Application of the Internet of Things in Banking Activities

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SUMMARY: Internet of Things (IoT) technology has been of great interest in the banking sector in recent years. In order to keep up with digital transformation, commercial banks have been implementing many IoT projects, accelerating the digitalization process. The article is based on research on IoT, practical statistics in the industry and data at commercial banks in Vietnam. To understand IoT technology and how the banking industry approaches this technology. How has the Internet of Things helped commercial banks in the technology race and what benefits does it bring to customers using the service? In addition, the research paper also addresses the challenges that IoT is currently facing. Thereby, we propose a few recommendations to contribute to improving and solving those challenges.

KEYWORDS: IoT, digital transformation, banking activities.

1. INTRODUCTIONS

In the era of comprehensive digitalization, the convergence of financial technology (Fintech) and network connectivity has created remarkable changes in the role of banks in the economy. In particular, the complicated developments of the Covid-19 pandemic since 2020 have led to many consequences for the economy in general and the banking industry in particular, forcing the system to shift from the traditional banking model to digital. to adapt to social distancing.

In Vietnam, commercial banks have strongly applied modern technologies to develop their systems, the Internet of Things (IoT) has gradually become a popular technology and brought a breakthrough in digitalization. IoT is not just an abstract concept of connectivity, but also the realization of smart devices being able to exchange information and interact with each other to bring services and customer experiences. better. At the same time, increase data management efficiency in an open and networked environment.

At the conference "Data connection, smart payment to promote socio-economic development" held on June 16, 2023 in Ho Chi Minh City, based on achievements after two years of implementing Decision Decree No. 1813/QD-TTg dated October 28, 2021 of the Prime Minister on the goal of developing E-commerce and Digital Commerce (TTKDTM) in Vietnam in the period 2021-2025 , stating the percentage of people owning Bank accounts have reached over 75%, non-cash payments have reached more than 7.59 billion transactions with a value of nearly 219.5 million billion VND. This is an impressive number, an increase of 89% in number of transactions and 32% in value. The growth rate of mobile payment channels, Internet and QR codes reaches over 100% each year. Furthermore, many banking services have been performed entirely on digital channels with simple and quick processes. Another important part is the design of appropriate banking services for remote areas (Phuong Linh, 2023). From general numbers across the country, we conducted this study with the aim of showing how commercial banks in Vietnam approach IoT, specifically apply IoT and combine it with other technologies. in the general development of the banking system in Vietnam, thereby drawing out achievements, limitations and recommending some specific solutions.

2. GENERAL THEORY ABOUT THE INTERNET OF THINGS

2.1. Concept of Internet of Things

IoT (Internet of Things) is based on combining diverse processes such as identification, sensing, networking and computing that enables large-scale technological innovation and services that facilitate individual user interactions. with "things". (Alem Čolaković & Mesud Hadžialić, 2018)

According to Pham Xuan Hoe and colleagues: "The Internet of Things (IOT - Internet of Things) - is the connection of production processes and production factors (people, machines, raw materials) in the environment. Internet and high technology school; These cyber-physical systems interact with each other and with humans in real time; Then, through the Internet of Services (IOS - Internet of Services), users will participate in the value chain by using these services." (Pham Xuan Hoe et al., 2016)

2.2. Characteristics of the Internet of Things

"Things" connectivity through the Internet: It is a system built to link any related object, using wireless connection technologies. From here, "things" can interact and exchange data and information with each other to perform tasks through interaction with users.

Sensor capabilities: Sensors are integrated and connect "things" together, allowing them to perform the ability to communicate, exchange, process and analyze data information from interactions and behaviors. of humans was previously recorded through its own identification, thereby bringing intelligence to these objects.

Interoperability: This is the ability to connect, communicate, and interact with other devices, objects, and systems through communication protocols. This allows the system to collect data, transmit information and receive commands from users or central systems to perform tasks and control automated devices.

Ability to self-configure: In the Internet of Things, each device has a different configuration and system. The connection of the device is mainly based on the connection of the system and the ability to self-identify and be compatible with the hardware and the ability to automatically update the software from the supply source. This feature allows the system to expand strongly and helps the entire system achieve high performance.

