting for 70.3% of the total population. With this figure, Vietnam is the country with the 12th highest number of Internet users in the world and ranks 6th out of a total of 35 countries and territories in Asia. According to Statista's statistics, Vietnam is in the top 5 countries with the most digital asset owners in the world in 2021. This shows that Vietnam is a potential market in the development of digital banking.

Secondly, the legal corridor is gradually completed with guidelines and policies throughout from the central government to ministries, branches and localities. Resolution 52-NQ/TW of the Politburo dated September 27, 2019 on a number of guidelines and policies to actively participate in the fourth industrial revolution; Resolution 50/NQ-CP dated 17/4/2020 promulgating the Government's action program to implement Resolution 52-NQ/TW; Decision 749/QD-TTg dated June 3, 2020 on approving the national digital transformation program to 2025, with a vision to 2030; Decision 2289/QD-TTg dated 31/12/2020 on the National Strategy on Industry 4.0 to 2030; Decision No. 810/QD-NHNN dated May 11, 2021 approving the Digital Transformation Plan of the Banking Industry to 2025, with a vision to 2030; Decision No. 1813/QD-TTg dated 28/10/2021 on approving the Scheme on development of non-cash payment in Vietnam in the period of 2021 - 2025; Directive No. 02/CT-NHNN dated January 13, 2022 on promoting digital transformation and ensuring information security and safety in banking activities; The Prime Minister's Decision No. 689/QD-TTg dated June 8, 2022 approving the Scheme "Restructuring credit institutions associated with the handling of bad debts in the period of 2021-2025", which sets out the goal of developing digital banking models, increasing utilities, customer experience and achieving the goal of financial inclusion, etc sustainable development, upgrading and development of payment infrastructure, commercial and commercial center services; These policies and orientations have created an important premise to help promote Vietnam's banking industry to be more active in the current digital transformation trend.

Third, the great thrust comes from both the supply and demand sides. On the supply side, credit institutions in Vietnam consider digital transformation as one of the strategic focuses, accelerating investment in digital technology to automate business processes to help reduce costs and time, and at the same time launch increasingly convenient products on digital platforms. faster, safer and more suitable for customers. According to the announcement of the State Bank of Vietnam (SBV), in 2022, many banking operations such as opening payment accounts, money transfer payments, deposits, and savings deposits have been fully digitized 100%. On the demand side, Vietnam's GDP is growing quite fast (an average of nearly 6% in the 2016-2020 period and forecast about 6.5-7% in the 2021-2025 period. The National Committee on Digital Transformation signed Decision 27/QD-UBQGCĐS dated March 15, 2022, which sets the goal for digital infrastructure development in 2022 is that the percentage of the population with smartphones reaches 85% along with 75% of households with broadband fiber optic internet lines. Moreover, the number of people who have not yet accessed financial services, especially digital finance in Vietnam, is still large. This is a large source of potential customers that banks implementing digital transformation can exploit.

The current situation of digital transformation in Vietnam's banking system

Firstly, the digitization of banking activities has reached the 2nd level. There are 3 main levels of digitalization for banks, including: digitization of customer communication channels, digitization of business activities, and pure digital banking. Up to now, it can be seen that Vietnamese banks have moved towards level 2 digital transformation. This is reflected in the following two clear proofs:

Banks invest heavily in new technologies, core banks to serve digital transformation. Some banks have pioneered providing digital services to customers from a very early age, such as: Vietcombank started with the Internet Banking version for individual customers and the VCB-Money system for institutional customers since 2001; VietinBank replaced the CoreBanking system (Core SunShine) and deployed EDW enterprise data warehouse since 2017; VPBank built YOLO digital bank with its own Core banking system, separate from the current system in 2018;... That process continues continuously, some recent examples such as: BIDV completed the construction of modern infrastructure for Open API - BIDV SmartConnect in September

2022 with a speed of up to 5,000 transactions/second, connections and sharing are secured at many levels; Agribank launched the Digital Banking model - Agribank Digital in August 2022;...

There are quite a lot of modern and breakthrough technologies that have been applied by banks into operation. Modern technologies can be mentioned such as: (i) Electronic payment solutions with electronic payment gateways, cards or e-wallets are becoming more and more familiar and gradually becoming popular; (ii) Blockchain technology, in which BIDV pioneered the application of Blockchain in trade finance, becoming the first Vietnamese bank to successfully apply Blockchain technology in the issuance of letters of credit to a bank notifying outside the system; followed by MB, VPBank, Vietcombank,... have applied Blockchain in a number of financial transactions. (iii) Application of artificial intelligence (AI), for example: BIDV Smart Banking applies AI to launch a digital transaction space and put robots into use (in 2019); VIB combines AI technology with Big Data processing technology into the credit scoring and credit card limit approval process (end of 2020); SHB launched a SAHA robot – assistant to directly serve customers at the headquarters (March 2022); (iv) Biometric technology (voice, face, fingerprint, iris recognition) with TPBank with LiveBank application (6/2022), many other banks have also applied such as: BIDV, VietinBank, VIB... Vietcombank applies both biometric technology and a new technology, Push Authentication, to launch VCB Digital digital bank from 2020; (v) Increasing emphasis on data-based decision-making: VPBank applies IBM's data analysis technology to synchronize customer data, support customer behavior analysis from 2015, January 2021 launched the digital bank Cake by VPBank, by April 2022 there were 1.6 million customers; BIDV established the Data Management Center at the end of 2020; KienLongbank signed a strategic cooperation agreement with BPC Banking Technologies to provide a suite of SmartVista products to manage the entire ATM and POS system (April 2022). In particular, from the beginning of 2022, VIB has started to deploy activities on the Metaverse, through cooperation with the virtual reality platform Bizverse World to establish VIB showroom. Customers can visit this virtual VIB showroom, register and can immediately receive a real credit card within 15-30 minutes with a limit of up to 200 million VND.

Secondly, banks are transforming digitally very actively. Digital banking has become an important part of the business strategy of many banks. Banking ecosystems are gradually forming. A standard banking ecosystem will consist of 3 service layers: The core banking service layer includes basic services such as: payment, credit, investment, trade finance, etc.; The banking ecosystem service class includes services such as: spending management, education, discounting, accounting, tax management, etc.; Non-banking ecosystems include services such as healthcare, housing, telecommunications, securities, etc. In Vietnam, the services in the banking ecosystem are providing focusing on the core banking service layer and some banking ecosystem services. In particular, banks leading in digital transformation such as: Vietcombank, BIDV, VietinBank, VPBank, Techcombank, TPBank... It can be said that the banking ecosystem has been formed and gradually improved. For example, Vietcombank has succeeded in connecting directly with the customer's ERP system; connecting the provision of level 4 public services with the National Public Service Portal, the State Treasury, Social Insurance, hospitals, transport, tax portals for foreign suppliers,...; continuously expanding cooperation and connecting with payment intermediaries and Fintech in the market; BIDV is also increasingly perfecting its digital ecosystem with BIDV SmartBanking and BIDV iBank,... Most of the rest are other banks such as: Agribank, Sacombank, HDBank,... products and services in digital applications are still limited to the core banking service layer.

Banks have made changes in the organizational model for the development of digital banking, in which: (i) For banks with small shares, they often tend to choose the model of establishing new business segments or establishing pure digital banks, For example: VPBank established the Banking Digitalization Center (Digital Lab) along with the development of the Timo model - a model without traditional bank branches (in 2017); LienVietPostBank piloted a smart digital transaction office with digitized procedures (10/2021);.... (ii) For large-scale banks, mainly state-owned commercial banks, are aiming for model No. 1 – digital transformation on the basis of current business activities such as BIDV, Vietcombank, ACB,... has made great strides in the organizational model of establishing the Digital Banking Center and the Data Management Center.