Programmability: This allows "things" in IoT systems to perform different, customized behaviors and react based on user decisions or environmental conditions without the need for structural changes general of the system. (Bach Tan Sinh & Duong Khanh Duong, 2020)

2.3. Benefits of the Internet of Things for the banking industry

Create a strong link between the banking system and customers: Thanks to the ability to collect data from customers through sensor devices, banks will have a clear view of how customers interact with the system finance. Thanks to this, the bank can provide optimal support in making financial decisions. Understanding trends will also help in personalizing the experience to suit customer requirements.

Improve data storage and analysis efficiency through IoT: Sensor devices in the IoT system allow real-time data collection and storage on a centralized data system. This means that when there is a transaction, the bank will immediately record and store thousands of data almost immediately. This ability allows banks to improve the analysis process and make decisions in credit appraisal or risk assessment,...

Providing the ability to interact and connect devices: IoT helps banks interact effectively with smart mobile devices, opening up diverse and flexible communication capabilities. Connectivity through IoT helps create a seamless connectivity environment, allowing access and management anywhere and on any device with an Internet connection. Banks can develop direct communication channels via applications or smart wearable devices to make it convenient for customers when they need support or perform transactions. (Chau Dinh Linh, 2018)

2.4. Basic Internet of Things model
2.4.1. Key components of an IoT model

Data connectivity and standardization: A "software" interface integrated with different protocols and data formats ensures data transmission and interaction with the device.

Device management: Ensuring connected "things" operate correctly and seamlessly, updating and patching system software and applications.

Database: The device has the capacity to store and scale to meet cloud-based database requirements and ensure volume, variety, speed and authenticity.

Processing and management: Perform "smart" actions based on sensor data.

Analytics: Conduct a range of complex analytics from basic data clustering and deep learning to prediction and value extraction.

Visualization: Visually describe data through line charts, 2D, 3D models,...

Additional tools: Enables IoT system prototyping for simulation testing.

External interfaces: Integrate with third-party systems and the entire ecosystem through built-in application programming interfaces (APIs), software development kits (SDKs), and communication gateways . (Knud Lasse Lueth , 2016)

2.4.2. Some basic models

Automated financial transactions: Using devices to allow customers to perform financial transactions such as withdrawing money, transferring money and checking balances, paying for goods and services via smart cards or devices intelligently without the need for staff intervention.

Automatic asset management: Sensors will monitor behavior and transactions, then analyze and provide forecasts to users to optimize asset usage efficiency.

Smart customer care: Automated communication system to take care of customers through online channels on mobile applications, websites, and other communication platforms based on needs through collection and Analyze customer data continuously.

Smart credit and risk assessment: Uses data from connected devices to evaluate customers' financial situation through continuously updated financial transaction history. From there, evaluate the risks in granting credit.

Surveillance and security: Use sensors and surveillance devices to monitor, protect and warn when detecting unusual activities affecting bank assets, from facilities, personnel employees and customers to the bank's important data system. (Ly Thu Trang & Pham Tung Huong, 2021)

3. CURRENT STATUS OF INTERNET OF THINGS APPLICATIONS AT VIETNAMESE COMMERCIAL BANKS

3.1. Some Internet of Things applications at Vietnamese commercial banks

3.1.1. Developing ATM 2.0 system

IoT helps create a flexible connection environment for devices and sensors in the ATM system to develop ATM 2.0 or Smart ATM. This allows ATMs to provide better and more efficient services such as cardless transactions, providing transactions like a traditional bank. In addition, using IoT also helps ATM 2.0 perform remote inspection, maintenance, and management functions effectively. By collecting and analyzing data from connected devices, banks can easily predict and detect problems for timely repairs.

Combining IoT applications and biometric technology significantly reduces the possibility of fraud, increases security and speeds up transactions exponentially. (Do Thi Kim Hao & Nguyen Thi Viet Ha, 2021) Accordingly, a smart device can request to connect to an ATM to perform authentication. The system will record biometric samples, digitize and store them in a central database system along with other identifying information for comparison and retrieval when necessary (Tran Thi Thu Ha, 2014).

In Vietnam, in early 2017, Tien Phong Commercial Joint Stock Bank (TPBank) launched the TP LiveBank smart banking chain and deployed 86 computers by 2018. After 4 years of development, 443 Livebank points has been newly opened with a network covering 45 provinces and cities nationwide by the beginning of 2023. The number of active customers increased 4.5 times from the beginning of 2017 to the end of 2022, an increase of 3,000 times. 5 million customers in just 5 years. According to previous records, it took TPBank 11 years to get the first 3 million customers. During the same period, TPBank's total customer deposits also increased from VND 76 billion to VND 195 billion. In 2022, the customer mobilization rate will reach 39.7%, a sharp increase compared to previous years of only about 20%. (TPBank, 2023)

At Military Commercial Joint Stock Bank (MBBank), the MB Smartbank model was deployed at the end of 2020. By the end of 2022, MBBank had operated 52 MB Smartbank along with 373 CRM machines nationwide. In addition, the user experience on ATM/CRM is also improved thanks to redesigning the interface and reducing operations by 50%. In 2022, a sharp increase in scale to 60 million Autobank transactions (including MB Smartbank and ATM) will be recorded, achieving a growth of 40% compared to 2021. (MBBank, 2023)

At the end of 2021, Nam A Commercial Joint Stock Bank launched the Onebank Digital Ecosystem and 95 points were put into operation by December 31, 2022. Compared to the beginning of 2022, total capital mobilization at Onebank locations increased by 2,582 billion VND, demand deposits increased by 96 billion VND, and the number of active customers increased by 25,967 customers (Nam A Bank, 2023). In early June 2023, Asia Commercial Joint Stock Bank (ACB) launched the first automatic banking point ACB Lite. On July 25, 2023, ACB put into operation the second ACB Lite location in Vinhomes Grand Park, Thu Duc City, Ho Chi Minh City. (tuoitre.vn, 2023)

3.1.2. Develop transaction and payment systems

IoT along with the advancement of mobile devices has changed the way the banking system delivers services. Internet connectivity creates opportunities for distribution and expansion of service networks. In addition, online media channels also promote cashless transactions. Thanks to IoT, cardless transactions are becoming increasingly popular. Through API (Application Programming Interface) which is an "interface" between software and software (Do Thi Kim Hao, & Nguyen Thi Viet Ha 2021), customers today have the ability to make transactions at computers. ATMs, POS machines through banking applications on smartphones or mobile devices such as smart watches.

Most commercial banks in Vietnam such as Techcombank, TPBank, Sacombank, Eximbank,... provide contactless payment services using RFID or near-field communication (NFC) technology to pay at POS machines or Easily make transactions by using the application to generate QR codes. In 2022, MBBank will achieve a transaction rate on digital channels of 94.4% (MBBank, 2023), over 80% of the number of transactions of corporate customers and 97% of the number of transactions of Vietinbank's retail customers will be carried out on digital channels. (Vietinbank, 2023), ABC's transaction base in 2022 is only 6% over-the-counter transactions, 73% e-banking transactions and 21% ATM, CDM, POS transactions (ACB, 2022),...

Furthermore, from August 8, 2023, 6 commercial banks in Vietnam including ACB , MBBank, Sacombank, Techcombank, Vietcombank and VPBank have also deployed Visa card integration into Apple products providing payment solutions. contactless math. (Tra My, 2023)

3.1.3. Automate processes and improve banking services by combining big data, artificial intelligence and the Internet of Things

Big Data is the process of creating, analyzing and using huge volumes of data through digital tools and information systems. The first type is used to process large amounts of data and needs to be performed periodically, called batch processing. The second type is stream processing, which focuses on speed over short periods of time. (Nguyen Thi Hien & Pham Thu Huong, 2019). In the application of artificial intelligence (AI), machine learning systems are used to simulate human thinking abilities towards intelligence and automation. (Nguyen Thanh Binh, 2021). Most banking systems are taking a new approach towards exploiting data to develop and innovate products because as customer volume

increases, it significantly affects the level and ability to provide services.

In 2015, Military Commercial Joint Stock Bank (MBBank) implemented a project focusing on building a centralized data warehouse system and management reporting tool (Data Warehouse) that allows managing business activities, warn of risks, optimize resources, and minimize costs (My Ha, 2015). According to MBBank's report "Application of Big Data and AI in digital banking" at the end of 2021, MBBank emphasized the importance of tracking behavioral data to increase customer expectations through focusing on implementing projects. Project Customer Insight, Smart Channel, Customer Onboarding,...(MBBank, 2021). Regarding automation, MBBank implemented a multi-dimensional profit management project to help analyze operational efficiency by business unit, 100% risk management project of key software system ICAAP, PD models, LGD and EAD achieved an automatic approval rate for science and technology loans of more than 40%. In 2022, MB Bank recorded the number of MBBank App accounts reaching nearly 7 million and more than 65.5 thousand BIZ MBBank accounts, increasing the proportion of customers on digital channels to over 82% and digital channel income 2.2 times. compared to 2021 (MBBank, 2023).