Thirdly, non-cash payments achieved high growth. According to the latest data of the SBV, in the first 6 months of 2022, commercial mall transactions increased by 69.7% in volume and 27.5% in value; transactions via the internet also increased by 48.39% and 32.76%, respectively; via mobile phones increased by 97.65% and 86.68%, respectively; via QR code increased by 56.52% and 111.62% respectively over the same period in 2021. As of the end of June 2022, there were nearly 5.5 million accounts opened by online method (eKYC) in operation; nearly 8.9 million cards opened by eKYC are in circulation and about 123 million payment accounts; the number of transactions on the Internet Banking channel increased by nearly 48% compared to 2021 and the transaction value increased 13 times (from VND 812 trillion to nearly VND 11 million billion); the number of transactions and transaction value on the mobile banking channel also increased by 100%. The total number of activated e-wallets increased by 10.37% compared to the end of 2021. The number and value through the bank's digital transaction channel have grown very positively. According to information from the Payment Department, SBV, in the first 8 months of 2022, transactions through the interbank electronic payment system increased by 7.24% in volume and 33.21% in value over the same period in 2021. Many credit institutions assess a high level of readiness for the application of popular technologies. For customers, up to 95% of the bank's transactions have been carried out on digital channels. The transaction cost on digital channels has decreased greatly compared to traditional channels.... Up to now, 90% of the bank's records have not used papers in business processes. According to the SBV's forecast, the value of mobile payments in Vietnam is expected to increase 4 times, from 16 billion USD in 2016 to 70.9 billion USD in 2025.

Although the emergence of the COVID-19 pandemic has negatively affected the economy, it is undeniable that this is one of the reasons that motivates people to increase the use of digital banking services. Specifically, during the period of social distancing, online shopping increased sharply and along with it the development of cashless payment methods via bank transfer, via e-wallets linked to e-commerce platforms, etc. So far, even after the lockdowns have been lifted, customers have maintained this payment habit.

Fourth, Fintech and Bigtech are facilitated to develop, actively participate, both compete and cooperate with banks, contributing to accelerating the digital transformation of the banking system. For Fintech, the SBV has granted licenses to provide payment intermediary services to 48 non-bank organizations, including more than 40 e-wallet service providers. According to statistics of the SBV as well as the Vietnam Fintech Market Report 2021, the number of Fintech companies has increased 4 times, from 39 companies at the end of 2015 to more than 154 companies at the end of 2021. Among Fintech companies in Vietnam, about 70% are startups. According to an announcement by Temasek and Bain & Company on October 27, 2022, Vietnam achieved the highest digital economy growth in Southeast Asia: the total value of goods in 2022 is expected to increase by 28% thanks to the growth of 26% of e-commerce over the same period last year; 60% of digital consumers; 55% of digital consumers are willing to pay an additional 5% for sustainable products or services; e-commerce has attracted 230 million USD of investment capital in the first 6 months of 2022, becoming the most popular investment field; 90% of digital consumers plan to maintain or even increase their use of e-commerce platforms in the next 12 months. According to the assessment of Robocash Group (in 2022), Vietnam's Fintech market is having the second fastest growth rate in the region, after Singapore, which is expected to reach 18 billion USD by 2024 with a high level of competition. Vietnam is also rated as No. 1 in the world in terms of the global cryptocurrency acceptance index in 2022. For Bigtech, currently, large technology companies in Vietnam (FPT, Viettel, CMC, VNG, VC Corp...) or Vingroup, Grab... with a huge number of users who have been approaching the financial services segment through the development of electronic payment technology.

The trend of Open Banking helps customers use the bank's products from many different applications in addition to digital banking applications, and at the same time helps banks reach a variety of customers at reasonable costs through other applications of partners. OCB is a pioneer in implementing an open banking model with an open application programming interface (API) platform at the end of 2019 with 30 APIs so that partners can connect the OCB system to the ecosystem. VietinBank also launched iConnect - an Open

Banking platform in 2019, providing more than 100 APIs and having connected with more than 60 partners via APIs at the time of launch, this number has now doubled. Other banks such as BIDV, Vietcombank... has also initially built and implemented the provision of Open API to partners. Nam A Bank brings users and customers the Digital Banking Open Banking version 2.0 with a modern and different interface. In general, banks are increasingly expanding cooperation and connecting with technology and Fintech companies to catch up and take advantage of business opportunities from digital platforms.