Joint Stock Commercial Bank for Industry and Trade (VietinBank) has deployed Data Warehouse since 2014 and put it into use in July 2017, supporting analysis systems and providing standard data sources with a scale of nearly 40 terabytes and connecting to 25 data sources from banking operational systems. This ensures uniformity and consistency for the data (Nguyen Tuan Cuong, 2018). The project creates the foundation for technologies such as business support chatbots and RPA (robotics process automation) process automation technology. According to VietinBank's statistics, RPA has helped save up to 65% of the time in processing mortgage loan applications using savings card books for customers... Furthermore, automation has partly helped VietinBank control the CIR rate well in Vietnam. level of 29.6%. Additionally, 63% of key business activities can already be conducted entirely through digital channels and online services. (VietinBank, 2023)

Technological and Commercial Joint Stock Bank (Techcombank) begins building a "data brain" aimed at improving customer experience in early 2021. Salesforce program for customer relationship management, corporate credit assessment tool Moody's CreditLens, Finastra's Kondor for asset management, liquidity, etc. programs are all supported by cloud services. Additionally, at the end of 2021, the DevSecOps project was launched aimed at automating and improving processes. By the end of June 2022, about 66% of workloads and 91.2% of new applications had adopted this technology. Thanks to improvements to personalize experiences, the number of customers increased by 21%,

sales across products increased from 9% to 36% and increased customer logins by nearly 70%. (Techcombank, 2023)

3.2. Achievements of applying the Internet of Things at Vietnamese commercial banks

Firstly, commercial banks have solutions that bring flexibility and convenience in financial transactions. IoT supports the development of many technologies to pay for goods and services or make transactions at ATMs without using cards integrated into mobile banking applications, helping to make transactions quickly and reduce the risk of using cash or traditional physical cards. . This method gradually becomes popular throughout the entire commercial banking system in Vietnam.

Second, make smart banking a new trend. Models such as TP Livebank, MB Smartbank, Onebank and ACB Lite provide services similar to traditional banks. Commercial banks diversify service distribution channels and reduce pressure related to building and managing branches and transaction offices. Thanks to that, commercial banks have rapidly expanded their networks to reach and increase the mobilization rate of new and potential customers.

Third, optimize and automate internal processes. Collecting data from multiple sources helps banks monitor in real time through payment channels, mobile banking applications , etc. Automate the process of loan appraisal, credit assessment and other transactions to help save time. time, reduce costs, increase productivity and reduce operational risks.

Fourth, commercial banks have strengthened and built trust in customers by improving the service experience. Thanks to understanding customers' behavior and spending habits, the bank has developed appropriate products, IoT devices are integrated into banking services to provide information and services according to customers' needs. goods automatically and intelligently. Forecasting customers' financial needs helps optimize communication and financial advice, creating a better, more personalized experience for customers.

3.3. Challenges for applying the Internet of Things at Vietnamese commercial banks

First, the legal framework on digital banking in Vietnam still limits the development of financial technology. The process of promulgating legal regulations requires a long time, which makes commercial banks reluctant to apply new services and technologies outside of legal regulations, especially for IoT technology, security is a challenge. big and interesting.

Second, the risk of user information and data security is always a big challenge for IoT systems. IoT systems allow banks to collect information from many different sources and require high security. However, data security infrastructure still has many limitations because banks focus on developing products and services due to the

impact of rapid digitalization. By 2023, many cyber attacks targeting banks have been carried out, according to Mr. Tran Dang Khoa, Deputy Director of the Information Security Department, Ministry of Information and Communications, who also said that online fraud cases tend to increase. Most of which are fake websites of banking and financial institutions and more than 95% of more than 4,000 reports of fraud cases are related to forgery and fraud in the banking and financial sector. This shows that the risks of fraud, theft of customer information and data are still a huge problem. (mic.gov.vn, 2023)