In addition, the trend of banks cooperating with Regtech, Suptech, and Proptech has also begun to be implemented in Vietnam in different forms, in which Regtech is the application of information technology to support legal enforcement for financial institutions (Regtech for Financial Institutions); while Suptech is the application of information technology to support legal enforcement for management and supervisory agencies (Regtech for Supervisors), Proptech is the application of information technology and basic economics to the real estate market, referred to as real estate technology for short.

5. The current situation of digital technology application in banking activities In the

Digital transformation strategy, commercial banks actively transform digitally both in terms of customer communication channels and internal operations. The majority of banks have applied new technical and technological solutions such as: Cloud Computing, data analysis, Big Data, process automation by robots, AI, ML, Blockchain to recognize and identify customers by eKYC, etc. in professional activities and providing products and services to improve operational efficiency and increase customer experience. In particular, Big Data and AI technology is the most applied by banks and fully utilizes the analysis of customer behavior and needs to help optimize and personalize the provision of products and services. Here are some advanced technologies that have been tested or applied to banking activities such as: *Big Data:* Allows people to earn and store a huge amount of data. If the previous technology took a very long time to process data, for today's digital technology, it allows processing and analysis in a very short period of time to extract information and make appropriate decisions (Truong Dinh Dung, 2022).

IoT: It is a combination of the Internet, microelectronics technology, and wireless technology. The Internet helps connect supporting devices such as smartphones and computers to exchange and share data in real time. IoT describes everyday physical objects that are connected to the Internet and can identify themselves with other devices, thanks to increasingly small, low-cost, and low-energy sensors. IoT plays an important role in connecting the real environment with the digital environment (Nguyen Thanh Thu, 2021). *AI/ML:* Will help automate tasks that previously required human intelligence, mainly based on huge data sources analyzed with greater security. ML makes machines capable of self-learning like humans. Due to the increasing data and faster computing power, ML is breakthrough in deep learning techniques such as visual recognition, voice recognition, decision-making, etc. For the banking sector, AI has been applied more and more strongly and will continue to develop with Chatbot/Chatbox applications, data collection and analysis, risk management, anti-money laundering, etc. (Truc Linh, 2021; Nguyen Thanh Thu, 2021). Cloud Computing: Allows users to use information storage services thanks to providers such as Google, Microsoft, Amazon. All data is stored, organized, and organized on the systems of service providers. Banks can implement marketing automation strategies based on this technology platform to save costs, minimize security risks, and optimize bank resources. Cloud Computing allows banks to provide services to customers continuously every day, through any device with an Internet connection (Manh Vy, 2010).

In addition, a number of other digital technologies have been tested by commercial banks, supporting system upgrades, creating new products and services such as DLT and Blockchain technology, connecting to Fintech, biometrics, and cybersecurity.

Recognizing the importance of digital technology for banking activities, commercial banks have applied technical solutions and new technologies to professional activities and provided products and services to improve operational efficiency and increase customer experience. Commercial banks have invested in technological innovation and developed sales channels through digital technology such as Internet Banking, Mobile Banking, etc. Most commercial banks have used Core Banking, many banks have upgraded the Core

Banking system to meet development requirements such as: Joint Stock Commercial Bank for Foreign Trade of Vietnam (Vietcombank), Joint Stock Commercial Bank for Import and Export of Vietnam (Eximbank), Joint Stock Commercial Bank of Vietnam Prosperity (VPBank)... In fact, a series of digital products and services are brought new experiences by commercial banks to customers, creating a competitive advantage in the market. Tien Phong Joint Stock Commercial Bank (TPBank) launches 24/7 automatic "Live Bank" service, Vietnam Joint Stock Commercial Bank for Industry and Trade (VietinBank) launches iPay Mobile version with 50 new features, speed and high security.