Third, most banks currently lack talent to serve information technology development. Meanwhile, according to statistics from recruitment channels, currently the recruitment demand of the information technology industry in Vietnam has increased 4 times, of which the software development industry always reaches more than 50% of recruitment demand. industry-wide use. The demand for human resources is increasing, but the labor market in this field in Vietnam is always in a state of shortage in both quantity and quality. Specifically, in 2019, the estimated number of information technology human resources needed is 350,000 people, but there is a shortage of about 90,000 people . In 2020, the number of human resources needed in the information technology industry is estimated at 400,000 people and an estimated shortage of 100,000 personnel. In 2021, 500,000 people are needed and a shortage of 190,000 people. This greatly affects the banking sector in Vietnam today and faces the problem of human resource shortage in building and developing digital banks. (Vu Van Thuc, 2022)

Fourth, technological development is uneven among banks. The strength of IoT is connection, not only in a commercial bank but in the entire banking system in the near future. Therefore, it requires uniformity in technical and technological levels in banks. Currently, partly due to the lack of human resources and limited resources of banks, technology development among banks is uneven, which affects the ability to connect and exchange information. , data between banks for customers.

Fifth, large investment costs. IoT application banks are gradually developing with the introduction of many technology services and products, thus having a great impact on research and investment costs for product development with IoT utilities. To avoid being eliminated, commercial banks must regularly predict and improve the system to meet future needs. That causes great financial pressure.

4. SOME RECOMMENDATIONS

Firstly, competent state agencies need to promote the process of updating and promulgating legal regulations related to financial technology, especially regulations on the application of IoT in the banking system. . This helps create a favorable legal environment for the development of new services and technologies. In addition, it is necessary to promote cooperation between commercial banks with the State Bank, the Ministry of Finance,... to discuss and propose specific opinions on legal risks in parallel with simulation and technology development in the IoT segment. This will help shorten the time to promulgate regulations and ensure feasibility.

Second, commercial banks need to invest in building and upgrading data and information security infrastructure in parallel with developing new products. Information security is an extremely important factor for banks and is even more urgent during the digital transformation period. Some measures include protecting networks, servers and storage systems such as network security solutions, firewalls, data encryption and access control. In addition, banks need to establish detailed information and data security policies, including defining security standards, access authorization and risk management. Security processes need to be designed, implemented, maintained and periodically evaluated. This includes testing the system to detect security vulnerabilities and implementing remedial measures to ensure the safety and security of the bank's IoT system. Furthermore, commercial banks can cooperate with Fintech companies specializing in providing security services for banks to be able to carry out product development and handle potential security risks in parallel.

Third, the training, recruitment and use of human resources in the information technology industry, specifically financial technology, need to be done in a systematic manner. For universities, establishing specialized training programs is extremely important, so that in the future the Vietnamese banking system will have abundant professional human resources. Recruitment and retention of human resources of commercial banks need to be focused, especially recruited human resources must require professional abilities and market sensitivity, especially in the current technology race period. In addition, commercial banks need to specifically create conditions for personnel to quickly access digitalization, supplement necessary skills and adapt thinking to the rapidly changing technological environment in parallel with policy development. Appropriate and worthy benefits for talented people in the information technology field.

Fourth, commercial banks need to strengthen cooperation with Fintech companies to inherit technology. Uneven development also makes it difficult for the banking system to exchange information, especially in the IoT ecosystem. Therefore, commercial banks should promote cooperation with Fintech companies to support technology for payment transactions, money transfers and research and development activities for technology products based on the IoT network. This will help underdeveloped banks save research costs and accelerate the digital integration process.

5. CONCLUDE

IoT is becoming an increasingly important factor for commercial banks in the digitalization process thanks to its unique benefits. In recent times, IoT adoption has become popular, helping to develop a diverse ecosystem and expand the banking network in Vietnam quickly. Commercial banks that thoroughly grasp IoT technology are gradually becoming pioneer banks in the field of financial technology. This promotes strong competition, contributing to the development of the banking industry and Vietnam's economy.

Data collected from research, scientific journals and information from some commercial banks helped the team make specific comments on the application of IoT technology in banking. Because IoT-based products are diverse, bringing convenience, speed and high-tech experience to customers, thereby expanding the bank's customer system and improving the ability to conduct transactions. However, there is much evidence that IoT technology still has many limitations, especially in terms of security capabilities and resources for research and development. Therefore, the team proposes several recommendations to improve security and other aspects of IoT adoption. Technology development is important, but controlling information security risks is also an urgent issue.

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