In order to meet customer expectations, traditional banks have integrated digital technology into business activities, and at the same time taken advantage of innovative and creative business models. Some initial results were recorded from the application of digital technology to banking activities, creating a new experience for customers such as:

Application of AI, ML, Big Data technology: A number of AI technology applications have appeared in internal operations such as: Management system, credit activities, Chatbot, Marketing... Some banks have applied a combination of AI, ML and Big Data technology to evaluate, classify customers and decide on disbursement... helping to simplify processes, procedures and shorten transaction time with customers.

VCB-Mobile Banking (Vietcombank), BIDV Smart Banking (Joint Stock Commercial Bank for Investment and Development of Vietnam - BIDV) applied AI to launch a digital transaction space and put robots into use. In addition, TPBank and International Joint Stock Commercial Bank (VIB) integrate AI technology in the Chatbot/Chatbox application to support chat and interact with multi-channel customers: Facebook, Instagram, Website, Zalo... Customers can easily interact and manage customers across channels on a single screen. In particular, VIB combines AI technology with Big Data processing technology into the credit scoring and credit card limit approval process. For biometric technology: TPBank is the first bank to successfully apply biometric character recognition technology to recognize faces with the LiveBank application, many other banks have also applied such as: BIDV, VietinBank, VIB...

Vietcombank applies both biometric technology and a new technology, Push Authentication, to launch a brand new VCB Digital digital bank for individual customers, replacing Internet Banking and Mobile Banking services.

A number of other technologies have also been researched and tested by commercial banks and put into operation such as Cloud Computing technology, VPBank applying a cloud platform (Amazon Web service Cloud) to launch a digital bank called Yolo. In addition, Lien Viet Post Joint Stock Commercial Bank (LienVietPostBank), VietinBank, Saigon Joint Stock Commercial Bank (SCB), Asia Joint Stock Commercial Bank (ACB) have applied ledger technology to record detailed transactions (accounts, customers, products...) for the goal of multi-dimensional analysis of income, etc costs, profits... according to the requirements of administration and administration. In addition, Blockchain technology is also being tested and gradually put into application such as: HSBC successfully implemented letter of credit (L/C) transactions, Ho Chi Minh City Development Joint Stock Commercial Bank (HDBank) applied Blockchain technology to participate in connecting and processing trade finance transactions. Another technology that is always mentioned as an essential technology for banks to transform digitally is electronic customer identification (eKYC) technology, most commercial banks have implemented this technology, typically such as: TPBank, VPBank, HDBank, LienVietPostBank...

In addition, commercial banks also strengthen cooperation with Fintechs to provide digital products and services based on multi-channel platforms to ensure a rich experience for customers (the combination of Vietnam Technological and Commercial Joint Stock Bank (Techcombank) and Fastcash Company, VIB and Vietnam Weezi Digital Company, VietinBank and ON Company (UK), BE GROUP (Sweden)...). It is thanks to the support of Fintechs that many digital models and products have emerged such as: Mobile Wallet, Peer-To-Peer Transfer, Mobile Payment, Mobile Banking, Peer-To-Peer Lending. Companies engaged in payment activities, providing customers, retailers with online payment services or digital payment solutions.

In general, the majority of commercial banks in Vietnam have applied digital technology to internal and professional activities, creating a new experience for customers. Channels of interaction and access to customers are based on digital technology. As a result, the number of customers participating in payment transactions via mobile phones (an average growth of 87%/year in transaction volume and 140%/year in transaction value in the period 2015 - 2021) and the Internet (an average growth of 44%/year in transaction volume and 41%/year in transaction value in the period 2015 - 2021) increased rapidly (Tran Hoang Anh, 2021). However, due to limitations on the level of technology investment and digital transformation strategies, the application of digital technology is only implemented at some pioneering banks, and the level of technology application is still low. Digital banking products and services, e-wallets... are not diverse in types. Practice shows that a series of digital products and services are launched by commercial banks to bring a different experience for customers and above all, create a competitive advantage in the market, and also show the positivity and initiative of commercial banks in implementing legal regulations on the application of digital technology in business practices. In order to provide banking services based on modern technology, the safety factor must be the top priority. The integration process between technology and banking operations needs to be carried out cautiously and invest heavily.

Along with opportunities to develop the application of digital technology in banking activities or cooperate with Fintechs. In Vietnam, the application of digital technology still has many challenges, requiring continued research and improvement of the legal framework, especially electronic transactions, electronic signatures, electronic contracts, electronic identification and authentication, management and supervision mechanisms for Fintechs, etc. as well as ensuring safety and security against the increasing trend of crimes in the cyber environment with many increasingly sophisticated and complex tricks.

The application of digital technology to banking activities is not only due to the involvement of Fintechs, but many commercial banks have been gradually transforming and operating on modern technology platforms such as BIDV, VietinBank, TPBank, etc. meet customer service requirements quickly and smoothly. However, for some countries in the region, the number of Fintechs in Vietnam is still quite small, in the country there are only about 150 Fintechs participating in payment activities, providing online payment services or digital payment solutions, meanwhile, Singapore has more than 1,157 companies, Indonesia has 511 companies, Malaysia has 376 companies, Thailand has 216 companies (Trong Duc, 2021). Another concern is that the application of Fintechs operates on customer databases. Therefore, the possibility of customers' personal information and data being stolen or disclosed to other subjects is completely present. Therefore, the application of digital technology to banking activities is very necessary to have a full legal corridor to create a favorable environment for Fintechs to invest in the banking sector, avoiding the phenomenon of legal corridors not keeping up with the actual requirements of life.

An important issue of applying digital technology to banking activities is the threat of cybersecurity, security issues in the online environment, as well as user awareness of security issues. Cybersecurity is not only limited to data theft and financial fraud, but also a national security issue. Although there are many legal documents issued in the country such as the Law on Information Technology, the Law on Cyber Information Security, the Law on Cyber Security... however, there is still a lack of regulations on the protection of personal data and private information; rights and ethics issues when applying AI. Therefore, the study and promulgation of relevant legal regulations is a useful step in strengthening the psychology of peace of mind in consumers.

6. Some solutions to improve the efficiency of the application of digital technology to banking activities in Vietnam

Vietnamese banks need to focus on building a solid technology infrastructure for Big Data applications. Accordingly, in order to process and analyze Big Data effectively, investment in technology infrastructure is essential. Banks need to build and upgrade their information technology infrastructure, including server systems, data analysis software, data storage solutions, focusing on investing in cloud technology. This is also considered an effective solution, helping to reduce the initial investment cost and provide flexible scalability. In addition, banks also need to focus on updating new technologies and improving the system regularly.

Applying new technologies such as AI and machine learning to data analytics will help banks optimize processes and improve their predictive capabilities5. Banks should also cooperate with technology providers to update advanced solutions and ensure that the system always operates stably and efficiently.

Vietnamese banks need to promote investment and supplement financial resources by establishing a specific and clear budget management strategy. In addition, it is necessary to look for innovative solutions to save costs. One feasible option is to invest in internal research and development to develop its own Big Data technology solution, thereby minimizing dependence on foreign businesses. This can include collaborating with research institutes, universities, or technology companies in the country to develop solutions that are tailored to the needs and conditions of the Vietnamese market. In addition, banks can also consider taking advantage of support programs from the Government or international financial institutions to reduce the financial burden. In this way, the bank not only cuts costs but also improves competitiveness and optimizes operational efficiency through the application of Big Data more effectively.

The law needs to have more complete regulations aimed at strengthening the level of security and management of customer information data. Data security is an important factor in the application of Big Data to banking activities as stipulated in Article 38 of the Law on the State Bank of Vietnam and Article 13 of the Law on Credit Institutions 2024, however, there are still some inadequacies when deploying Big Data applications. when banks implement Big Data applications, it means that customers' personal information is digitized and stored in the algorithms of the data source. This is a major concern for cybersecurity criminals who intend to collect information to be used for malicious purposes. Therefore, it is necessary to have more specific and stricter additional regulations for the application of Big Data to banking activities in Vietnam based on the existing basic regulations. In addition, banks also need to take coordinated actions with relevant units in establishing and maintaining strict data security policies to protect customers' information from threats such as cyber attacks and data leaks. This includes implementing advanced security solutions such as data encryption, intrusion detection systems, and risk management tools.

Continue to improve the legal framework to facilitate banking digital transformation activities; reviewing and amending legal regulations on data connection and exploitation, on ensuring security, safety and confidentiality in e-banking activities, applying biometric authentication measures, etc.

Continue to build and improve technological infrastructure for the supply of digital products; strengthen integration and connection with other ministries, branches, localities and fields to provide banking products and services on digital platforms suitable for each region. In addition, the banking sector continues to closely coordinate with the Ministry of Public Security and relevant ministries and branches to accelerate the implementation of the Prime Minister's Project 06, bringing specific results on the application of the National Population Database in products, banking services.

Simplifying and optimizing processes and operations, focusing on improving customer experience, strongly applying digital technology to develop and provide safe and convenient products and services associated with ensuring information security for information technology systems and digital banking services, etc digital payment; promote international cooperation in the field of digital transformation to develop and receive new technologies into banking activities.

Promote information, propagation, raise awareness and understanding for customers and people about using banking services on digital channels in a safe and appropriate way; helping customers have the knowledge and skills to protect themselves from risks when trading in the electronic environment. At the same time, continue to closely monitor the development of innovative business models and solutions in the industry to promptly take measures to ensure security, safety, legitimate rights and interests of customers.

Focus on training and improving the quality of high-quality human resources, especially the leading leaders and experts; training cadres to grasp scientific and technological advances and apply them to the practice of the banking industry./.

4. CONCLUSION

The application of Big Data in banking activities in Vietnam brings many important benefits, including improving risk management and fraud detection to enhancing customer experience. However, to take full advantage of the potential of Big Data, banks need to overcome current challenges such as lack of technological infrastructure, tight financial resources, unmet human resources, and security issues that are not really guaranteed. To solve these problems, banks need to invest heavily in information technology, have effective financial management strategies, develop high-quality human resources, and improve security regulations. These efforts not only help improve the quality of banking activities but also improve the quality of services, maintaining competitiveness in the increasingly developing financial market. An assessment of the development status of digital banking in Vietnam shows that Vietnam's digital banking is at the stage of formation and the development potential of digital banking in Vietnam is relatively large, stemming from market demand, development orientation of the banking industry and financial integration, etc therefore, the trend of digital banking development in Vietnam will follow the trend of digital banking development in the world. However, the development of digital banking in Vietnam is facing challenges from the policy gap that has not kept up with the level of financial technology development, the shortage of high-quality human resources, and consumer protection in the field of digital banking has not been taken seriously. issues of privacy and personal information security are also one of the major barriers to the implementation of digital banking development solutions in Vietnam.

Research on the experiences of a number of countries (Singapore, India, China, South Korea, ASEAN countries, European Union) on digital banking management and development policies shows that all countries have policies friendly to digital banking development. Policies to create an environment for the development of digital banking include policies to create an information platform, a national citizen database, regulations on the electronic customer identification process and complete supporting infrastructure. In addition, countries have also issued programs and action plans to encourage the development of online payments, the development of fintech financial technology, policies related to human resources, user safety protection, and improving cybersecurity. The common point is that the policies aim to create an environment to promote the development of digital banking, on the basis of creating an equal environment for competition, encouraging innovation and protecting consumers.

With the current situation of digital banking development, Vietnam can apply a number of solutions to create an environment for digital banking development, focusing on completing the legal framework for digital banking development, building infrastructure and data, enabling electronic customer identification, etc upgrade and complete regulations on cyber security and protection of consumer rights in the field of financial services, implement solutions to develop non-cash payments, improve education and popularize financial literacy.

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